FCC CFR47 PART 15 SUBPART E
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

Intelligent Backhaul Radio UNII 5.3GHz band

MODEL NUMBER: IBR-1B

FCC ID: 2AAEH-102

IC: 11158A-102

REPORT NUMBER: 13U14996

ISSUE DATE: 2013-10-10

Prepared for
CBF NETWORKS, INC., DBA FASTBACK NETWORKS
2460 N. FIRST STREET, SUITE 200
SAN JOSE, CA 95131

Prepared by
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NVLAP LAB CODE 100255-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	2013-10-04	Initial Issue	Joseph Danisi
--	2013-10-09	Correct frequency typo in tables	Joseph Danisi

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: **CBF NETWORKS, INC., DBA FASTBACK NETWORKS**
2460 N. FIRST STREET, SUITE 200
SAN JOSE, CA 95131

EUT DESCRIPTION: **Intelligent Backhaul Radio UNII 5.3GHz band**

MODEL: **IBR-1B**

SERIAL NUMBER: **56**

DATE TESTED: **2013-05-02 to 2013-10-04**

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 9	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL By:

Bob DeLisi
WiSE Principal Engineer
UL

Tested By:

Joseph Danisi
WiSE Project Lead
UL

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, FCC KDB 789033, ANSI C63.4-2003, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 1285 Walt Whitman Rd. Melville, NY 11747, USA.

UL Melville is accredited by NVLAP, Laboratory Code 100255-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/1002550.htm.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test	Uncertainty
Conducted Emissions (worst case 9kHz-30MHz)	± 2.0, k=2 (95%)
Radiated Emissions, 30-200MHz, Horizontal	± 3.6, k=2 (95%)
Radiated Emissions, 30-200MHz, Vertical	± 3.8, k=2 (95%)
Radiated Emissions, 200-1000MHz, Horizontal	± 2.8, k=2 (95%)
Radiated Emissions, 200-1000MHz, Vertical	± 3.7, k=2 (95%)
Radiated Emissions, 1-18GHz (worst case, sVSWR)	± 4.9, k=2 (95%)
Radiated Emissions, 1-26GHz (worst case, Ground Plane)	± 5.7, k=2 (95%)

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

P-P outdoor radio in 5GHz unlicensed with an 802.11b management interface Intelligent Backhaul Radio

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

35MHz

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5269-5328	FDD	19.48	88.72

18MHz

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5261-5337	FDD	17.75	59.57

9MHz

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5257-5343	FDD	14.88	30.76

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Dipole array antenna, with a maximum gain of 10.5 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Build Sun Revision: 574M.

The test utility software used during testing was Micro monitor 1.18.0.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Based on the baseline testing, the worst-case modulation and data rate was:

35MHz bandwidth QAM 4
18MHz bandwidth QAM 4
9MHz bandwidth QAM 4
Data rate 30 Msamples/s for all bandwidths

5.6 DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Laptop	Lenovo	Think pad	N/A	N/A
POE	PHIHONG	POE 36U-1AT-R	N/A	N/A
Smart Class Ethernet	JDSU	HST-3000	N/A	N/A
Smart Class Ethernet	JDSU	SCE-1	N/A	N/A
Smart Class Ethernet	JDSU	SCE-2	N/A	N/A

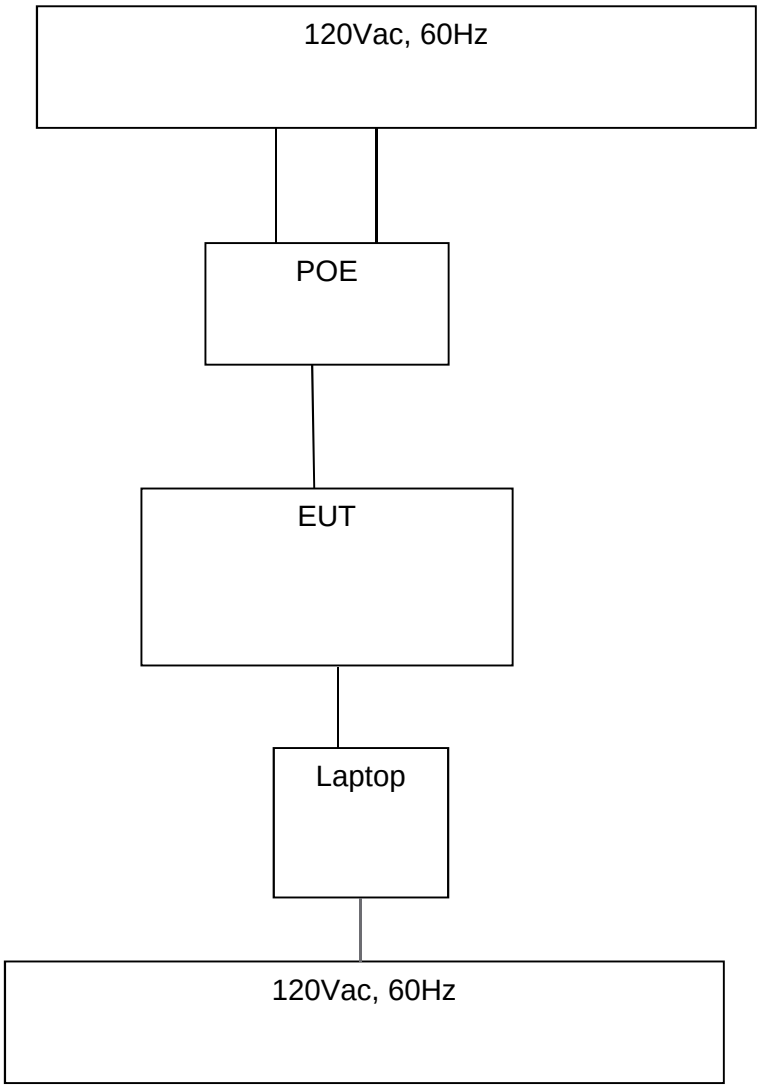
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	1	1	POE(Power over Ethernet)	Sheilded	About 40ft	N/A
2	2	1	Ethernet	Sheilded	About 40ft	N/A
3	3	1	USB-to-Serial Adapter	Sheilded	About 40ft	N/A

TEST SETUP

The EUT is a P-P outdoor radio used as a stand-alone device. Test software exercised the radio module

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Radiated Emissions					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
30-1000MHz					
EMI Receiver	Rohde & Schwarz	ESIB26	ME5B-081	2013-01-29	2014-01-31
Log-P Antenna	Schaffner	UPA6109	44068	2013-04-03	2014-04-03
Bicon Antenna	Schaffner	VBA6106A	54	2013-04-03	2014-04-03
Bias Tee	Miteq	AM-1523-7687	44392	N/A	N/A
Bias Tee	Miteq	AM-1523-7687	44393	N/A	N/A
Preamp	Miteq	AM-3A-000110-7687	44391	N/A	N/A
Preamp	Miteq	AM-3A-000110-7687	44394	N/A	N/A
Switch Driver	HP	11713A	ME7A-627	N/A	N/A
System Controller	Sunol Sciences	SC99V	44396	N/A	N/A
Camera Controller	Panasonic	WV-CU254	44395	N/A	N/A
RF Switch Box	UL	1	44398	N/A	N/A
Measurement Software	UL	Version 9.5	44740	N/A	N/A
Multimeter	Fluke	83III	ME5B-305	2013-01-28	2014-01-31
Above 1GHz (Band Optimized System)					
EMI Receiver	Rohde & Schwarz	ESIB40	34968	2013-01-30	2014-01-31
Horn Antenna (1-2 GHz)	ETS	3161-01 (26°)**	51442	2008-03-28	See * below
Horn Antenna (2-4 GHz)	ETS	3161-02 (22°)**	48107	2007-09-27	See * below
Horn Antenna (4-8 GHz)	ETS	3161-03 (22°)**	48106	2007-09-27	See * below
Horn Antenna (8-12 GHz)	ETS	3160-07 (26°)**	8933	2008-11-24	See * below
Horn Antenna (12-18 GHz)	ETS	3160-08 (26°)**	8932	2007-09-27	See * below
Horn Antenna (18-26.5 GHz)	ETS	3160-09 (27°)**	8947	2007-09-26	See * below
Horn Antenna (26.5-40 GHz)	ETS	3160-10 (27°)**	73004	2007-09-26	See * below
Signal Path Controller	HP	11713A	50250	N/A	N/A
Gain Controller	HP	11713A	50251	N/A	N/A
RF Switch / Preamp Fixture	UL	BOMS1	50249	N/A	N/A
System Controller	UL	BOMS2	50252	N/A	N/A
Measurement Software	UL	Version 9.5	44740	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2012-12-22	2014-12-22
Multimeter	Fluke	83III	ME5B-305	2013-01-28	2014-01-31

Radiated Emissions					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date

* - Note: As allowed by the calibration standard ANSI C63.4 Section 4.4.2, standard gain horns need only a one-time calibration. Only if physical damage occurs will the horn antenna require re-calibration.

Gain standard horn antennas (sometimes called standard gain horn antennas) need not be calibrated beyond that which is provided by the manufacturer unless they are damaged or deterioration is suspected, or they are used at a distance closer than $2D^2/\lambda$. Gain standard horn antennas have gains that are fixed by their dimensions and dimensional tolerances.

** - Number in parentheses denotes antenna beam width.

Conducted Emissions					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Conducted Emissions – GP 1					
EMI Receiver	Rohde & Schwarz	ESIB26	ME5B-081	2013-01-29	2014-01-31
LISN	EMCO	3825/2R	ME5-790	2013-02-01	2014-02-28
LISN	Solar	9252-50-R-24-BNC	ME5A-636	2013-02-01	2014-02-28
Switch Driver	HP	11713A	44397	N/A	N/A
RF Switch Box	UL	4	44404	N/A	N/A
Measurement Software	UL	Version 9.5	44736	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43734	2012-03-13	2014-03-13
Multimeter	Fluke	83III	ME5B-305	2013-01-28	2014-01-31

Bench Tests					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
RF Room 1					
Power Meter	HP	437B	71769	2013-01-13	2014-01-13
Spectrum Analyzer	Agilent	E4446A	72822	2013-01-29	2014-01-31
Power Sensor	Rohde & Schwarz	NRP-Z81	75345	2013-01-30	2014-01-31
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2012-12-22	2014-12-22

7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

The EUT operates at a 100% duty cycle.

7.1.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
802.11b	100.00	100	1.000	100.0%	0.00	0.010

7.1.2. MEASUREMENT METHOD FOR POWER AND PPSD

The Duty Cycle is greater than or equal to 98% therefore KDB 789033 Method SA-1 is used.

7.1.3. MEASUREMENT METHOD FOR AVERAGE SPURIOUS EMISSIONS > 1 GHz

The Duty Cycle is greater than or equal to 98%, KDB 789033 Method AD with Power RMS Averaging is used.

8. ANTENNA PORT TEST RESULTS

8.1.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5269	34.6	34.6
Mid	5286	34.5	34.6
High	5328	34.7	34.5

Note: Chain 0=J48 Chain1=J49 35MHz bandwidth QAM4

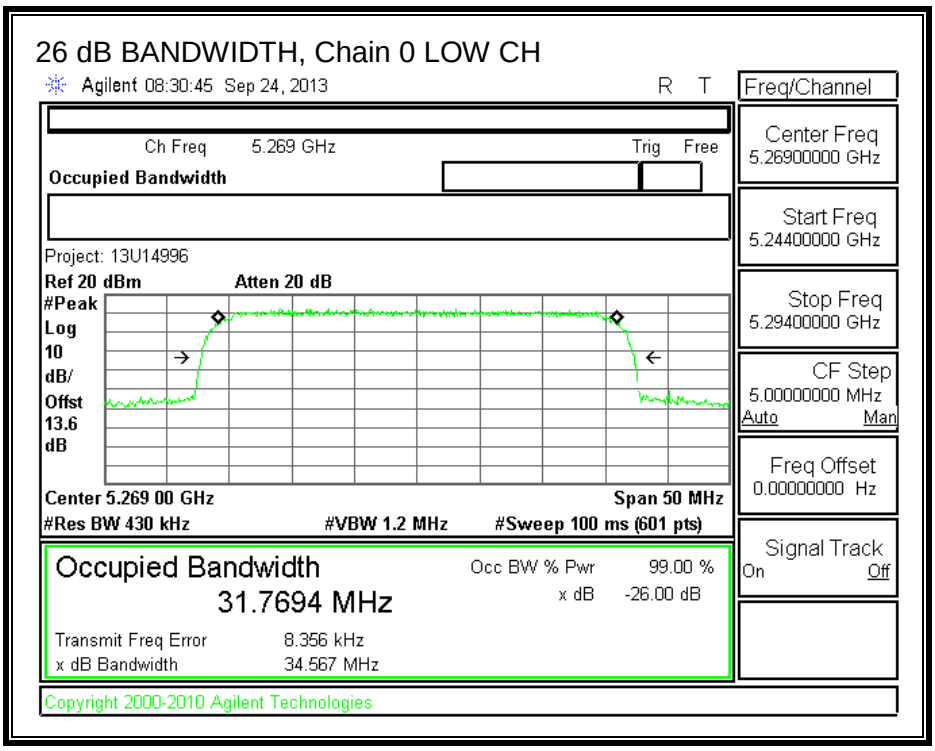
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5261	17.3	17.3
Mid	5289	17.2	17.3
High	5337	17.3	17.3

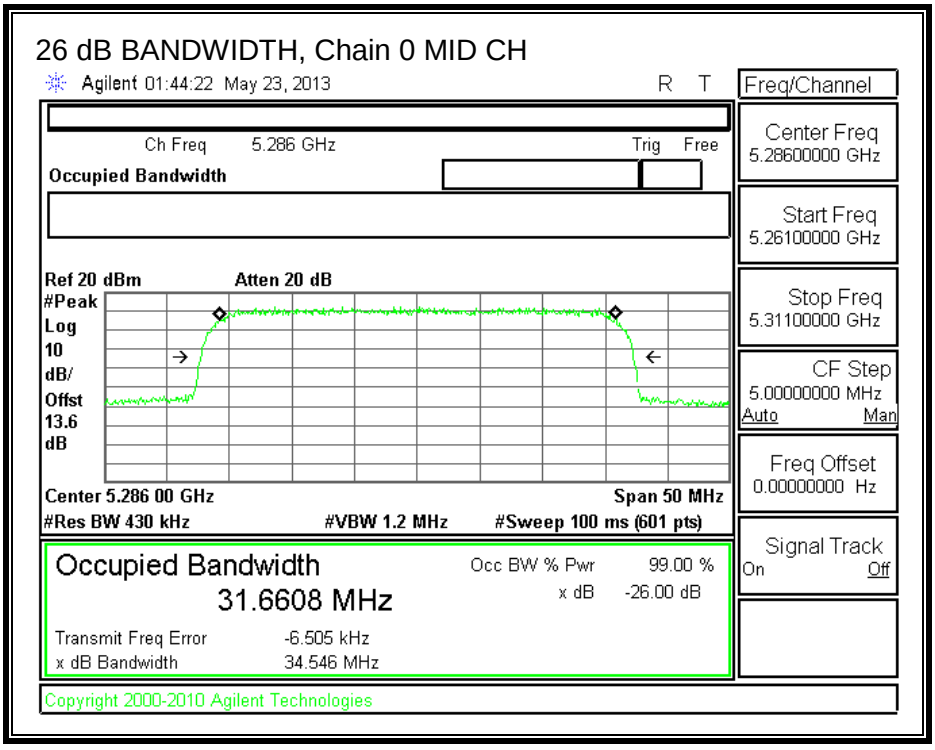
Note: Chain 0=J48 Chain1=J49 18MHz bandwidth QAM4

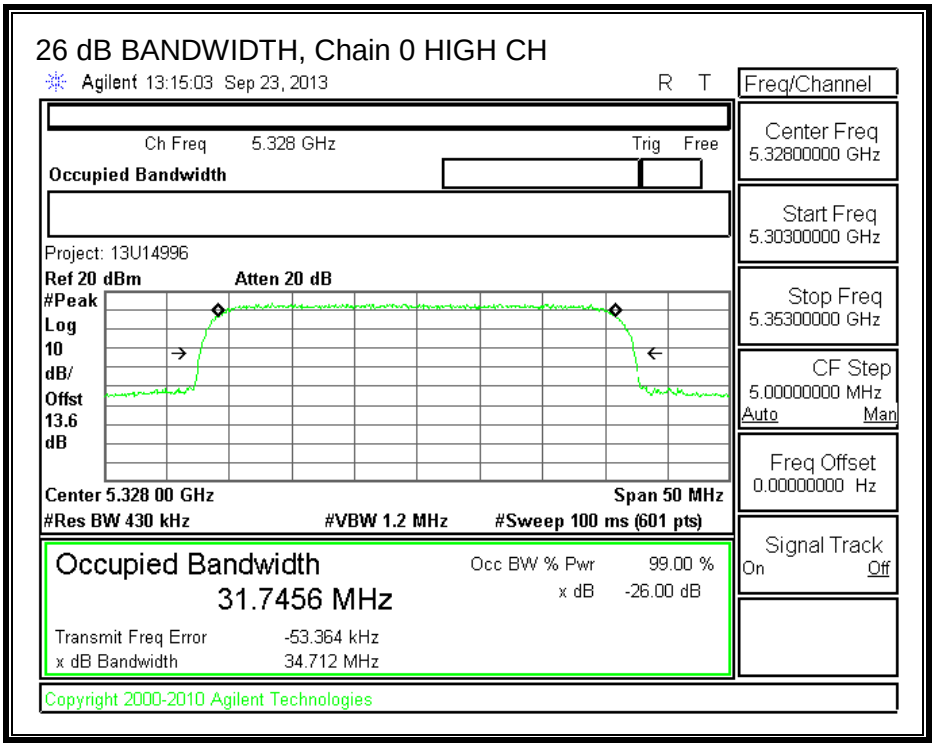
Channel	Frequency (MHz)	26 dB BW Chain 0 (MHz)	26 dB BW Chain 1 (MHz)
Low	5257	8.7	8.7
Mid	5291	8.7	8.7
High	5343	8.6	8.7

Note: Chain 0=J48 Chain1=J49 9MHz bandwidth QAM4

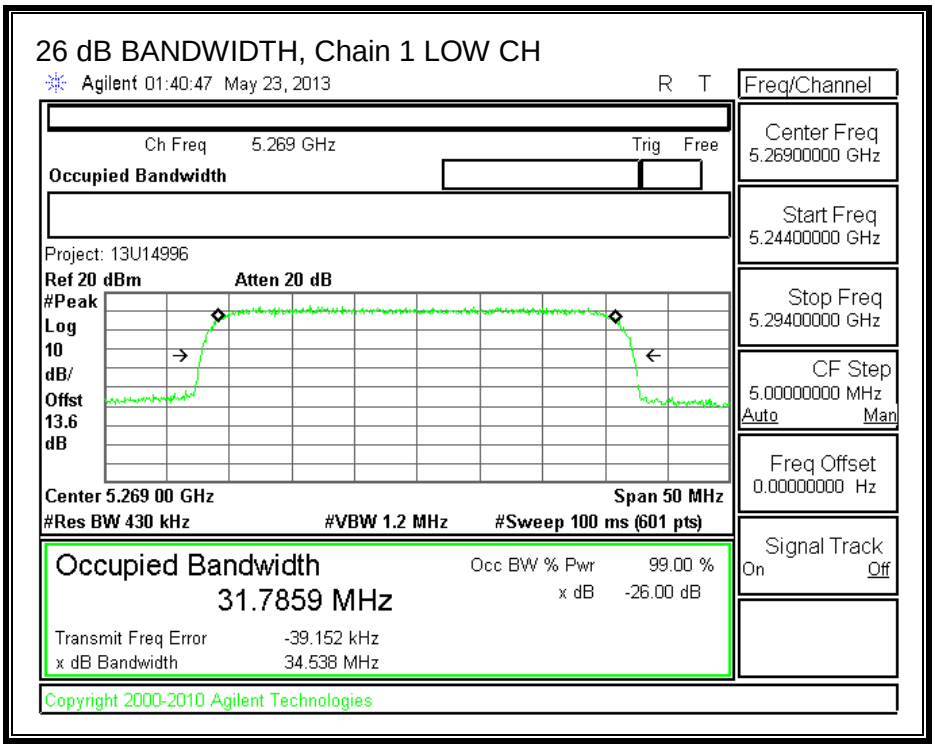
26 dB BANDWIDTH, Chain 0 35MHz setting

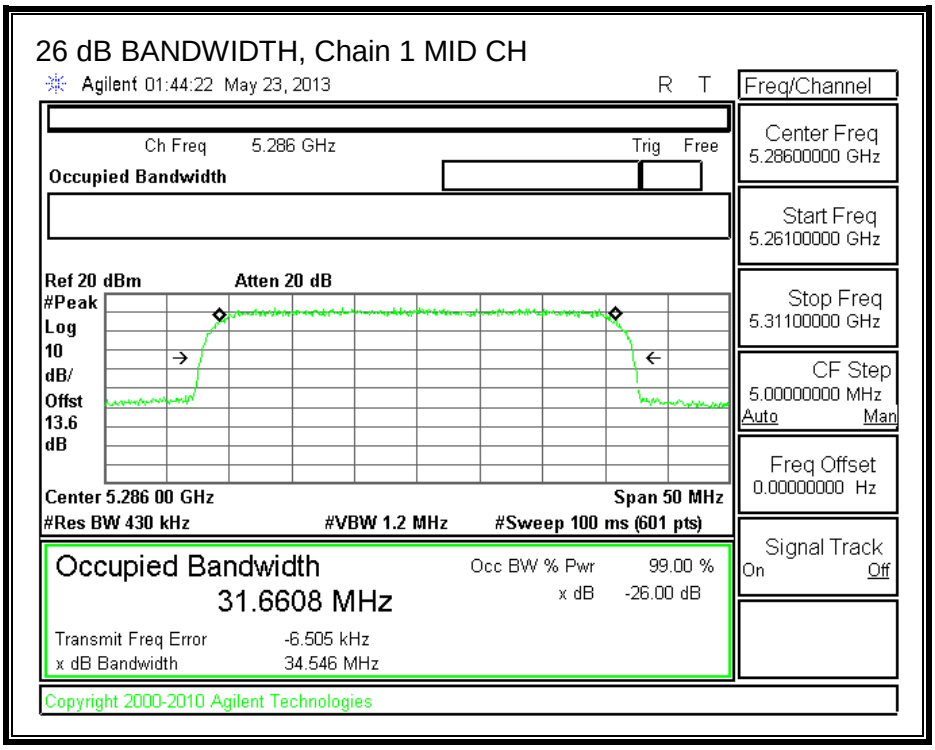


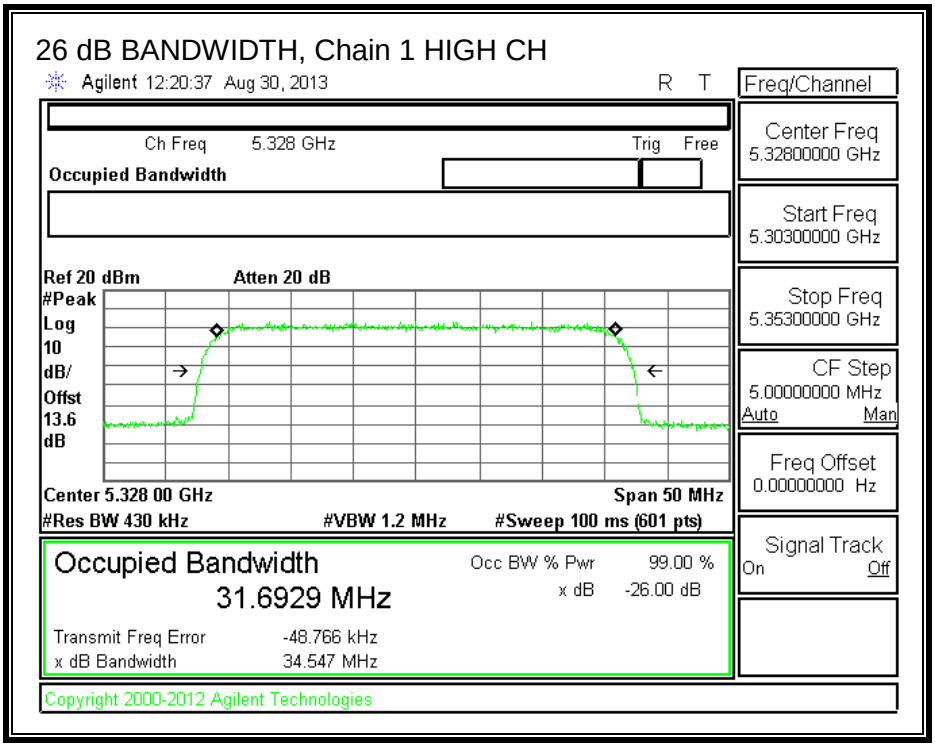




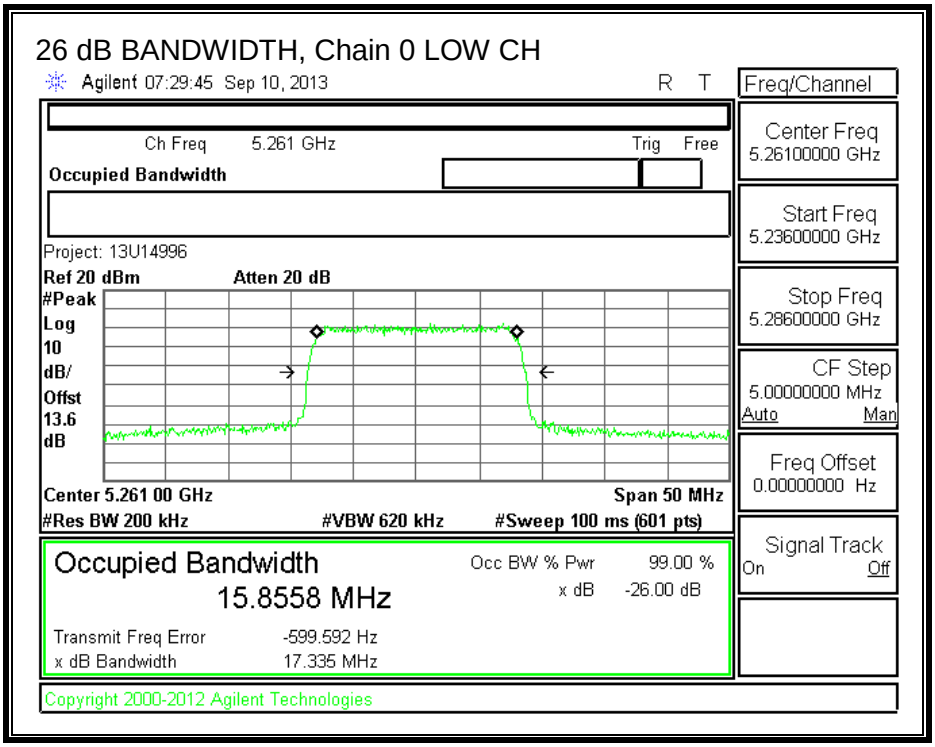
26 dB BANDWIDTH, Chain 1

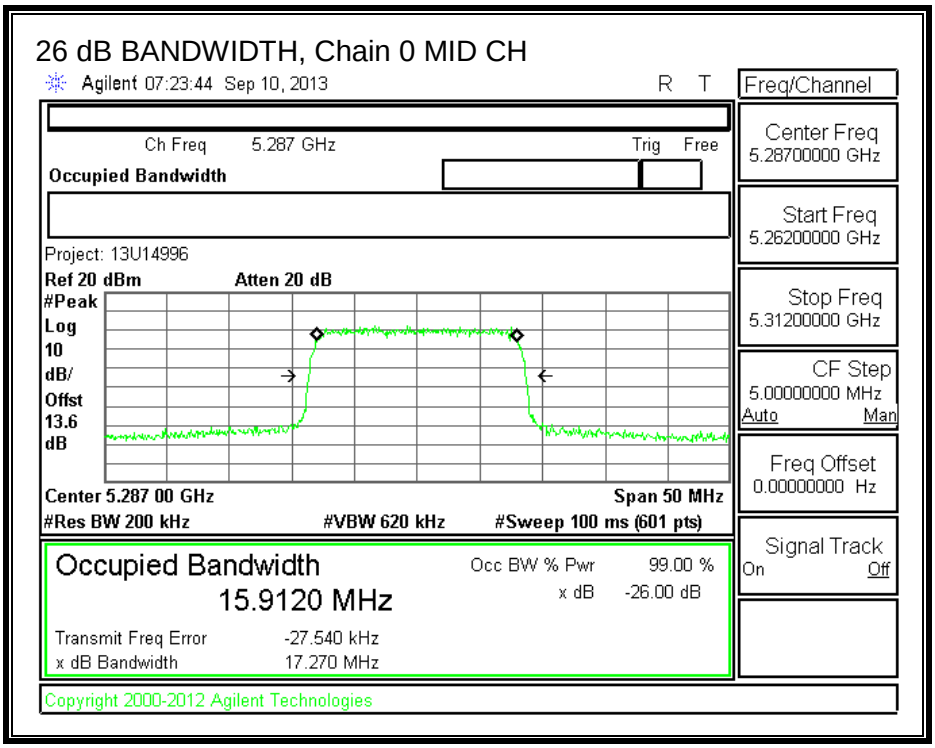


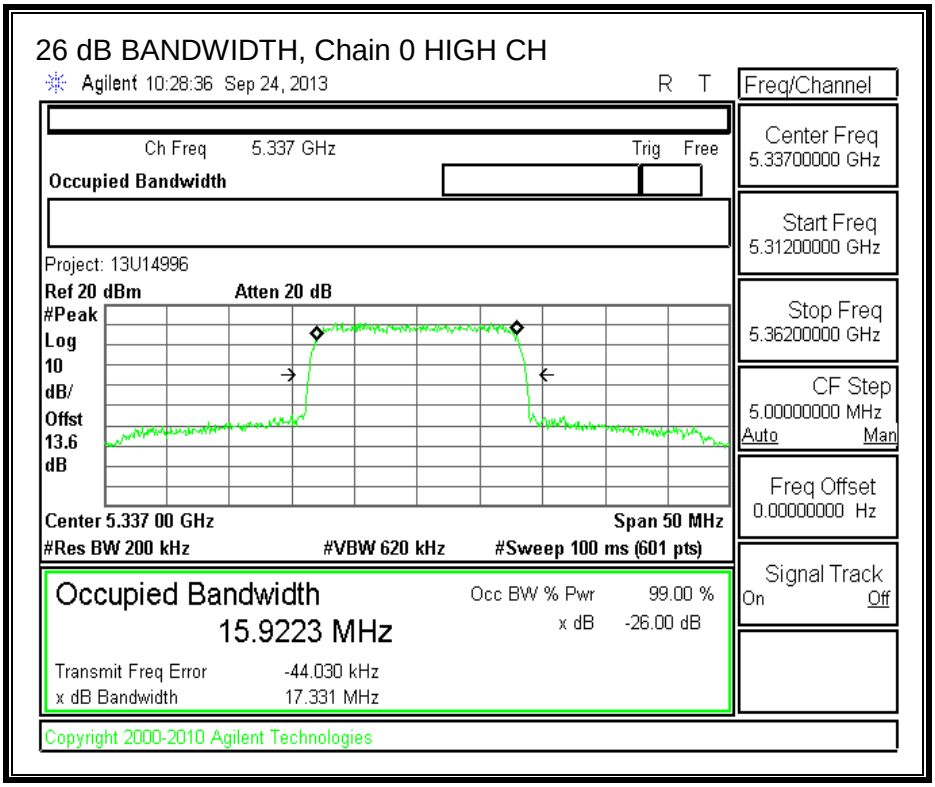




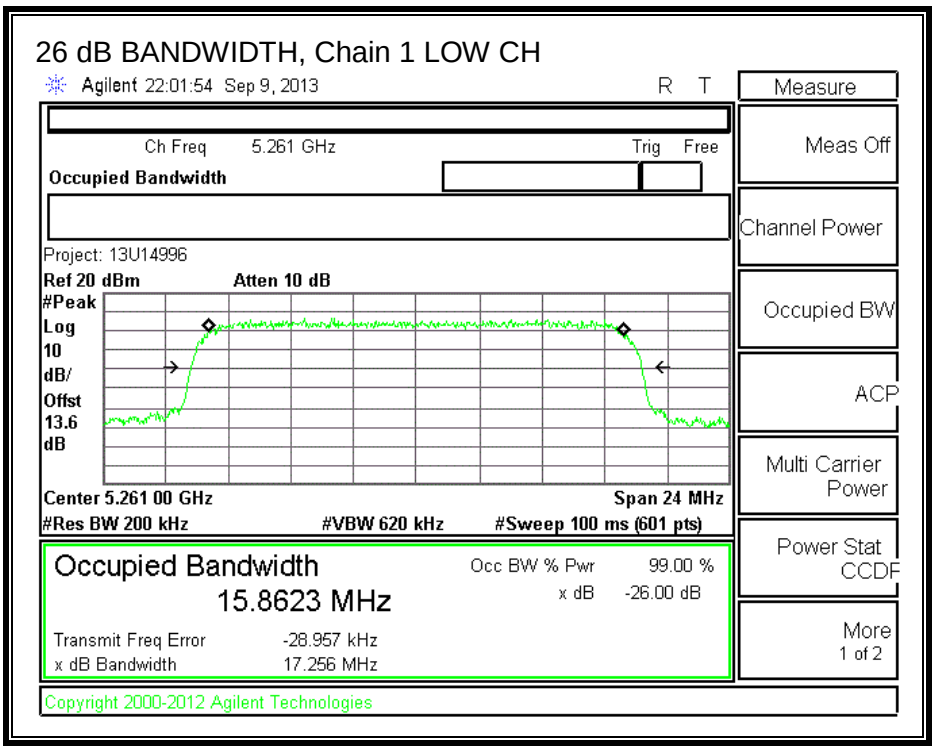
26 dB BANDWIDTH 18MHz setting, Chain 0

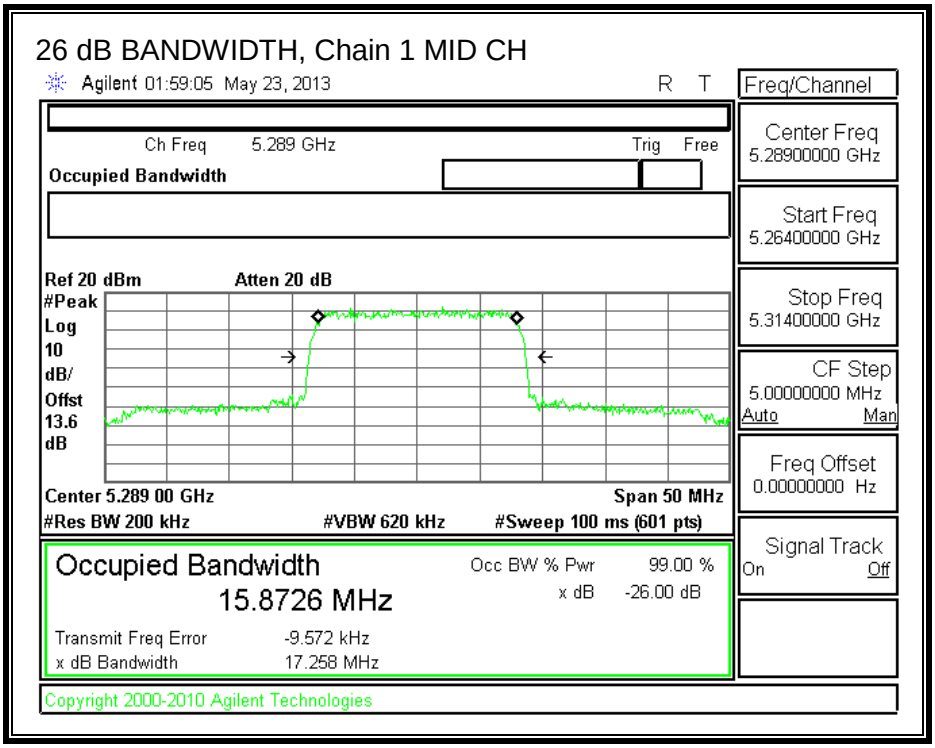


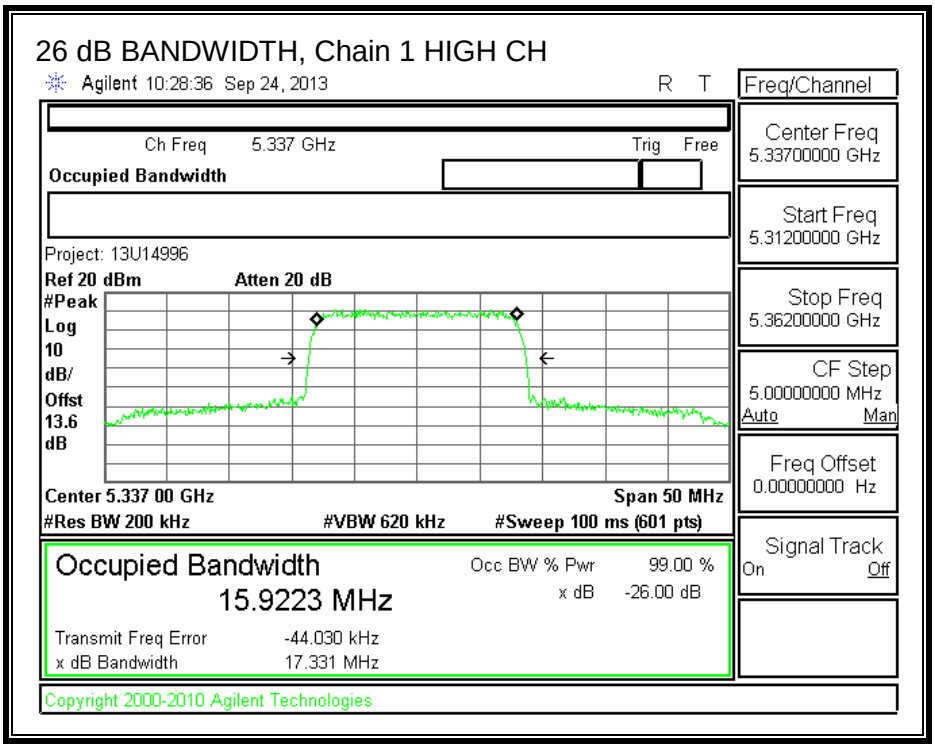




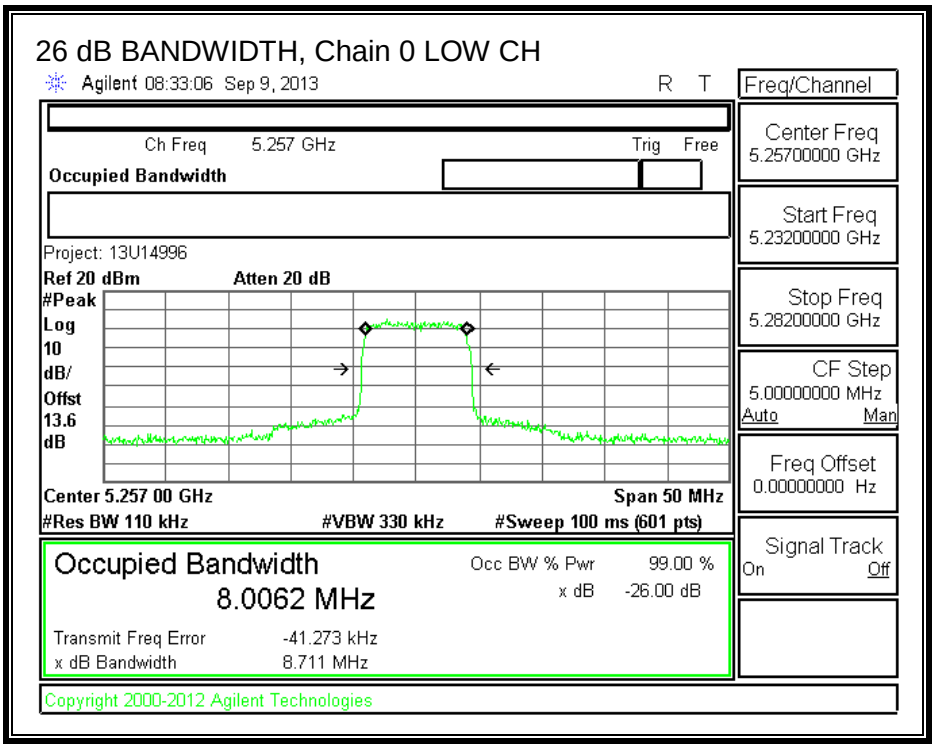
26 dB BANDWIDTH, Chain 1



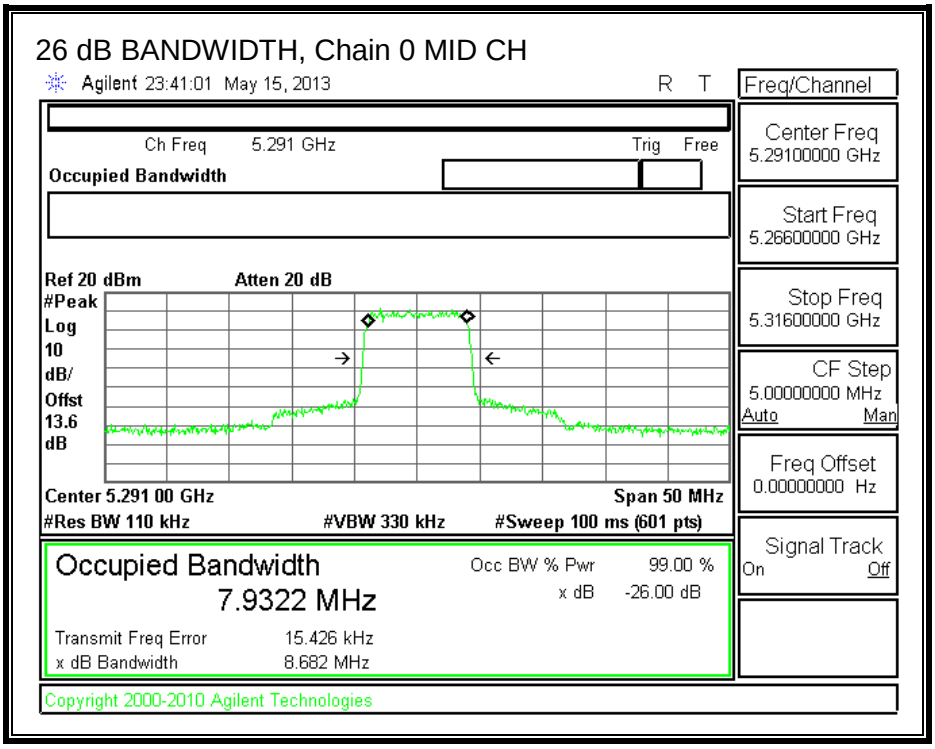




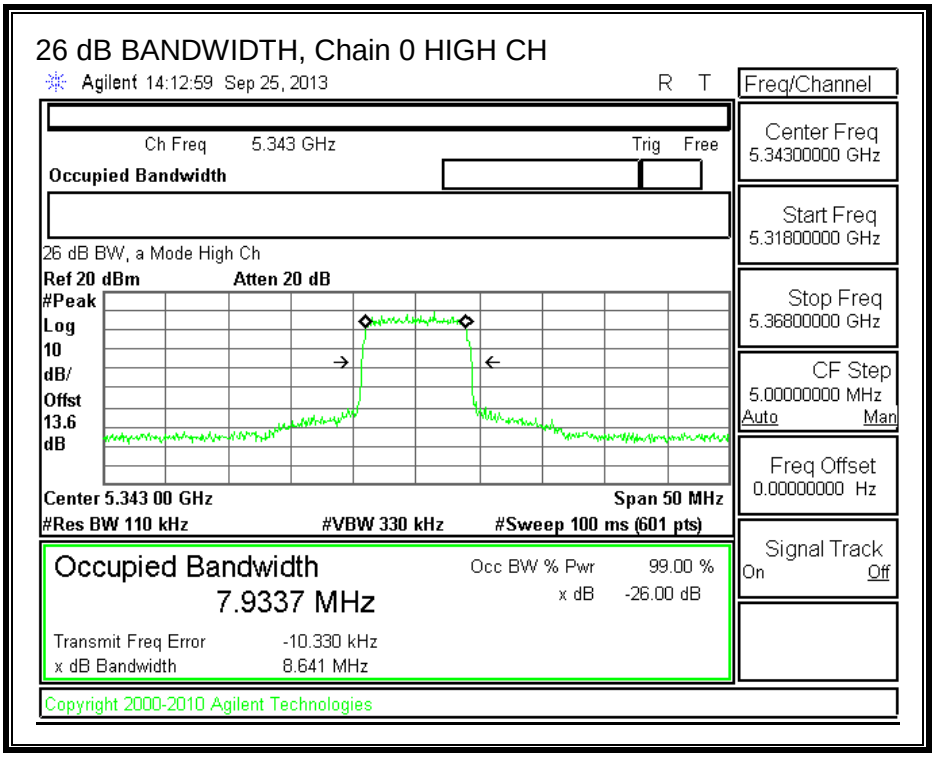
26 dB BANDWIDTH, Chain 0 9MHz



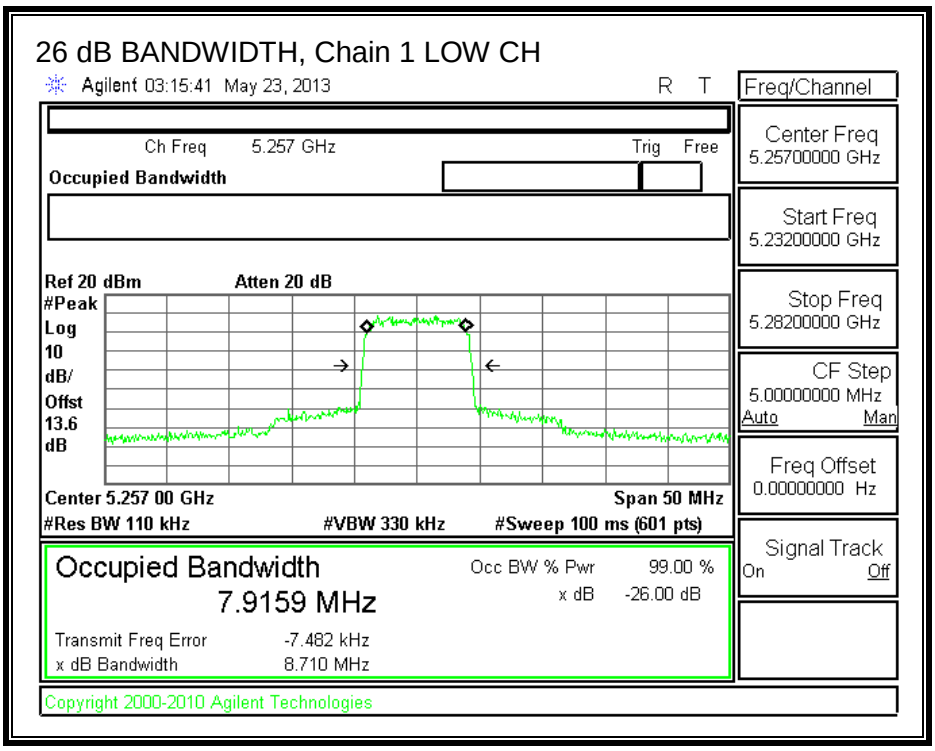
26 dB BANDWIDTH, Chain 0 MID CH

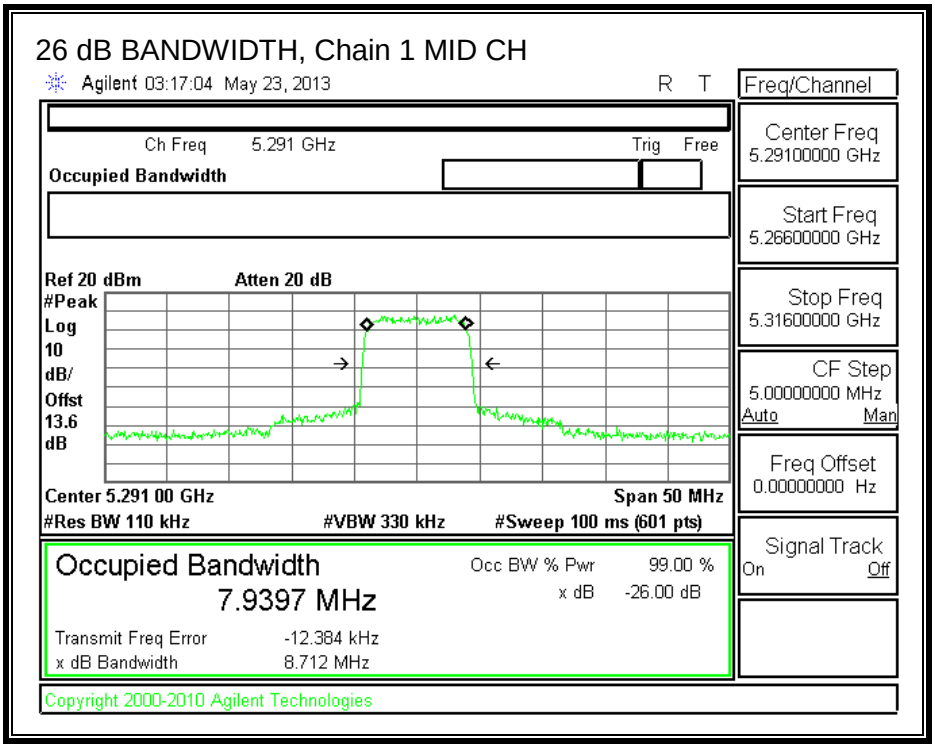


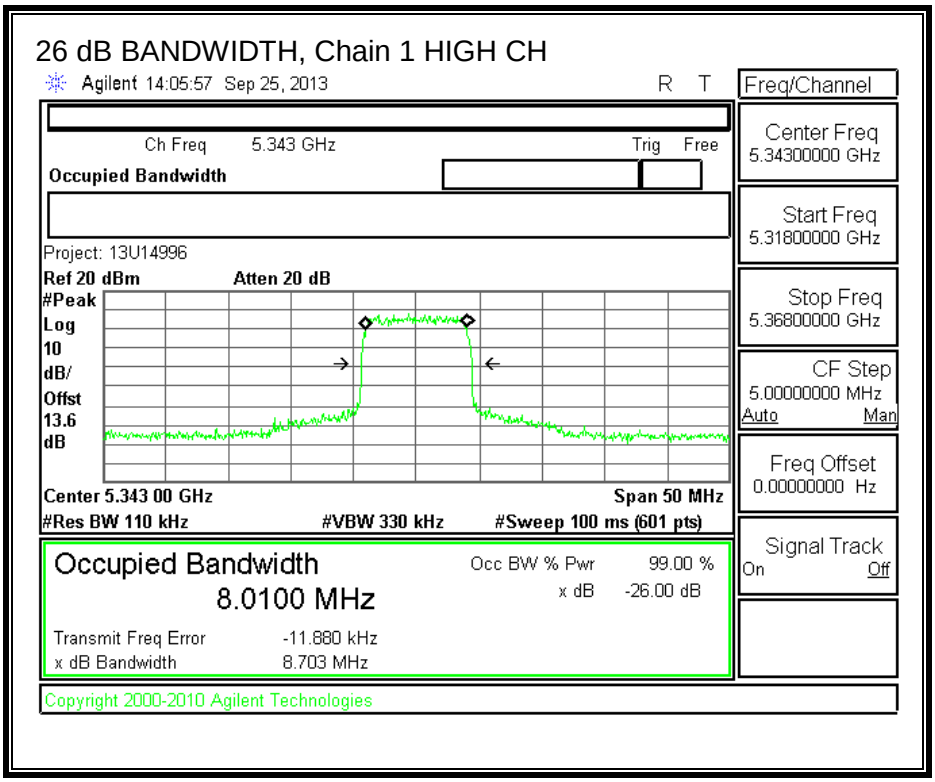
26 dB BANDWIDTH, Chain 0 HIGH CH



26 dB BANDWIDTH, Chain 1







8.1.2 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5269	31.6	31.6
Mid	5286	31.6	31.5
High	5328	31.7	31.8

Note: Chain 0=J48 Chain1=J49 35MHz bandwidth QAM4

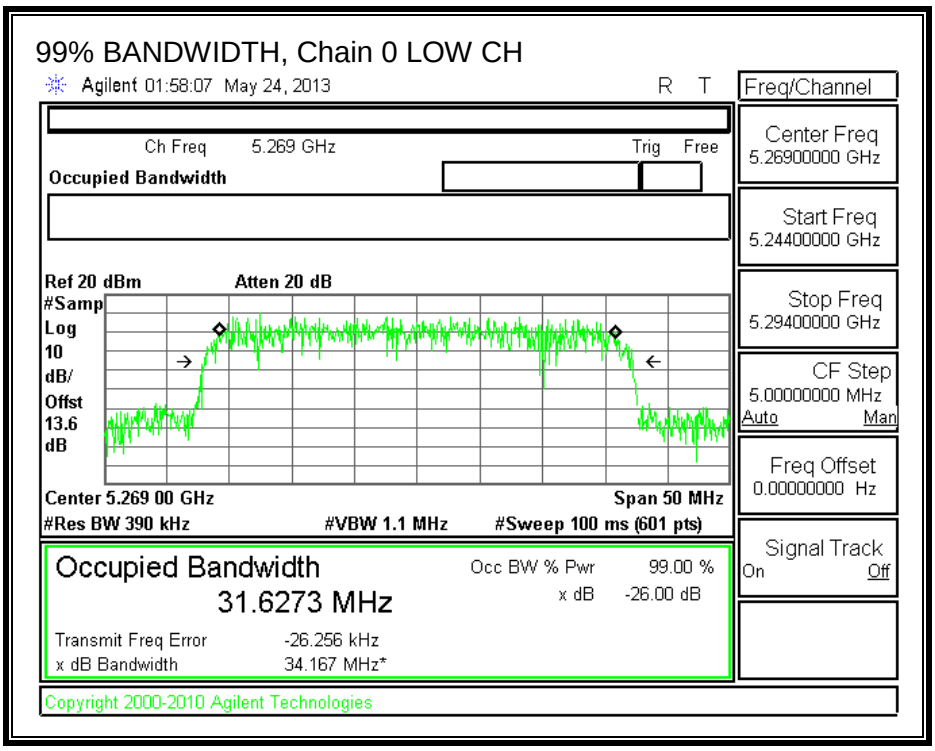
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5261	16.0	15.8
Mid	5289	15.7	15.8
High	5337	15.8	15.8

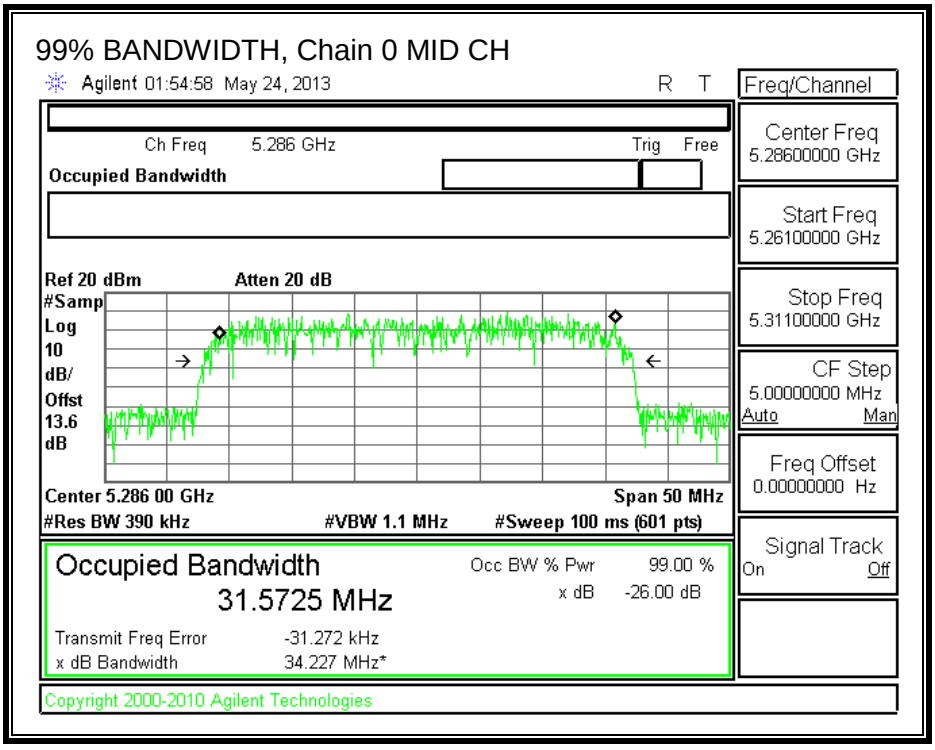
Note: Chain 0=J48 Chain1=J49 18MHz bandwidth QAM4

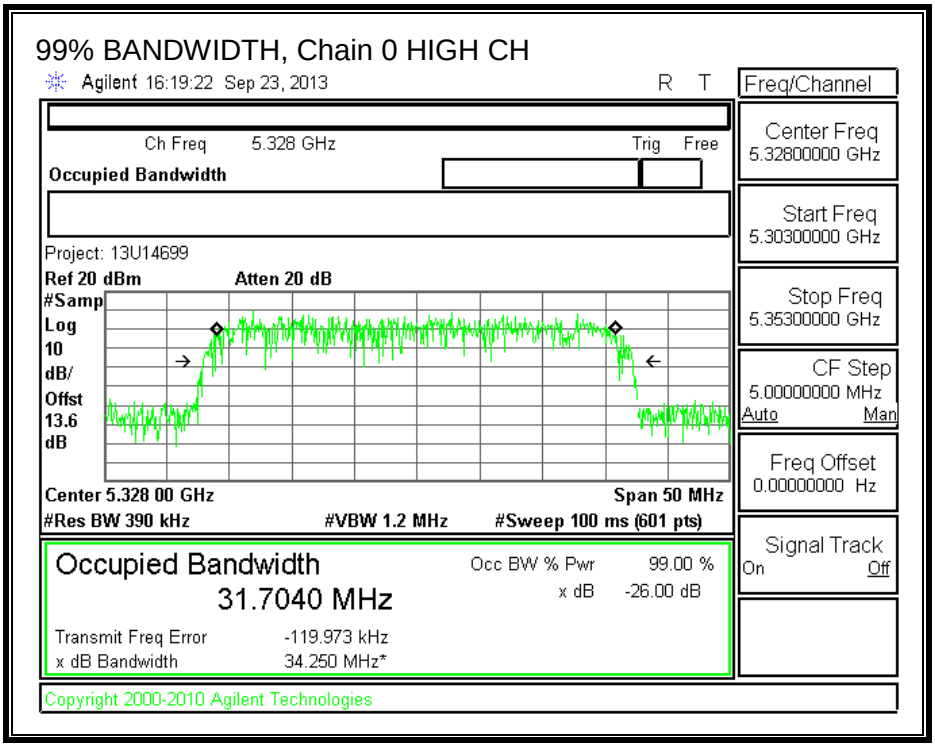
Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	5257	8.0	7.9
Mid	5291	7.8	8.1
High	5343	8.1	7.8

Note: Chain 0=J48 Chain1=J49 9MHz bandwidth QAM4

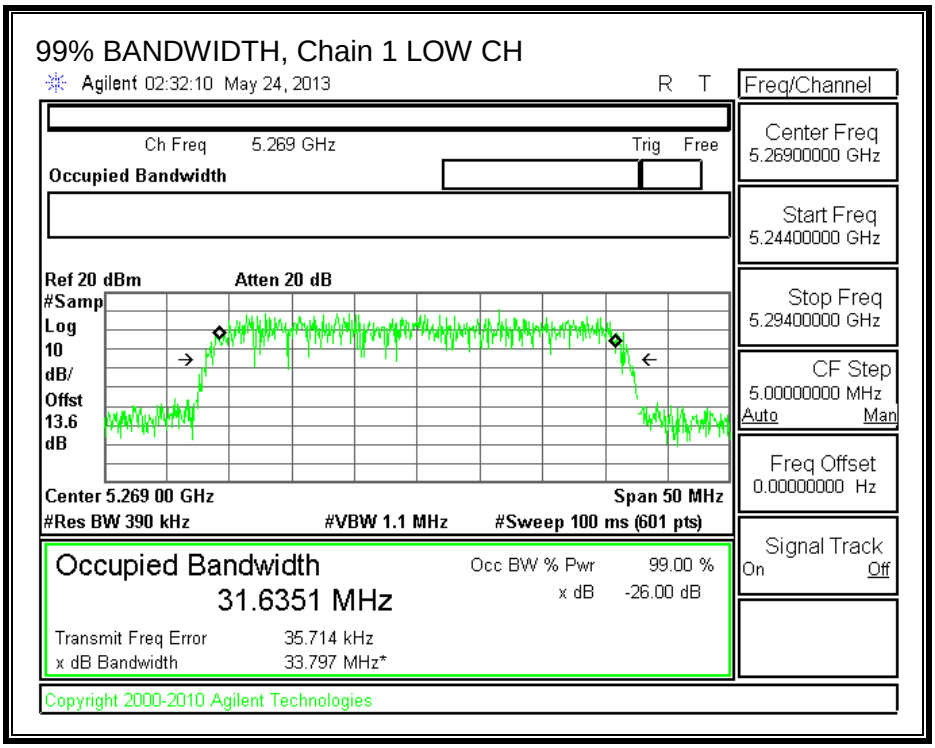
99% BANDWIDTH, Chain 0 Chain 0 35MHz setting

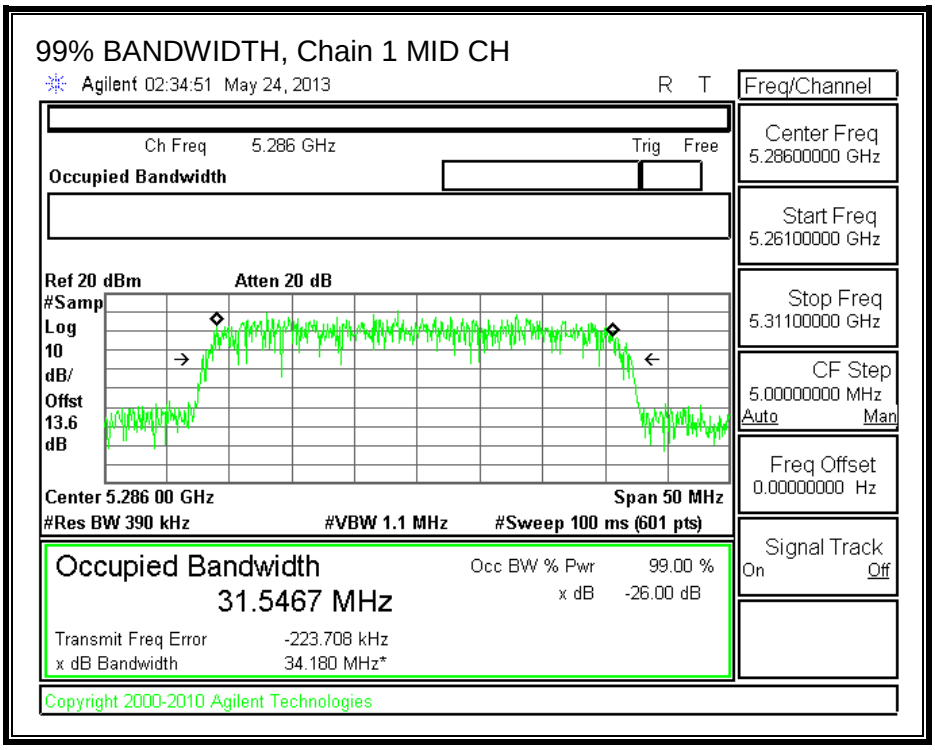


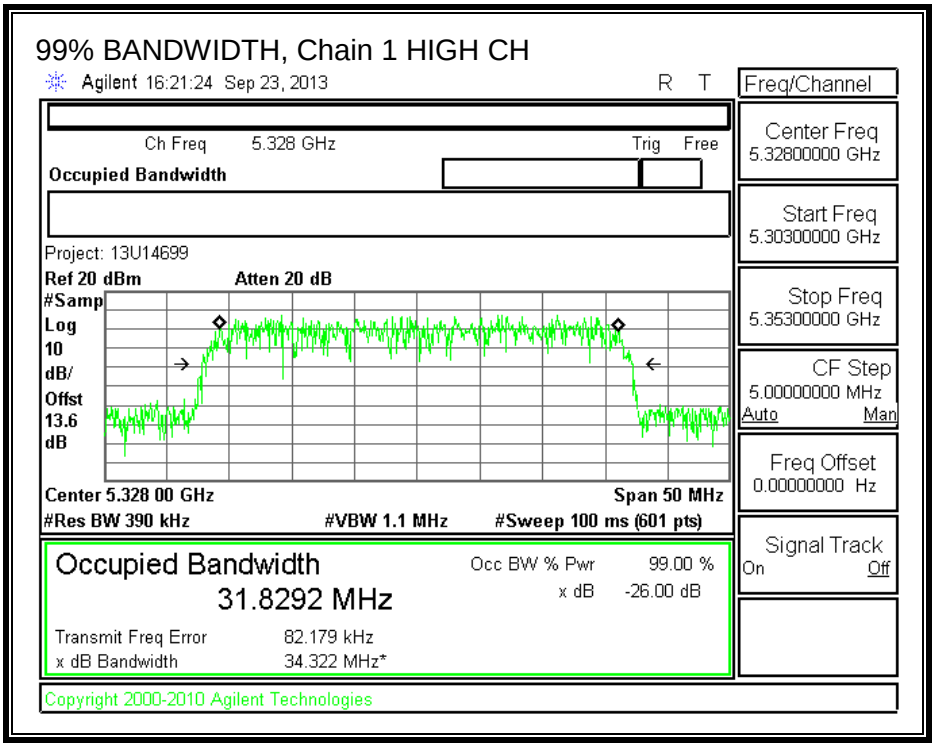




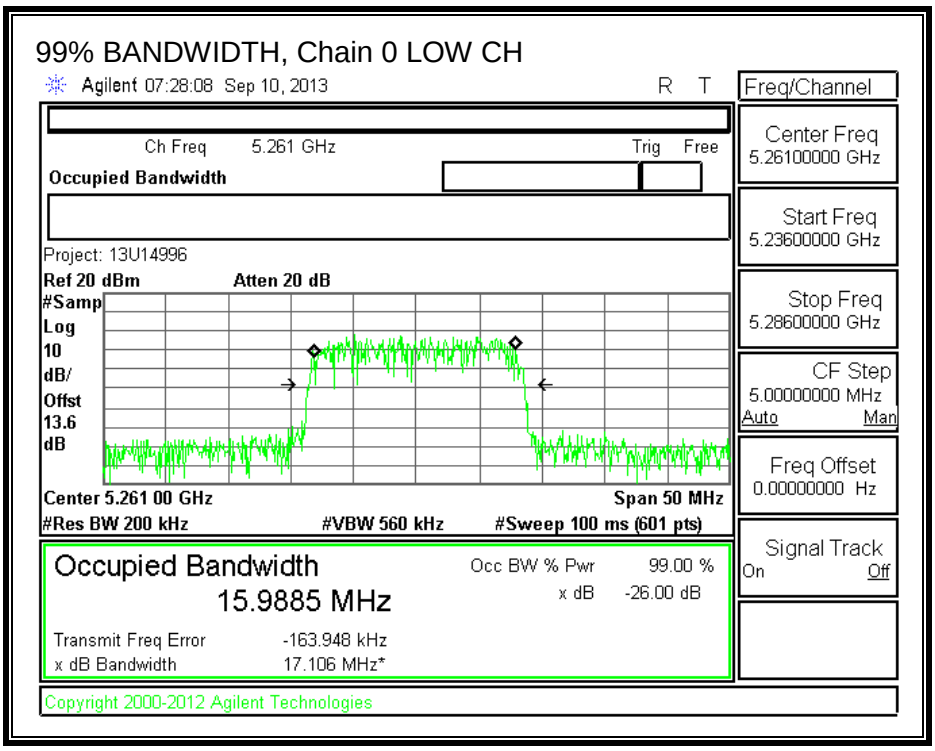
99% BANDWIDTH, Chain 1 35MHz setting

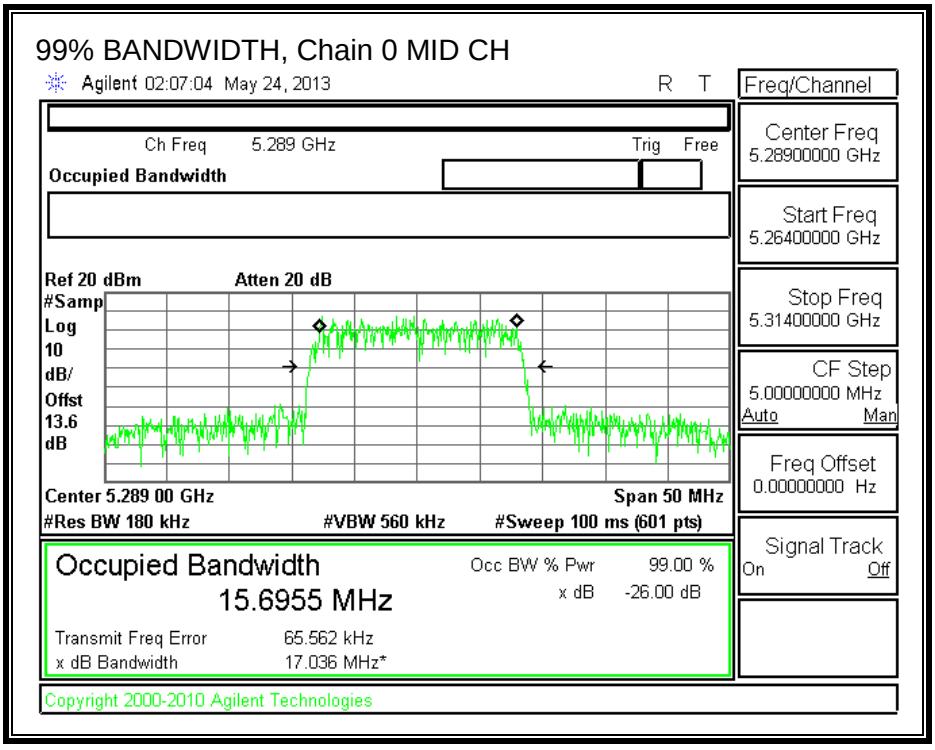


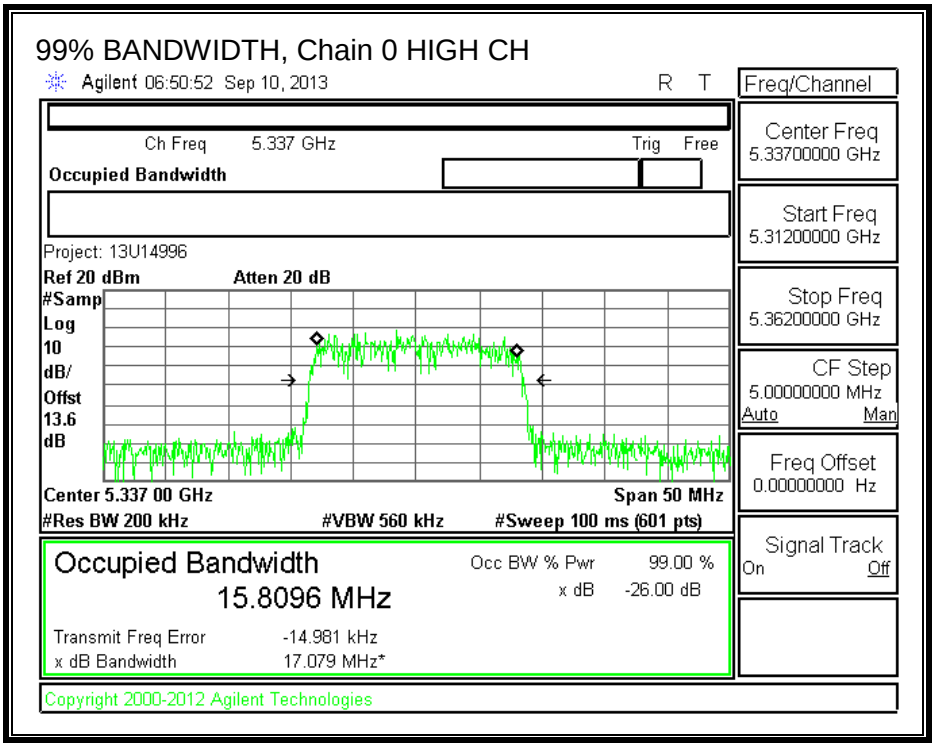




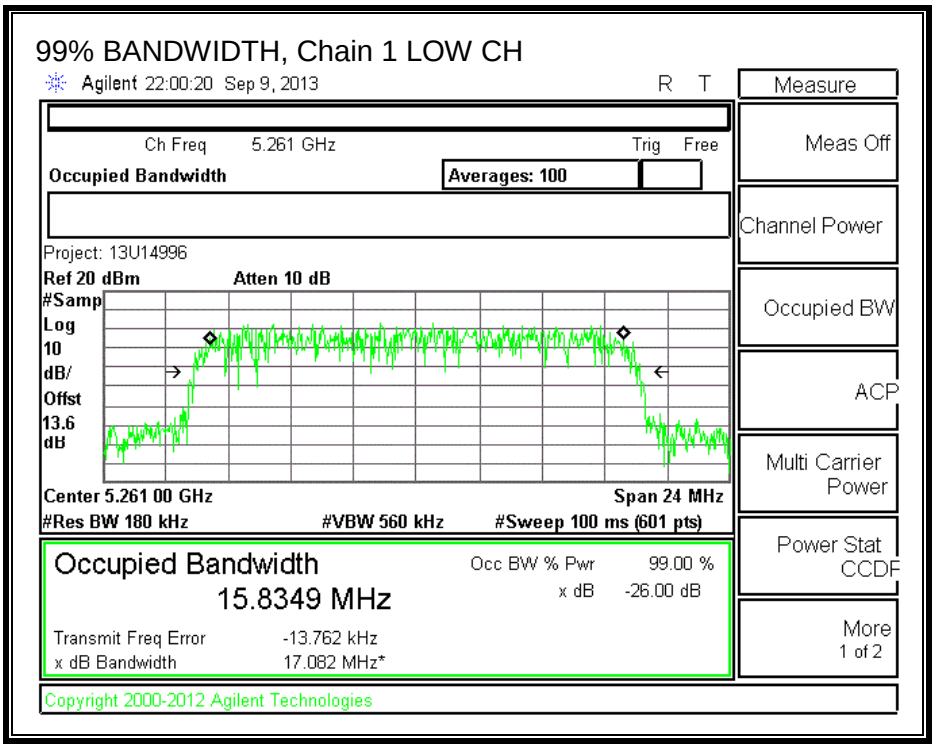
99% BANDWIDTH , Chain 0 18MHz setting

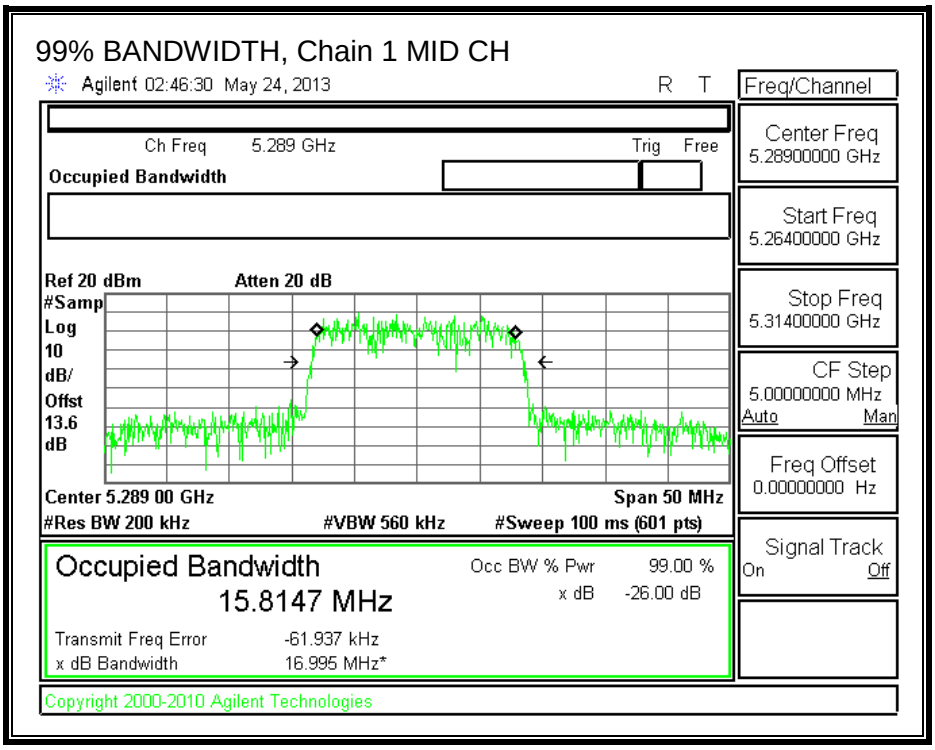


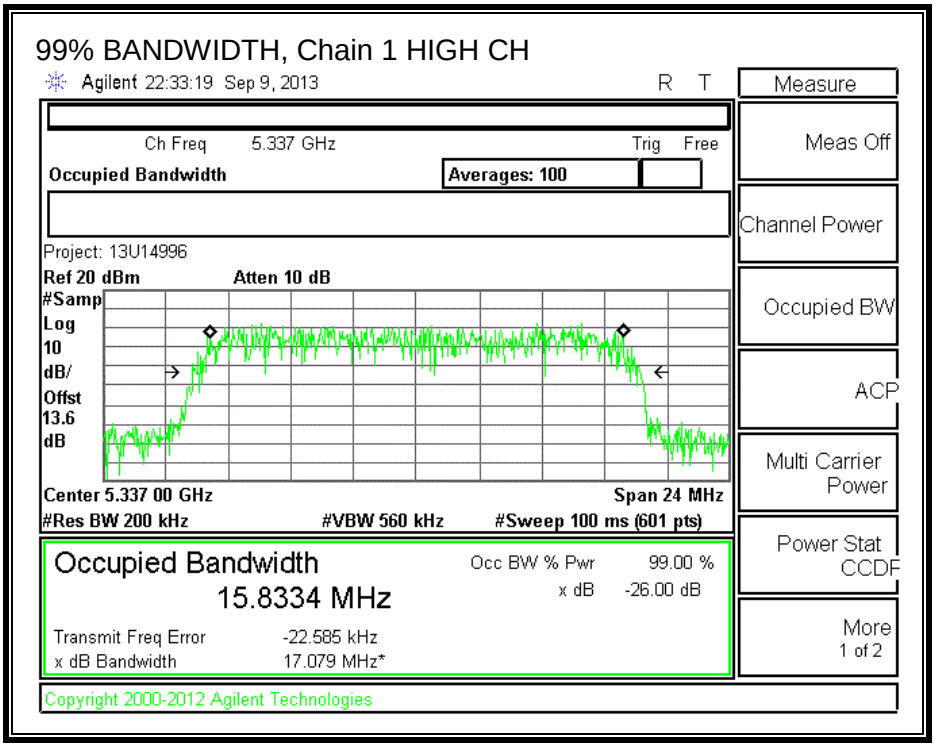




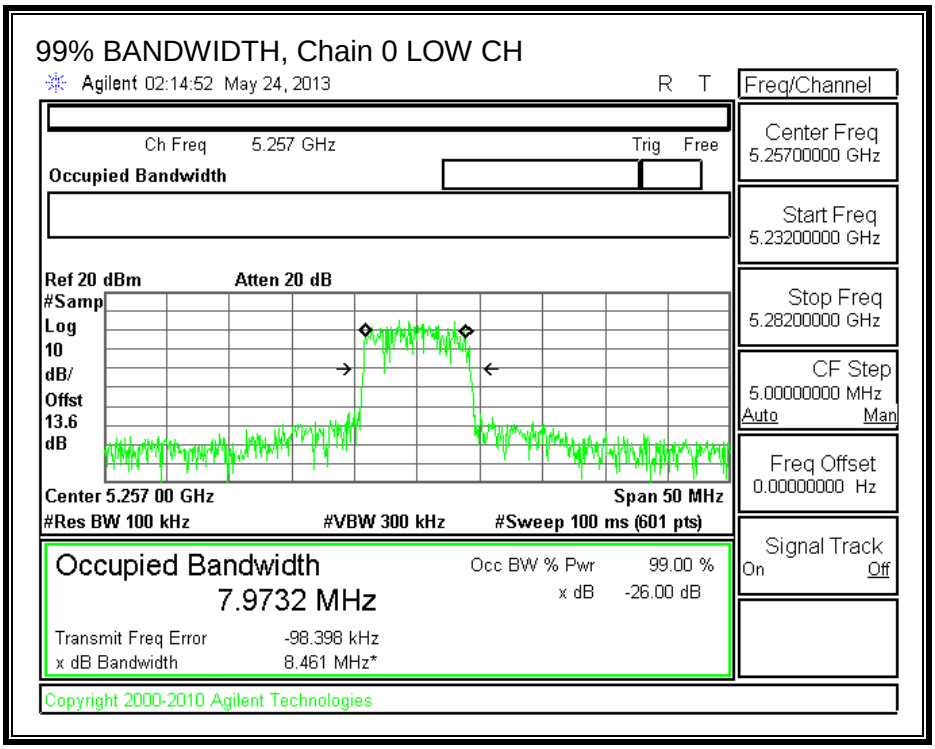
99% BANDWIDTH, Chain 1 18MHz setting

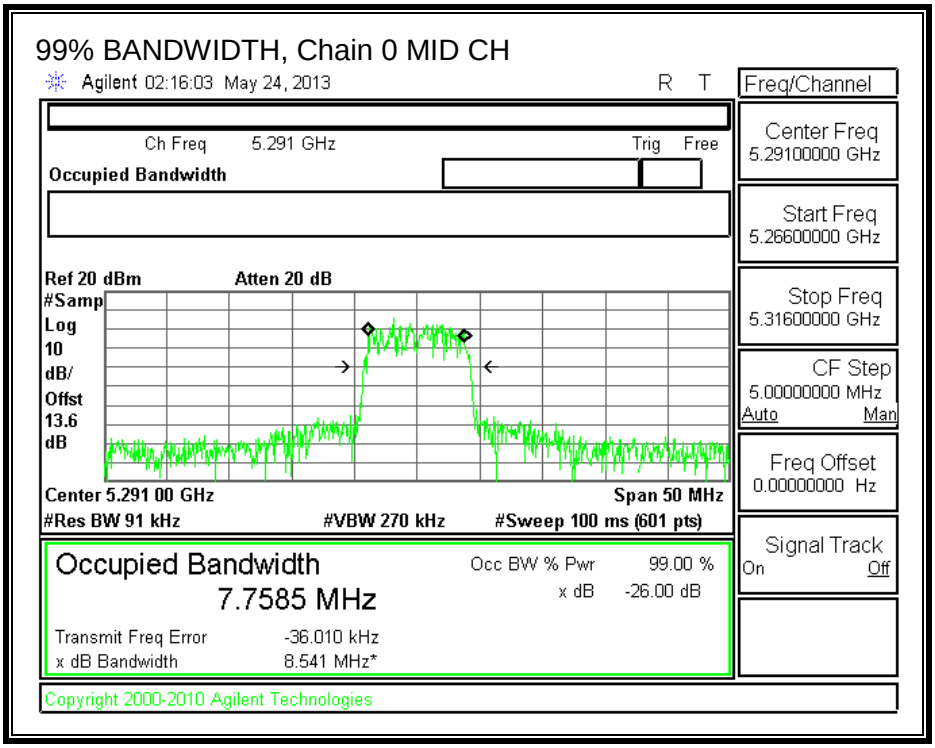


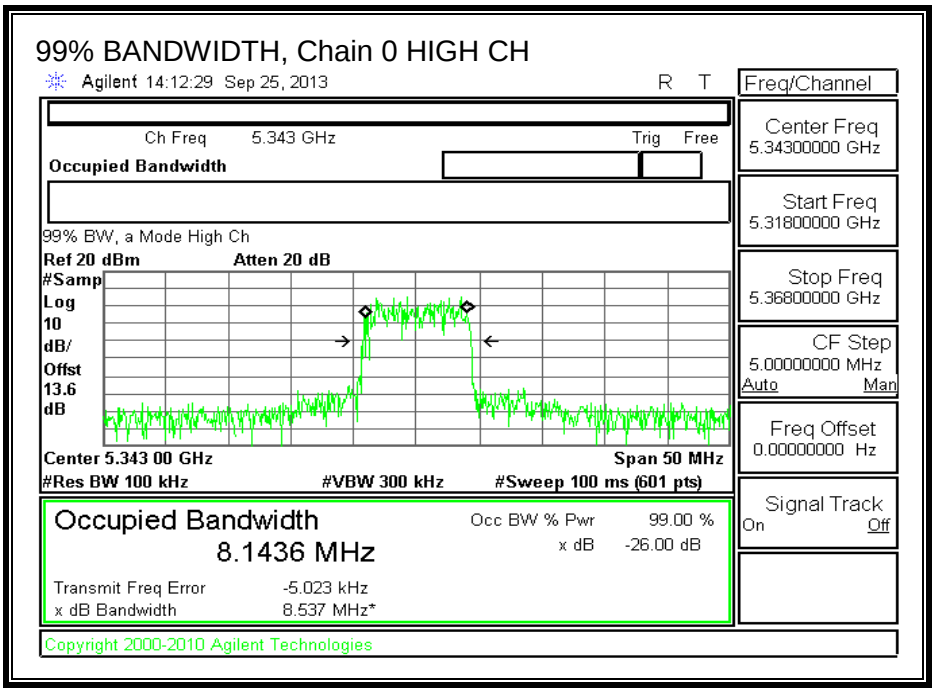




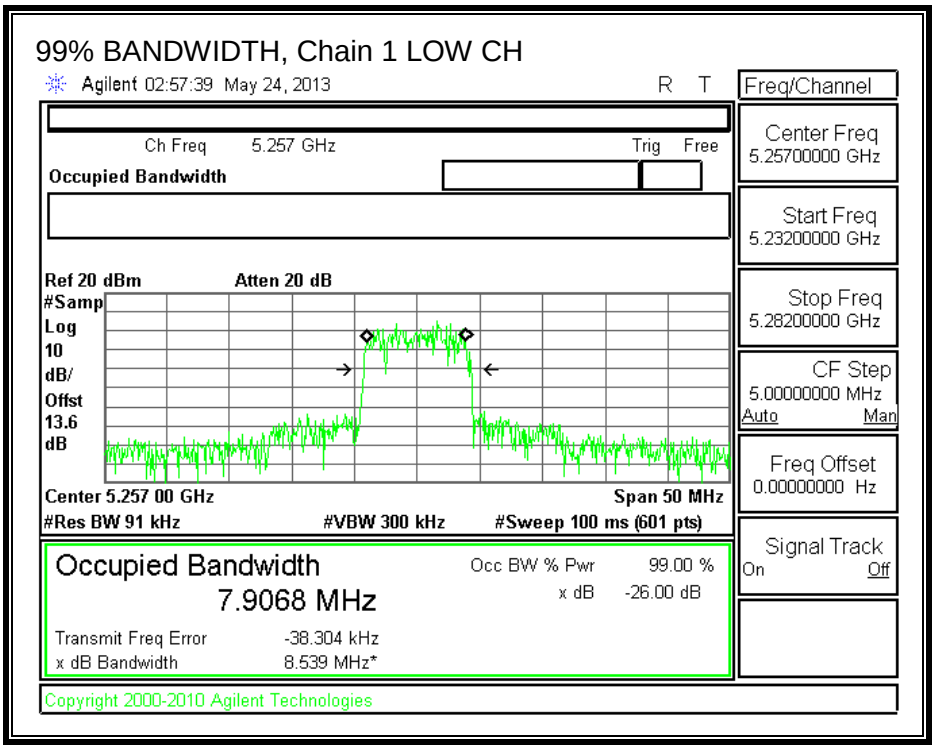
99% BANDWIDTH, Chain 0 9MHz setting

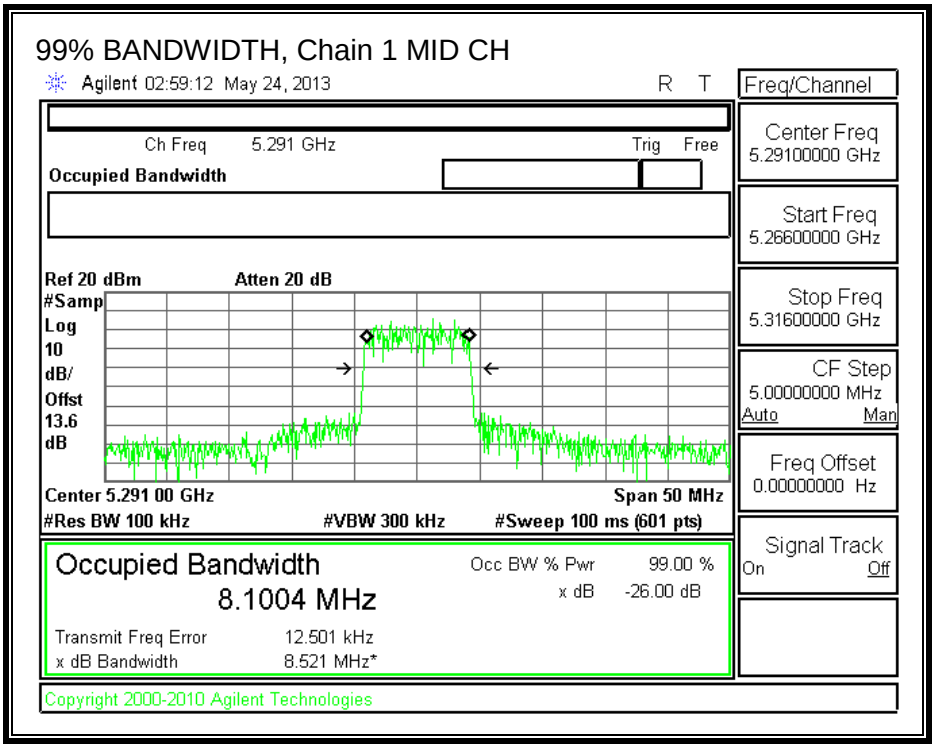


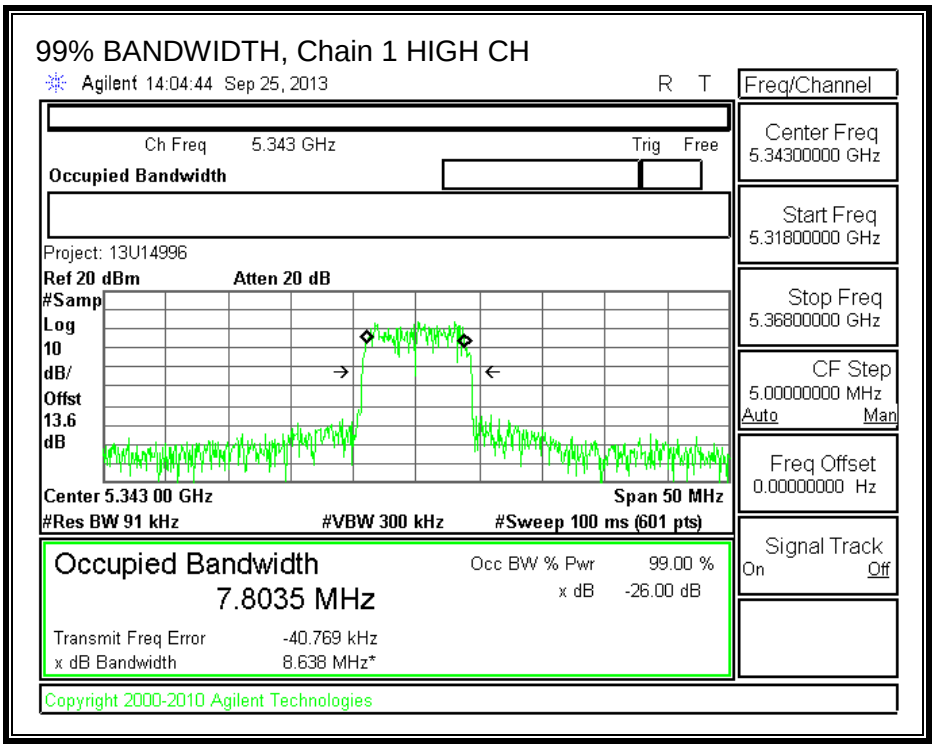




99% BANDWIDTH, Chain 1 9MHz setting







8.1.3 AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 13.59dB (including 10 dB pad and 3.59dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS Stream 1 (SISO)

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)
Low	5269	18.52	18.26
Mid	5286	18.40	18.21
High	5303	18.24	18.01
High	5308	16.10	15.93
High	5324	13.75	13.70

Note: Chain 0=J48 Chain1=J49 35MHz bandwidth QAM4

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)
Low	5261	16.82	16.99
Mid	5289	16.42	16.92
High	5315	16.48	16.57
High	5325	15.92	14.25
High	5333	13.67	10.55

Note: Chain 0=J48 Chain1=J49 18MHz bandwidth QAM4

RESULTS Stream 1 (SISO)

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)
Low	5257	13.93	13.56
Mid	5291	13.78	13.72
High	5325	13.45	13.31
High	5341	10.50	13.42
High	5343	7.47	10.45

Note: Chain 0=J48 Chain1=J49 9MHz bandwidth QAM4

RESULTS Stream 2 (MIMO)

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5269	15.41	15.39	18.41
Mid	5286	15.34	15.30	18.33
High	5304	15.07	14.96	18.03
High	5312	13.75	13.94	16.86
High	5328	13.72	13.74	16.74

Note: Chain 0=J48 Chain1=J49 35MHz bandwidth QAM4

RESULTS Stream 2 (MIMO)

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5263	13.16	13.03	16.11
Mid	5289	13.06	12.96	16.02
High	5315	13.81	13.63	16.73
High	5325	12.42	12.24	15.34
High	5337	10.44	10.40	13.43

Note: Chain 0=J48 Chain1=J49 18MHz bandwidth QAM4

RESULTS Stream 2 (MIMO)

Average Power Results

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	5257	10.14	10.84	13.51
Mid	5291	10.04	10.75	13.42
High	5325	10.76	10.32	13.56
High	5341	10.50	10.04	13.29
High	5343	7.43	7.26	10.36

Note: Chain 0=J48 Chain1=J49 9MHz bandwidth QAM4

8.1.4 OUTPUT POWER AND PPSD - SISO

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

RESULTS 35MHz J48 (SISO)

Limits

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Directional Gain (dBi)	Power Limit (dBm)	PPSD Limit (dBm)
Low	5269	24	34.6	26.39	10.50	19.50	6.50
Mid	5286	24	34.5	26.38	10.50	19.50	6.50
High	5303	24	34.7	26.40	10.50	19.50	6.50
High	5308	24	34.7	26.40	10.50	19.50	6.50
High	5324	24	34.7	26.40	10.50	19.50	6.50

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

Output Power Results

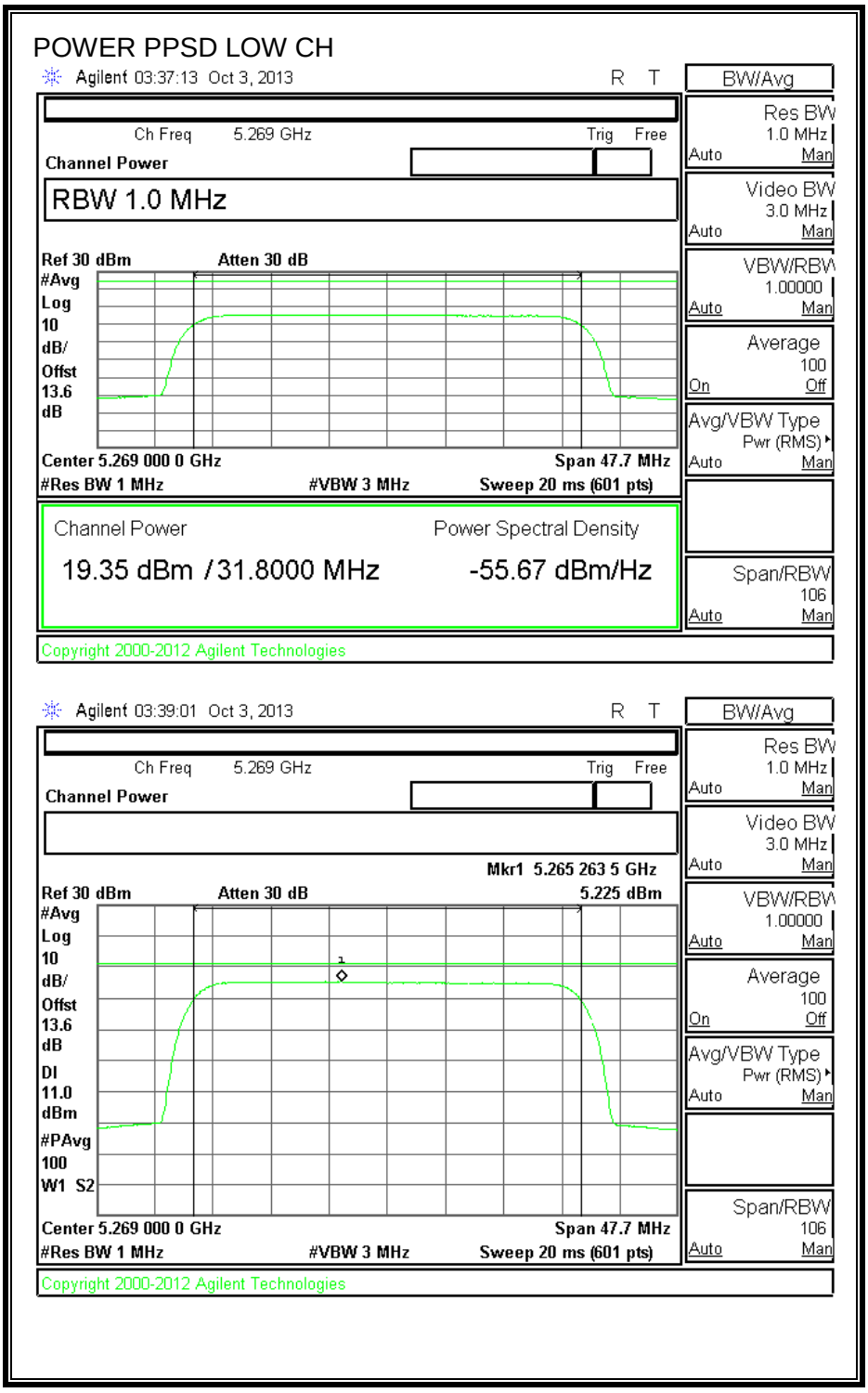
Channel	Frequency (MHz)	Meas Power (dBm)	Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5269	19.35	19.35	19.50	-0.15
Mid	5286	19.05	19.05	19.50	-0.45
High	5303	19.05	19.05	19.50	-0.45
High	5308	19.01	19.01	19.50	-0.49
High	5324	18.80	18.80	19.50	-0.70

PPSD Results

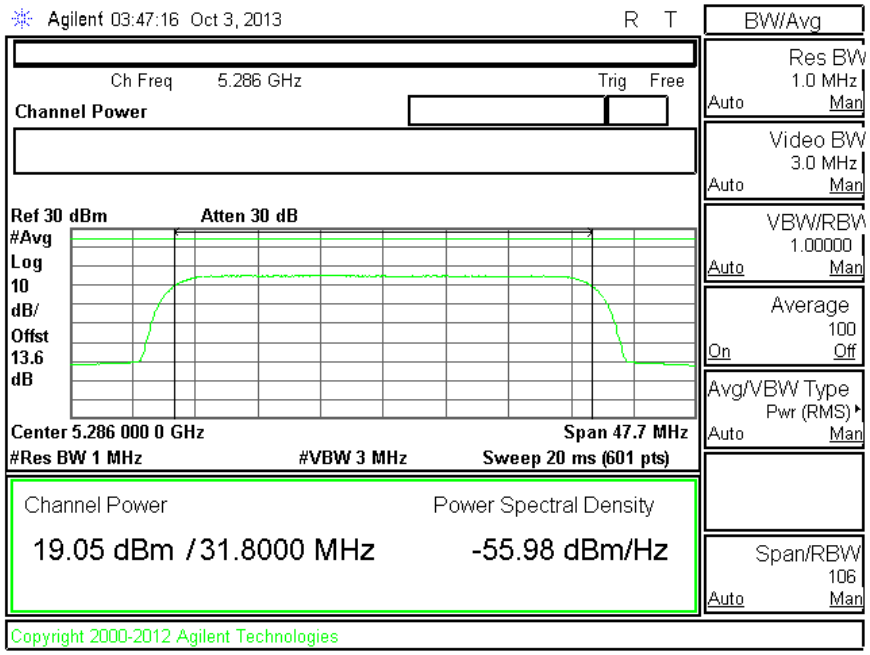
Channel	Frequency (MHz)	Meas PPSD (dBm)	Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5269	5.23	5.23	6.50	-1.28
Mid	5286	4.90	4.90	6.50	-1.60
High	5303	4.84	4.84	6.50	-1.66
High	5308	4.82	4.82	6.50	-1.68
High	5324	4.81	4.81	6.50	-1.69

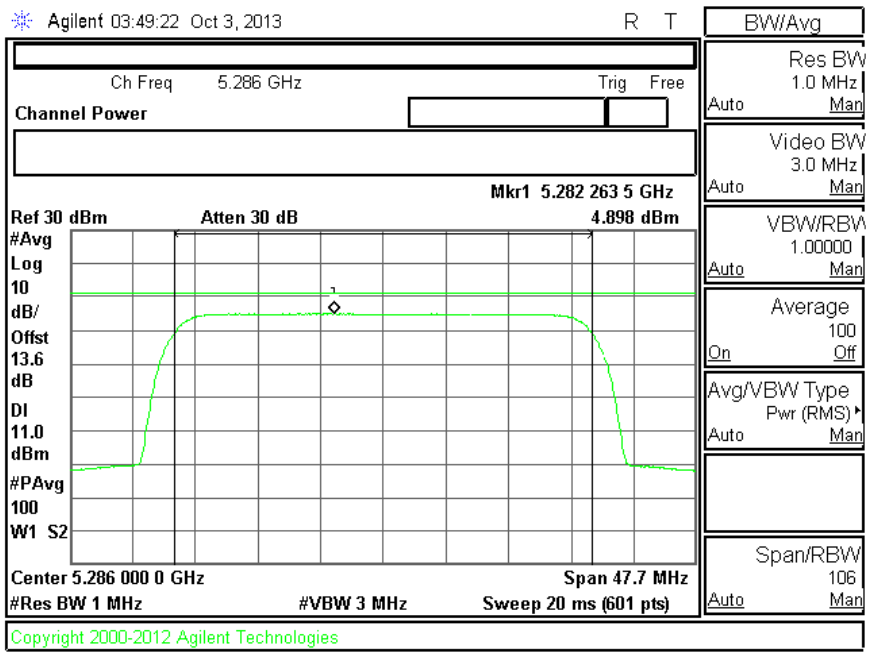
Note: Integration over 99% Occupied Bandwidth, Limits based on 26dB Bandwidth.

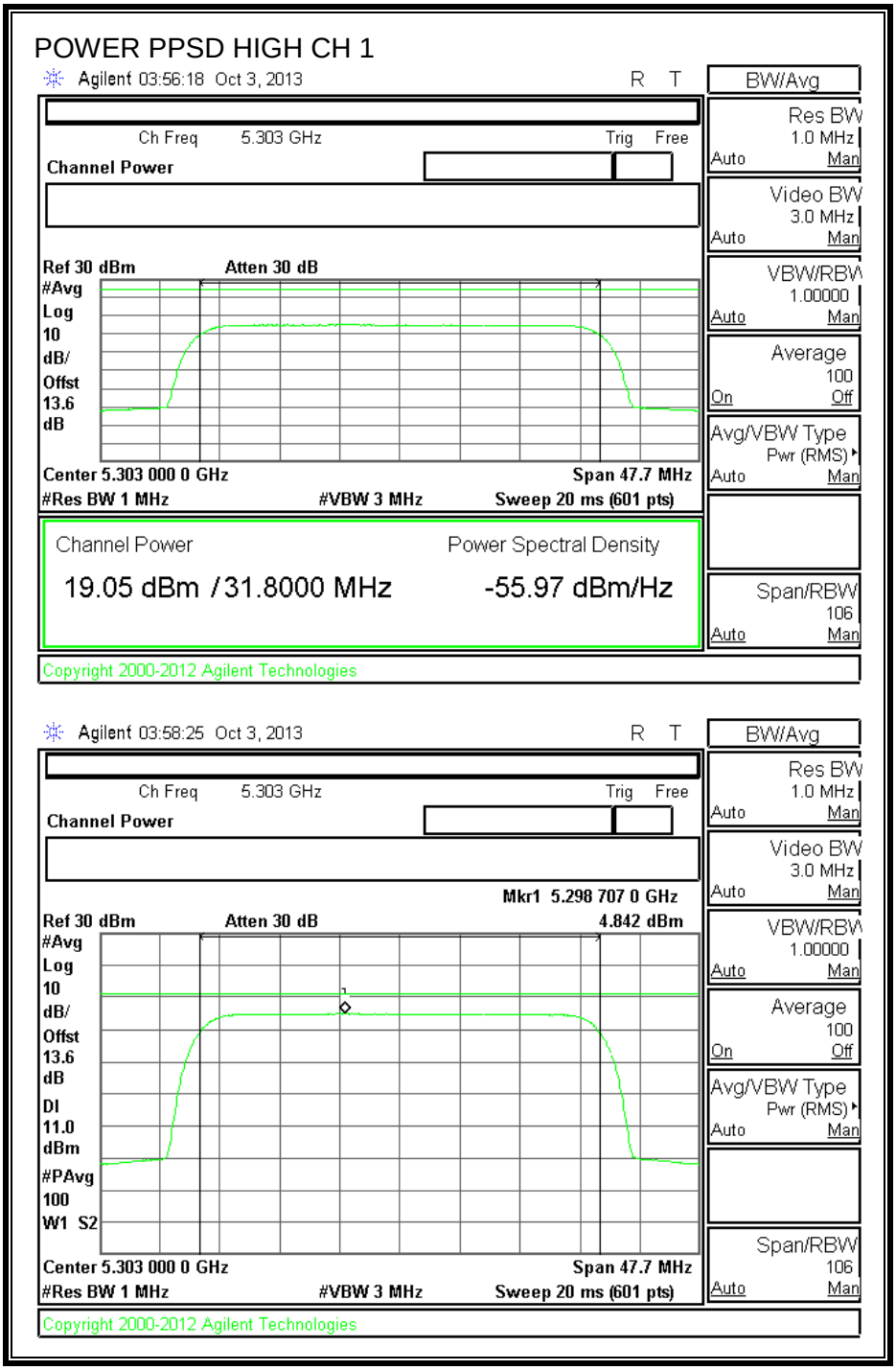
OUTPUT POWER AND PPSD

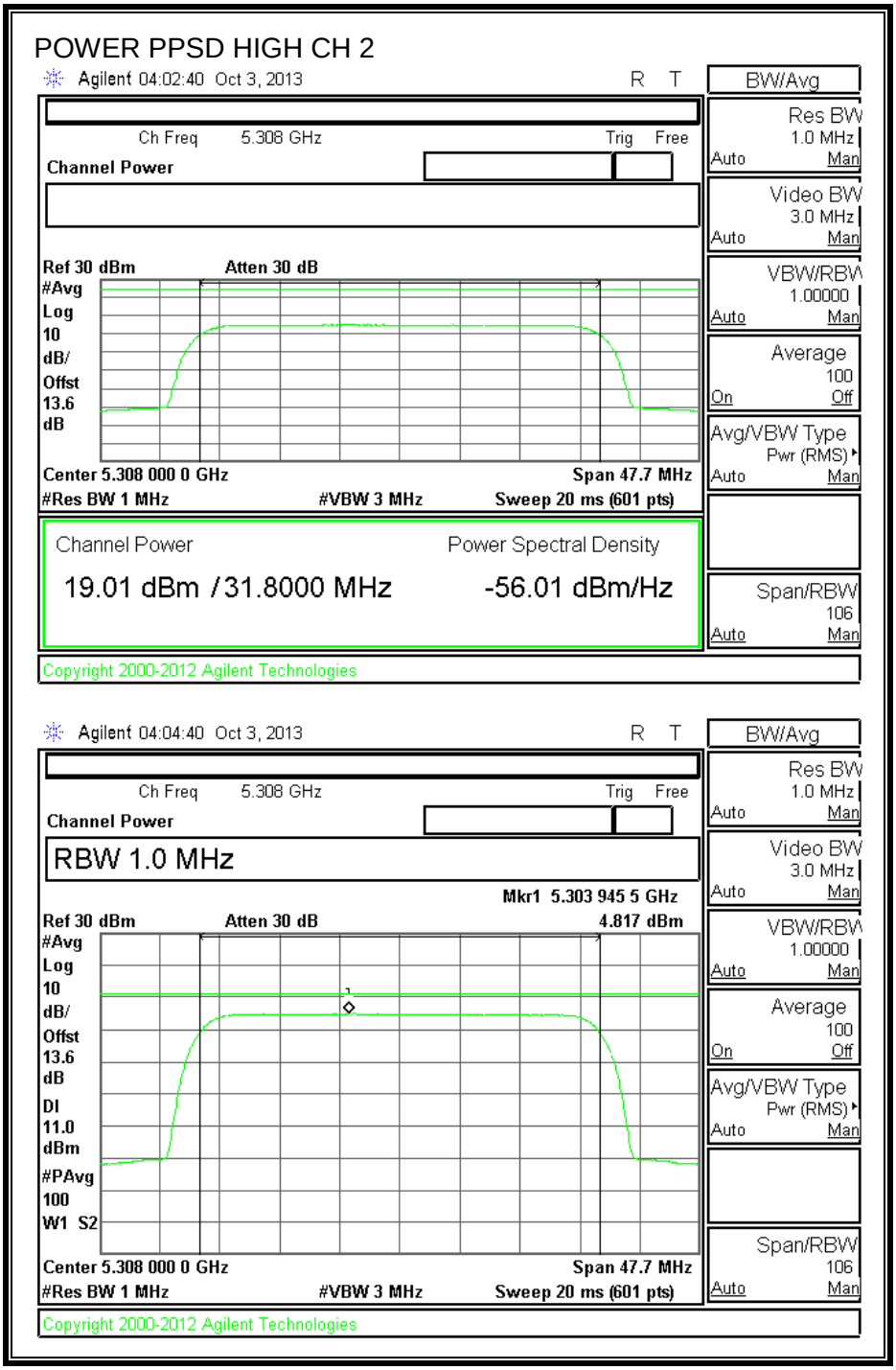


POWER PPSD MID CH

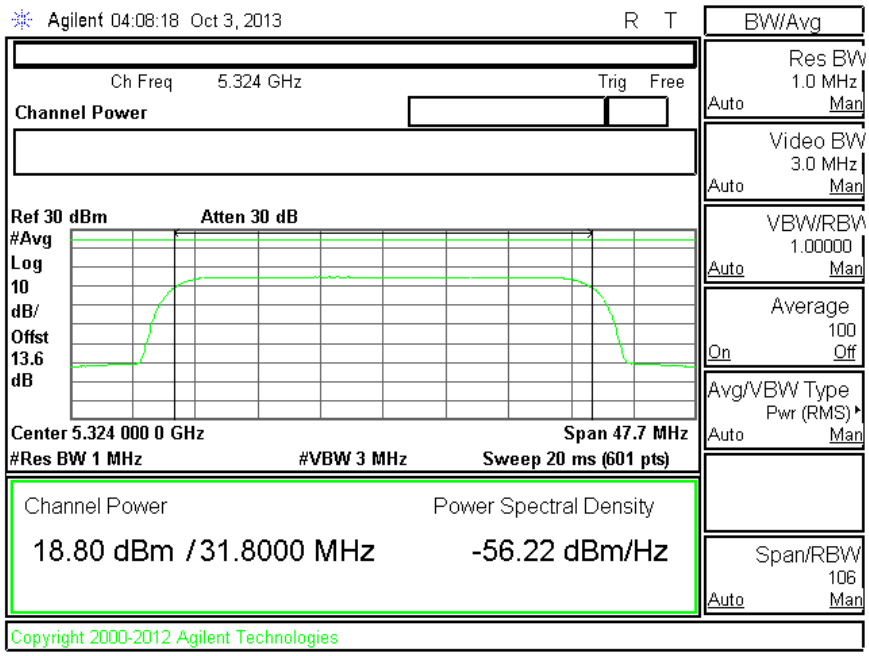


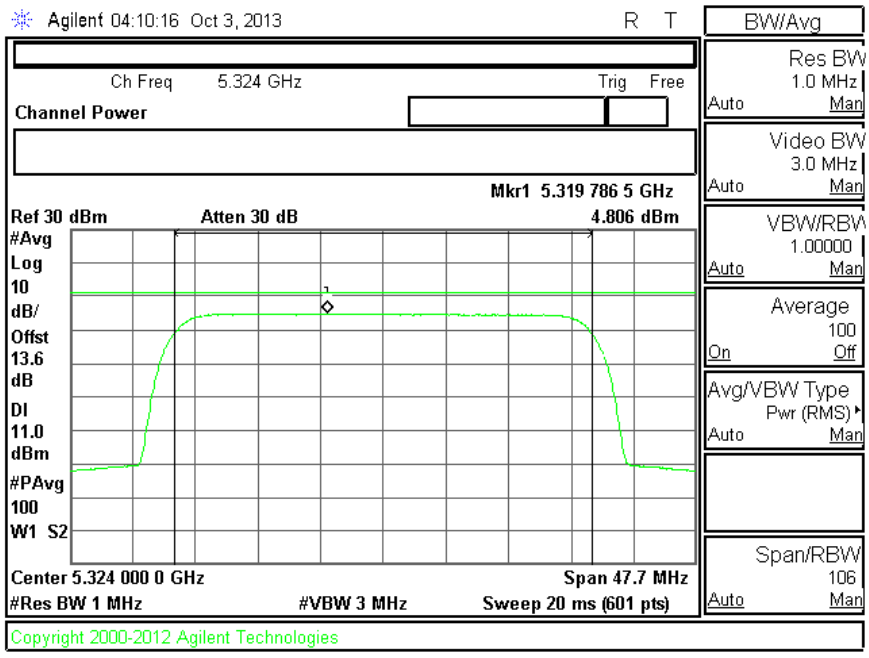






POWER PPSD HIGH CH 3





RESULTS 35MHz J49 (SISO)

Limits

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Directional Gain (dBi)	Power Limit (dBm)	PPSD Limit (dBm)
Low	5269	24	34.5	26.38	10.50	19.50	6.50
Mid	5286	24	34.5	26.38	10.50	19.50	6.50
High	5303	24	34.5	26.38	10.50	19.50	6.50
High	5308	24	34.5	26.38	10.50	19.50	6.50
High	5324	24	34.5	26.38	10.50	19.50	6.50

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

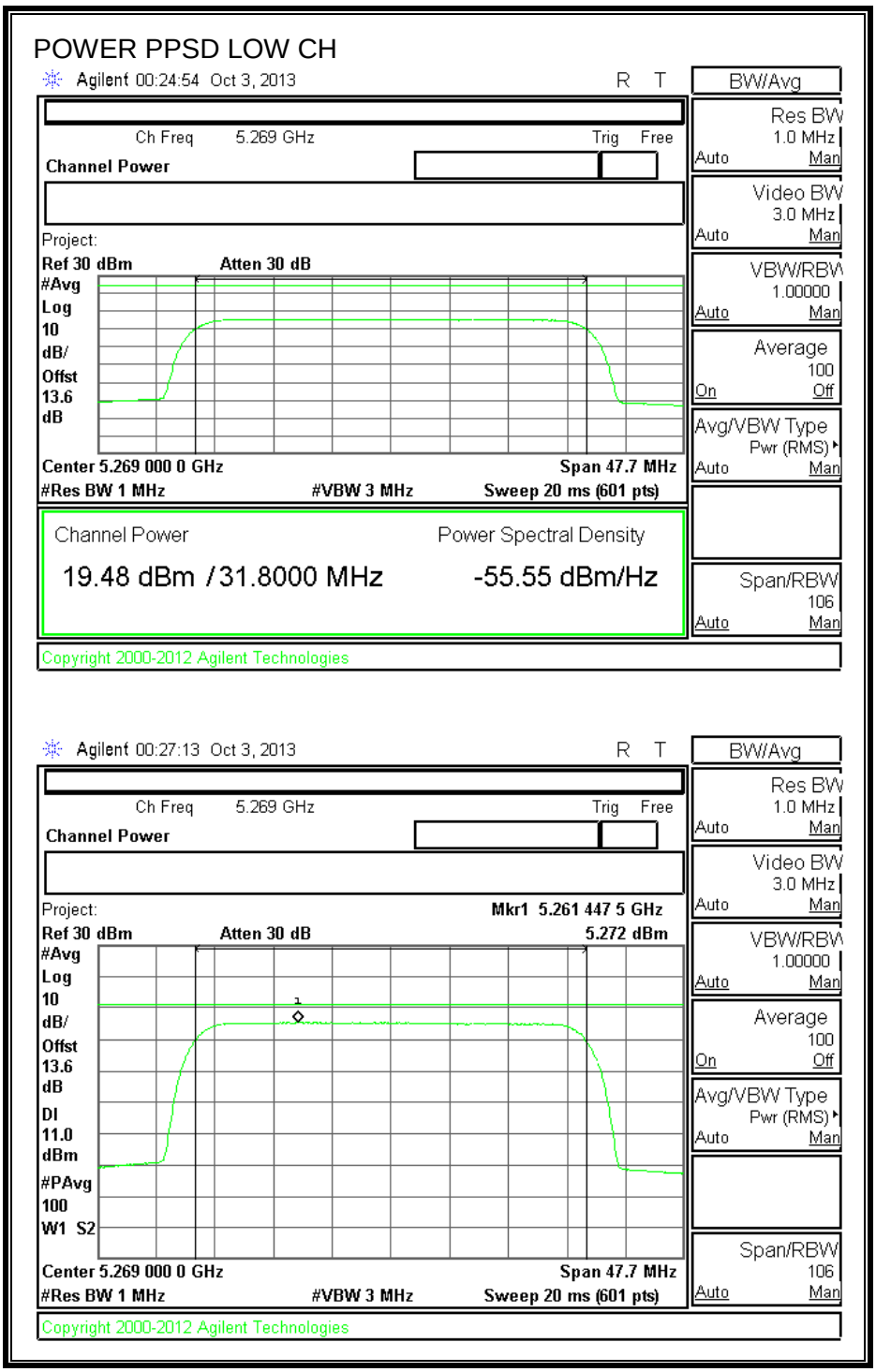
Output Power Results

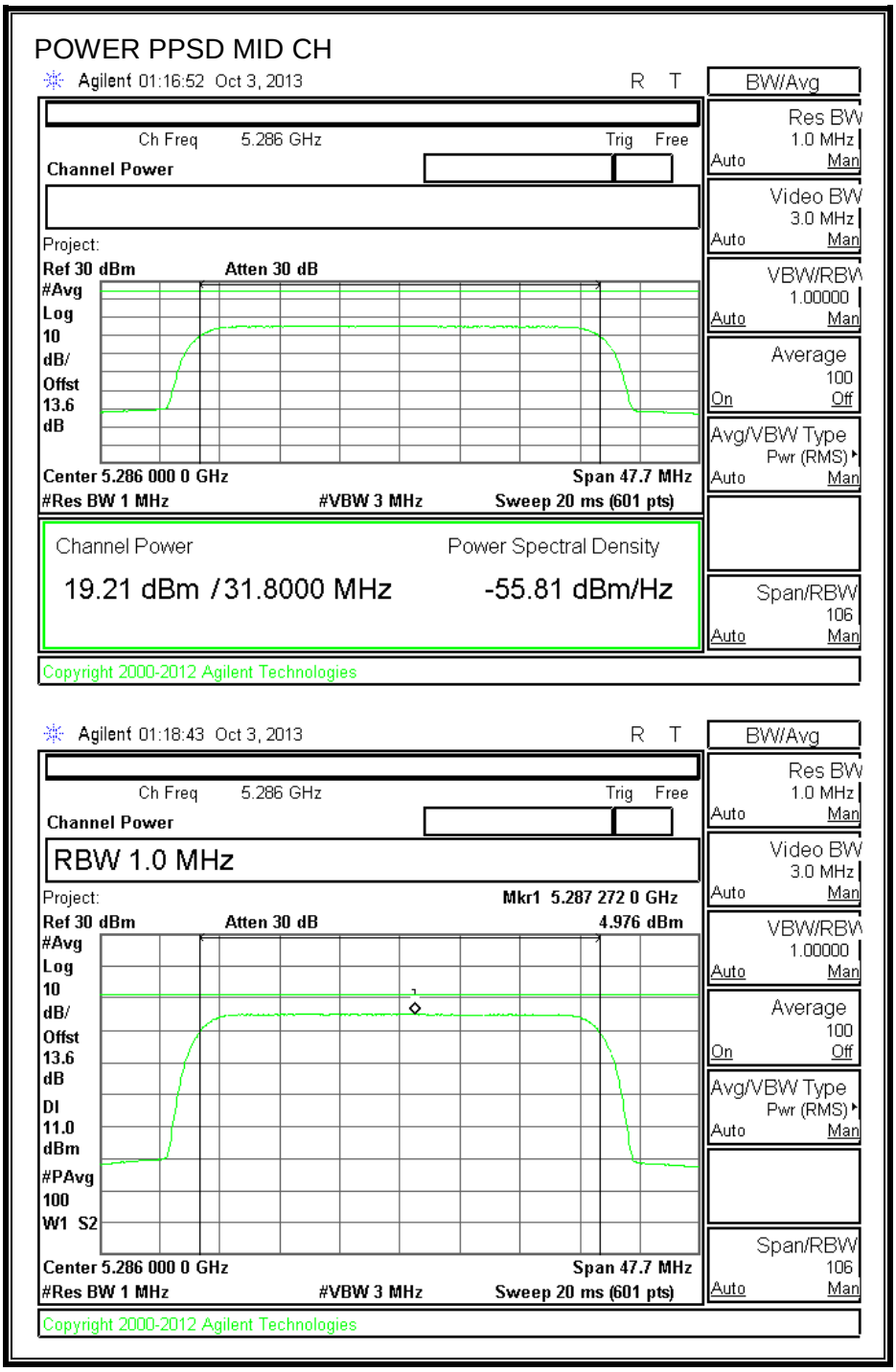
Channel	Frequency (MHz)	Meas Power (dBm)	Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5269	19.48	19.48	19.50	-0.02
Mid	5286	19.21	19.21	19.50	-0.29
High	5303	19.08	19.08	19.50	-0.42
High	5308	19.09	19.09	19.50	-0.41
High	5324	18.80	18.80	19.50	-0.70

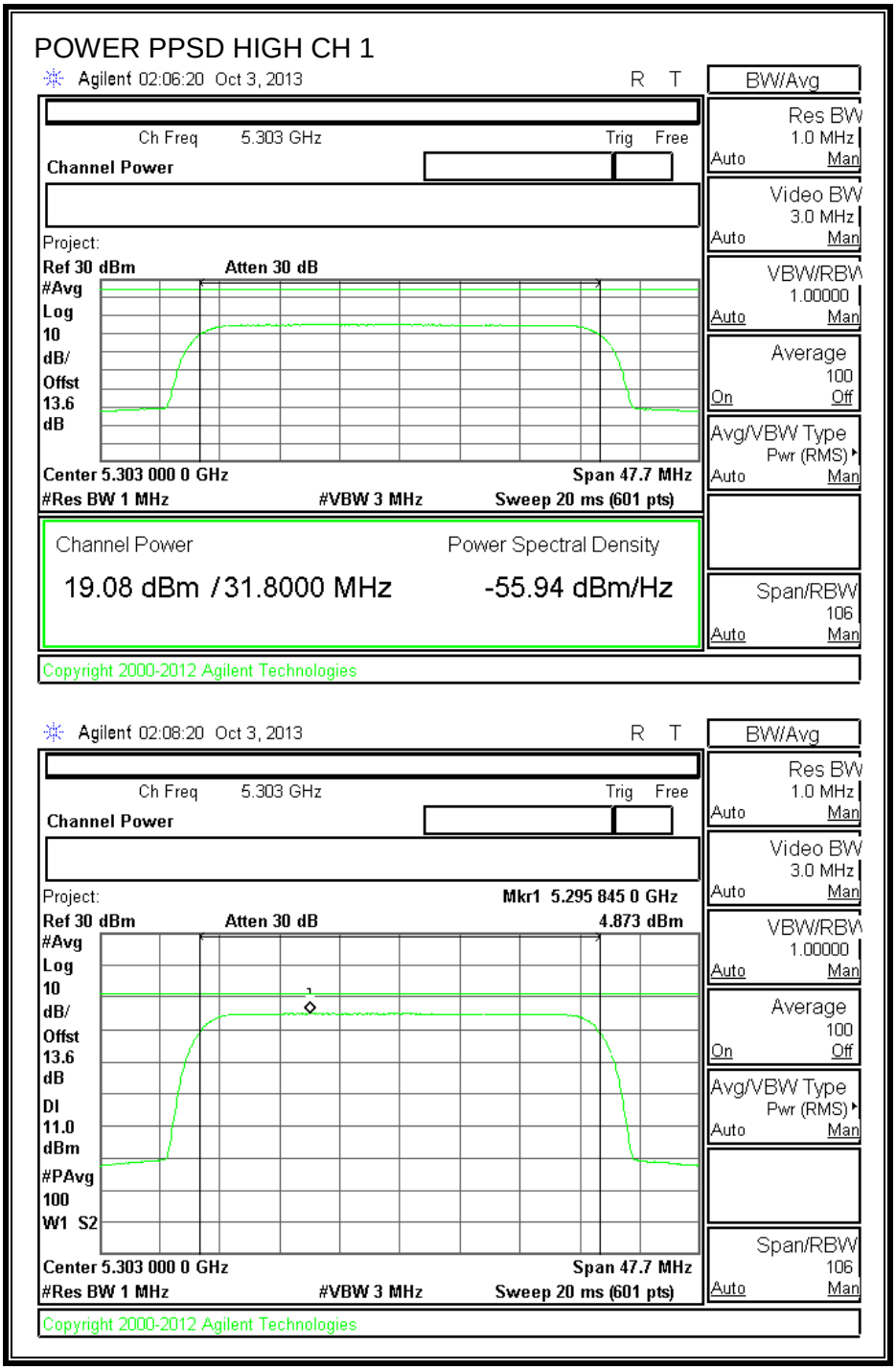
PPSD Results

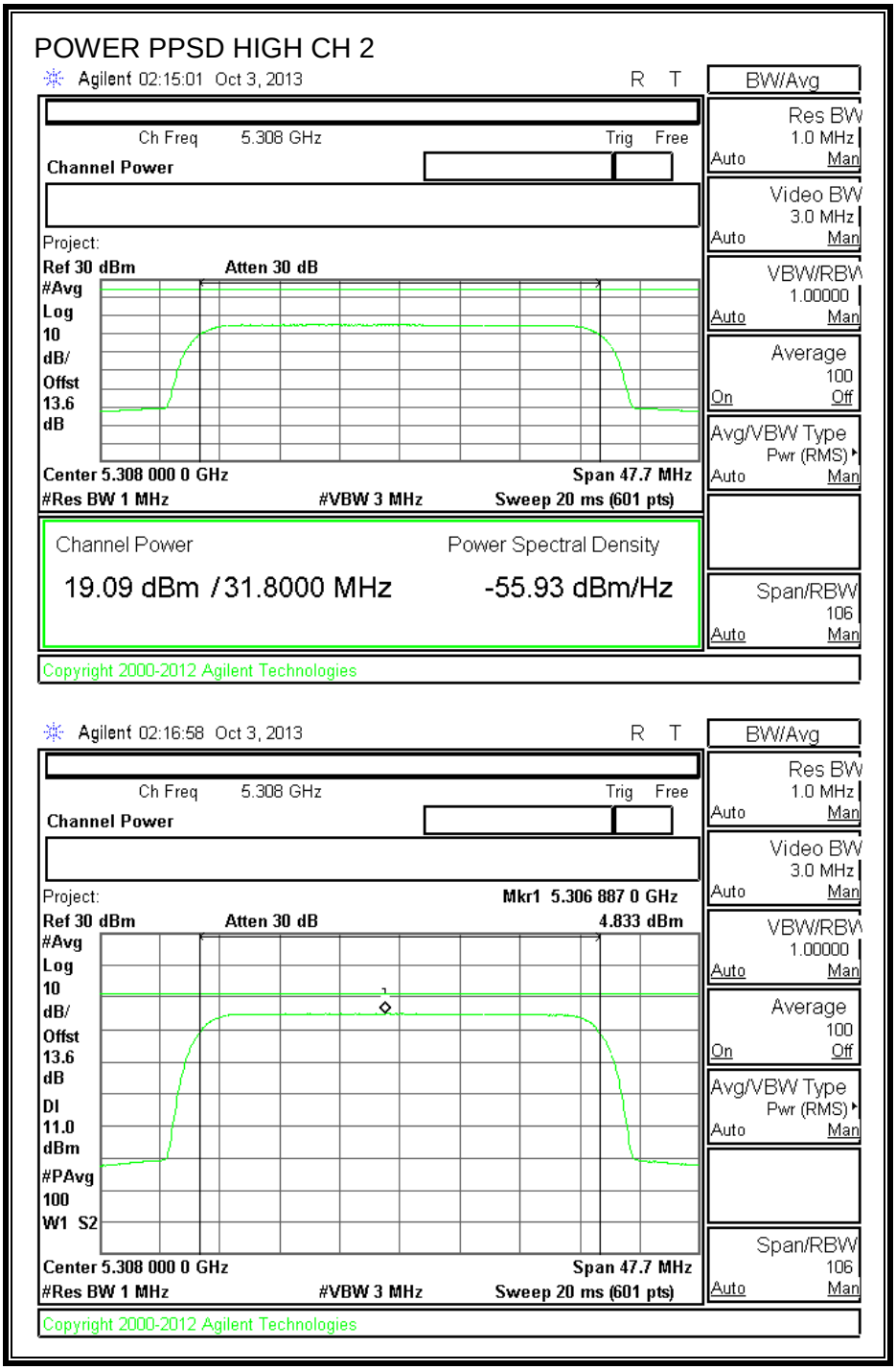
Channel	Frequency (MHz)	Meas PPSD (dBm)	Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5269	5.27	5.27	6.50	-1.23
Mid	5286	4.98	4.98	6.50	-1.52
High	5303	4.87	4.87	6.50	-1.63
High	5308	4.83	4.83	6.50	-1.67
High	5324	4.71	4.71	6.50	-1.79

OUTPUT POWER AND PPSD

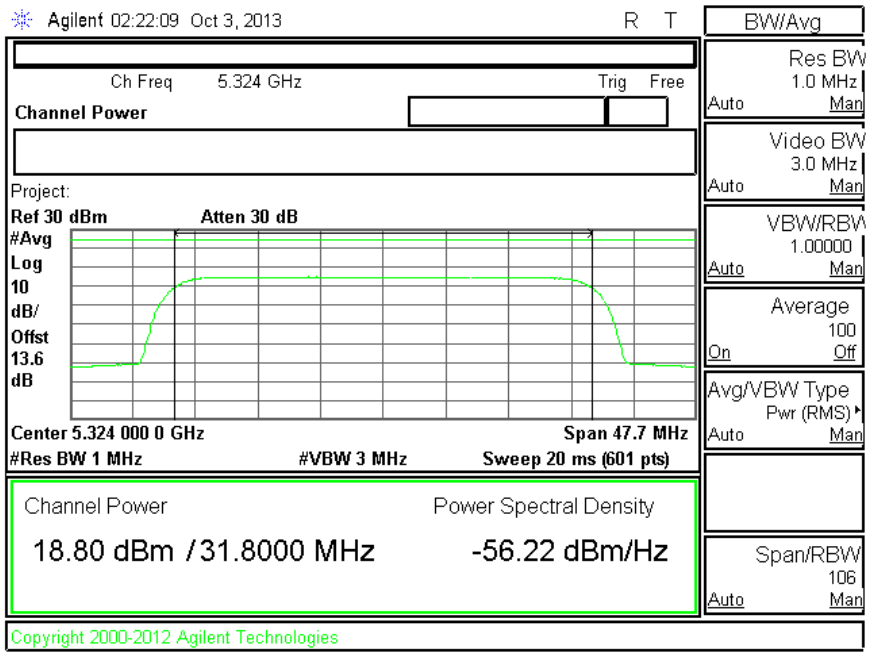


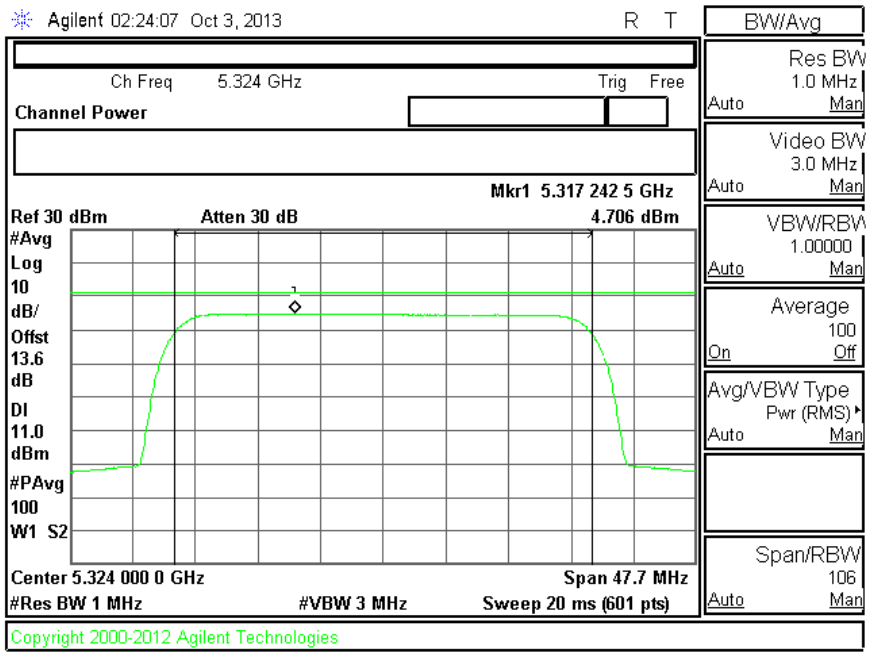






POWER PPSD HIGH CH 3





RESULTS 18MHz J48 (SISO)

Limits

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Directional Gain (dBi)	Power Limit (dBm)	PPSD Limit (dBm)
Low	5261	24	17.4	23.39	10.50	18.89	6.50
Mid	5289	24	17.3	23.37	10.50	18.87	6.50
High	5315	24	17.3	23.39	10.50	18.89	6.50
High	5325	24	17.3	23.39	10.50	18.89	6.50
High	5333	24	17.3	23.39	10.50	18.89	6.50

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

Output Power Results

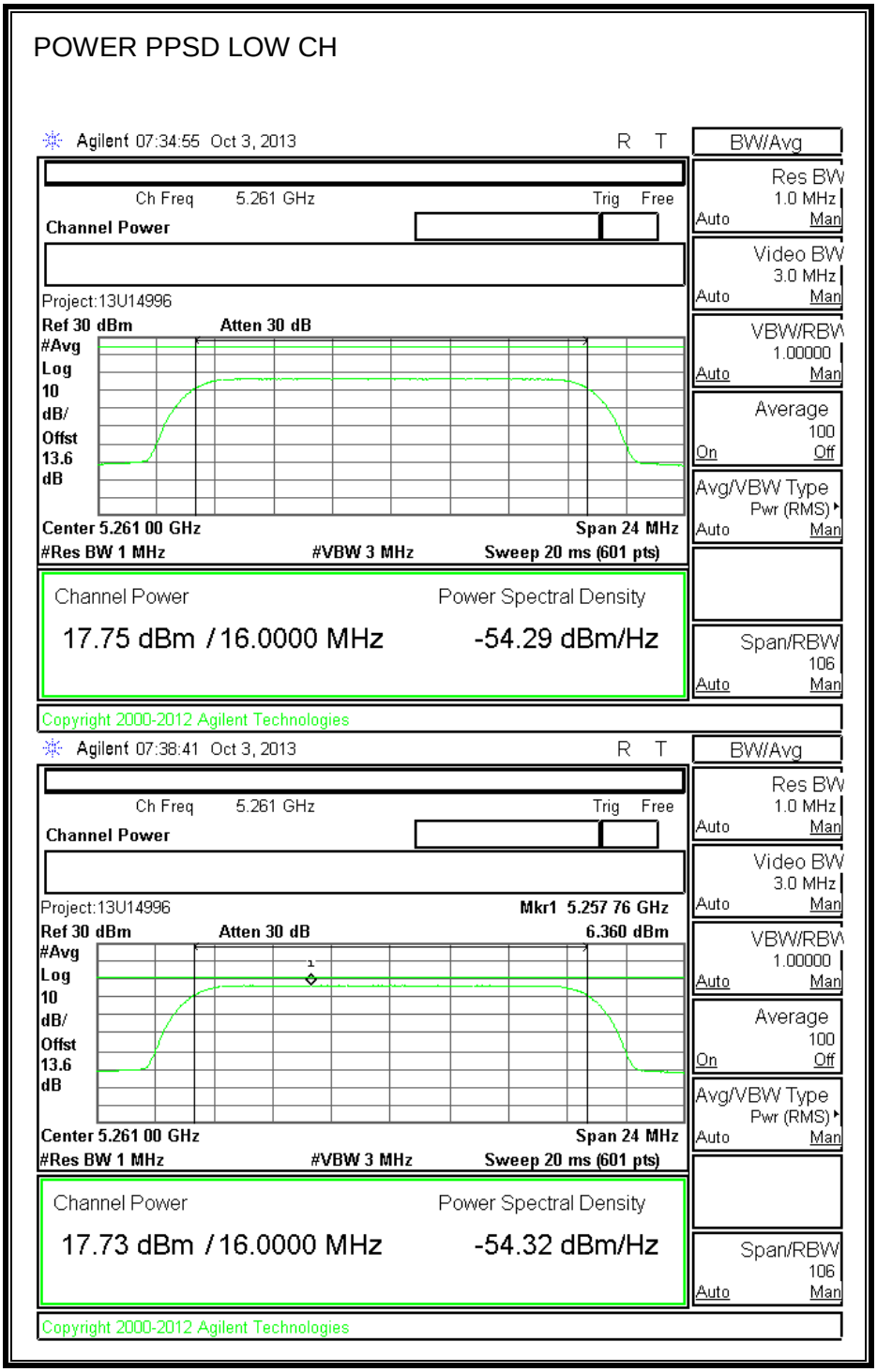
Channel	Frequency (MHz)	Meas Power (dBm)	Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5261	17.75	17.75	18.89	-1.14
Mid	5289	17.35	17.35	18.87	-1.52
High	5315	17.23	17.23	18.89	-1.66
High	5325	17.11	17.11	18.89	-1.78
High	5333	17.08	17.08	18.89	-1.81

PPSD Results

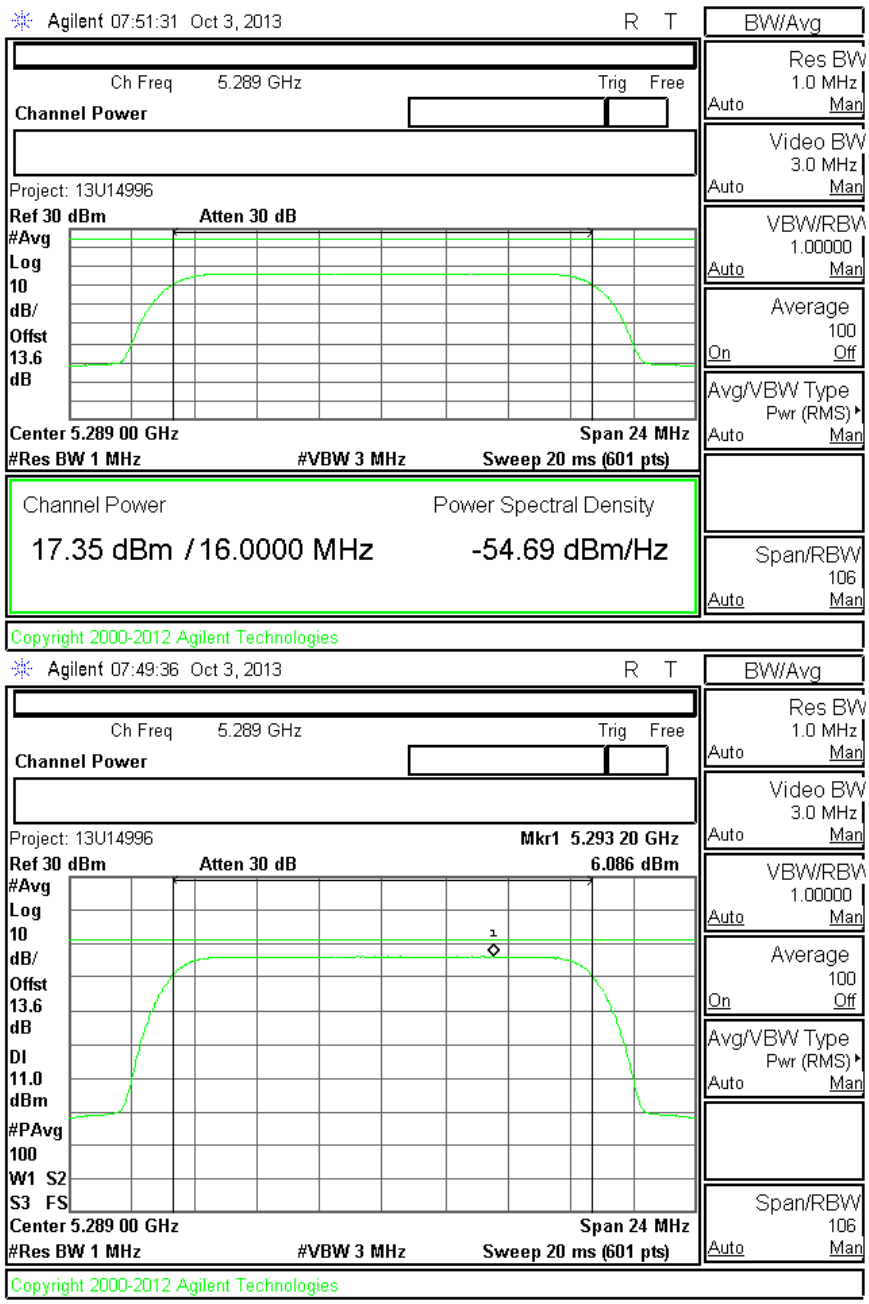
Channel	Frequency (MHz)	Meas PPSD (dBm)	Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5261	6.36	6.36	6.50	-0.14
Mid	5289	6.09	6.09	6.50	-0.41
High	5315	5.98	5.98	6.50	-0.52
High	5325	5.91	5.91	6.50	-0.59
High	5333	5.88	5.88	6.50	-0.62

OUTPUT POWER AND PPSD

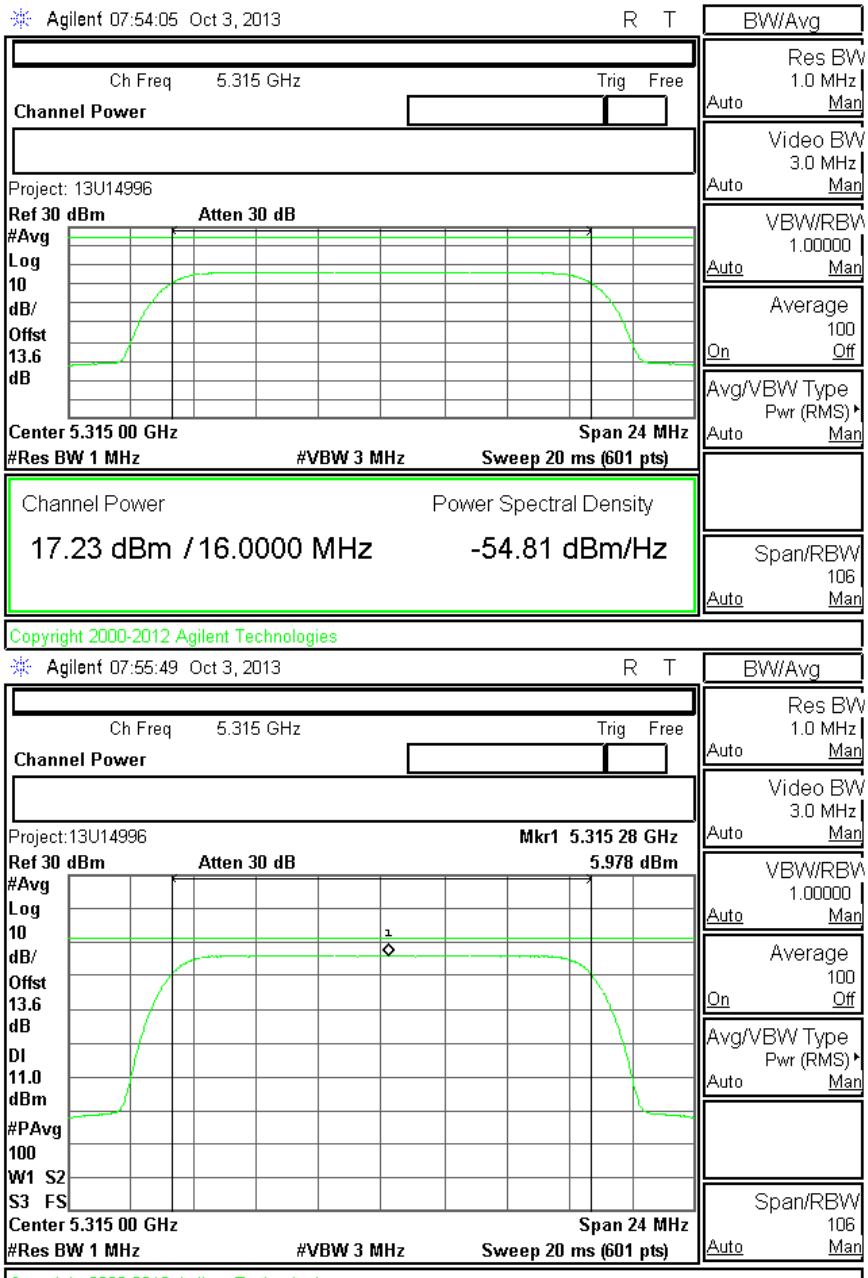
POWER PPSD LOW CH

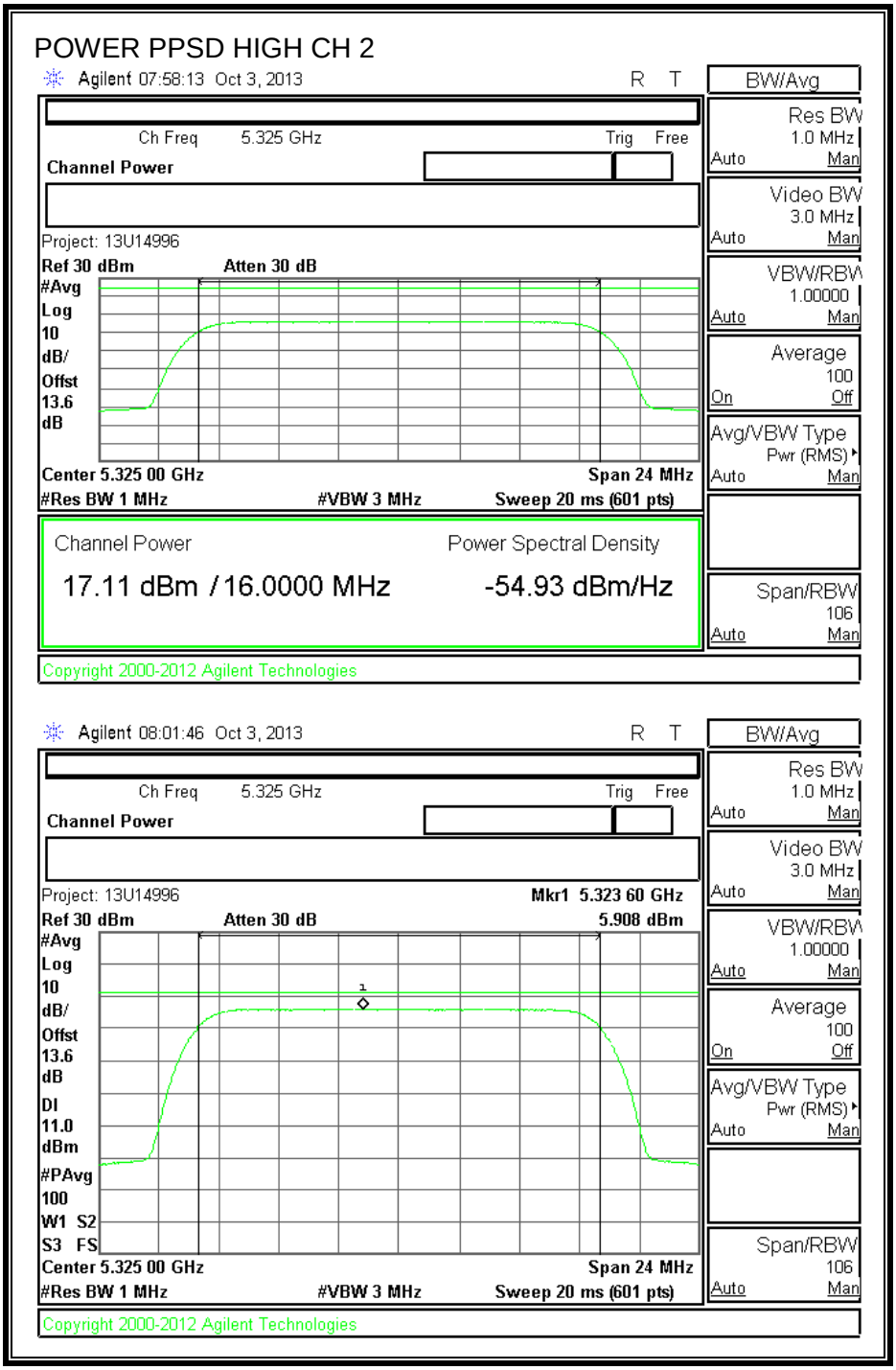


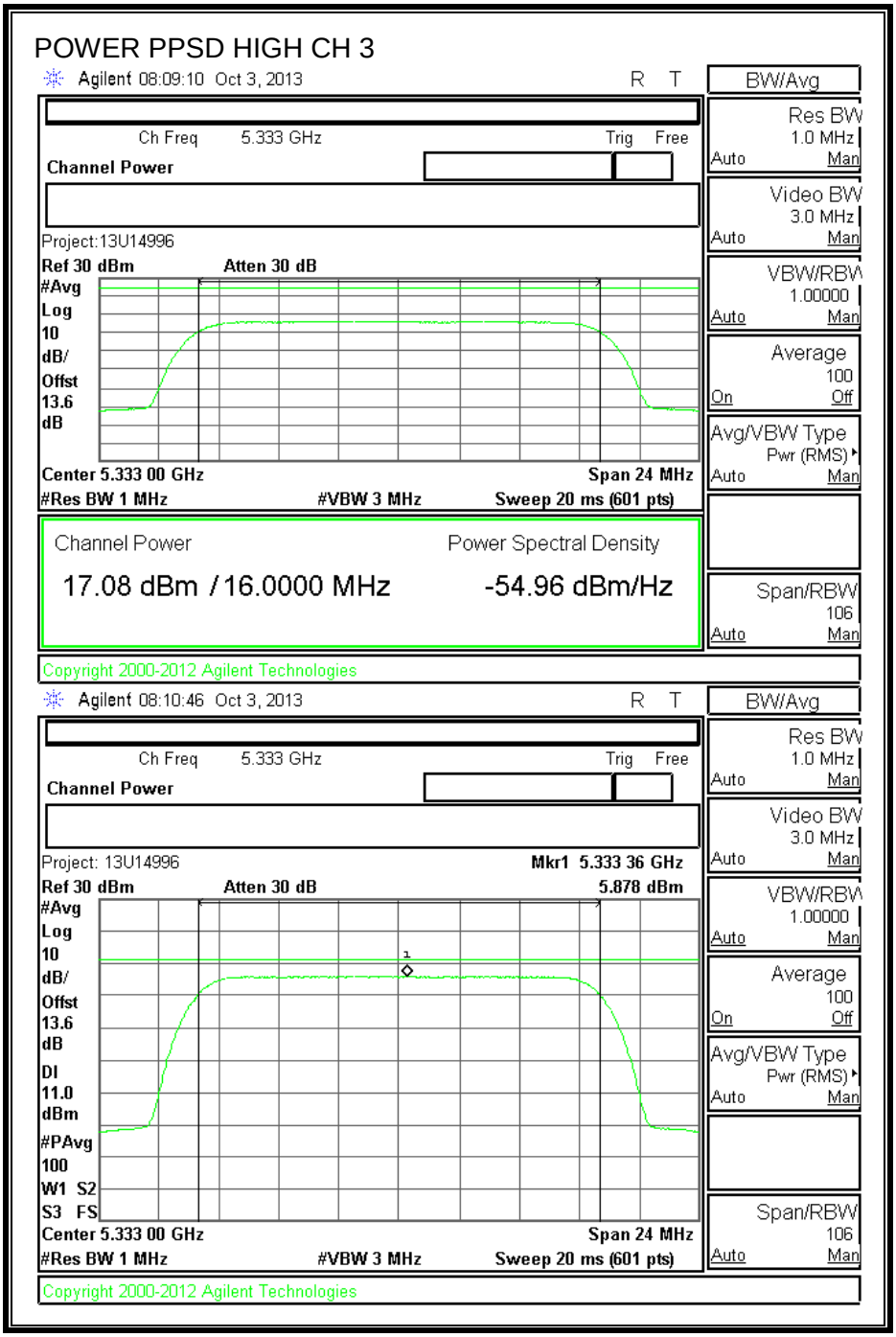
POWER PPSD MID CH



POWER PPSD HIGH CH 1







RESULTS 18MHz J49 (SISO)

Limits

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Directional Gain (dBi)	Power Limit (dBm)	PPSD Limit (dBm)
Low	5261	24	17.3	23.37	10.50	18.87	6.50
Mid	5289	24	17.3	23.37	10.50	18.87	6.50
High	5315	24	17.3	23.39	10.50	18.89	6.50
High	5325	24	17.3	23.39	10.50	18.89	6.50
High	5333	24	17.3	23.39	10.50	18.89	6.50

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

Output Power Results

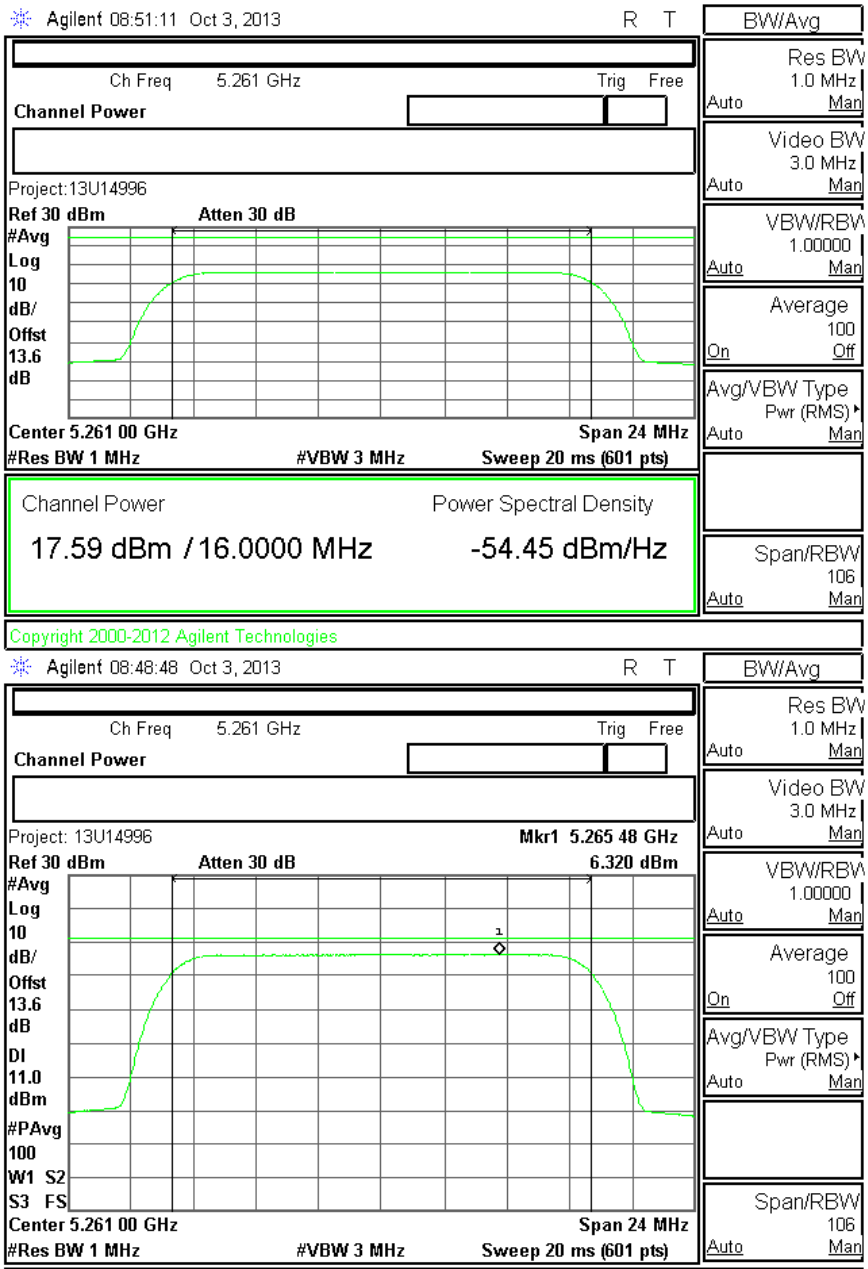
Channel	Frequency (MHz)	Meas Power (dBm)	Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5261	17.60	17.60	18.87	-1.27
Mid	5289	17.50	17.50	18.87	-1.37
High	5315	17.21	17.21	18.89	-1.68
High	5325	17.06	17.06	18.89	-1.83
High	5333	16.88	16.88	18.89	-2.01

PPSD Results

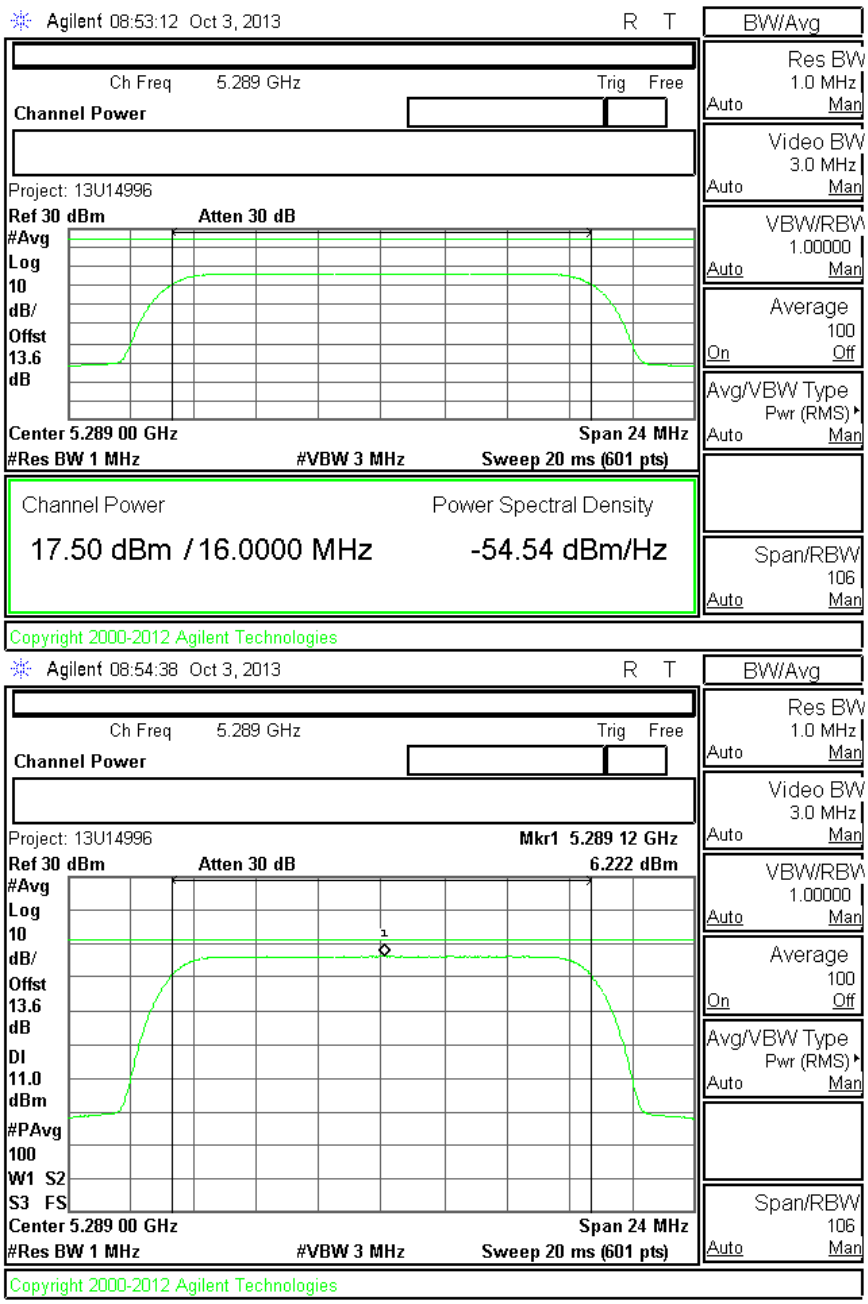
Channel	Frequency (MHz)	Meas PPSD (dBm)	Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5261	6.32	6.32	6.50	-0.18
Mid	5289	6.22	6.22	6.50	-0.28
High	5315	6.00	6.00	6.50	-0.50
High	5325	5.83	5.83	6.50	-0.67
High	5333	5.74	5.74	6.50	-0.76

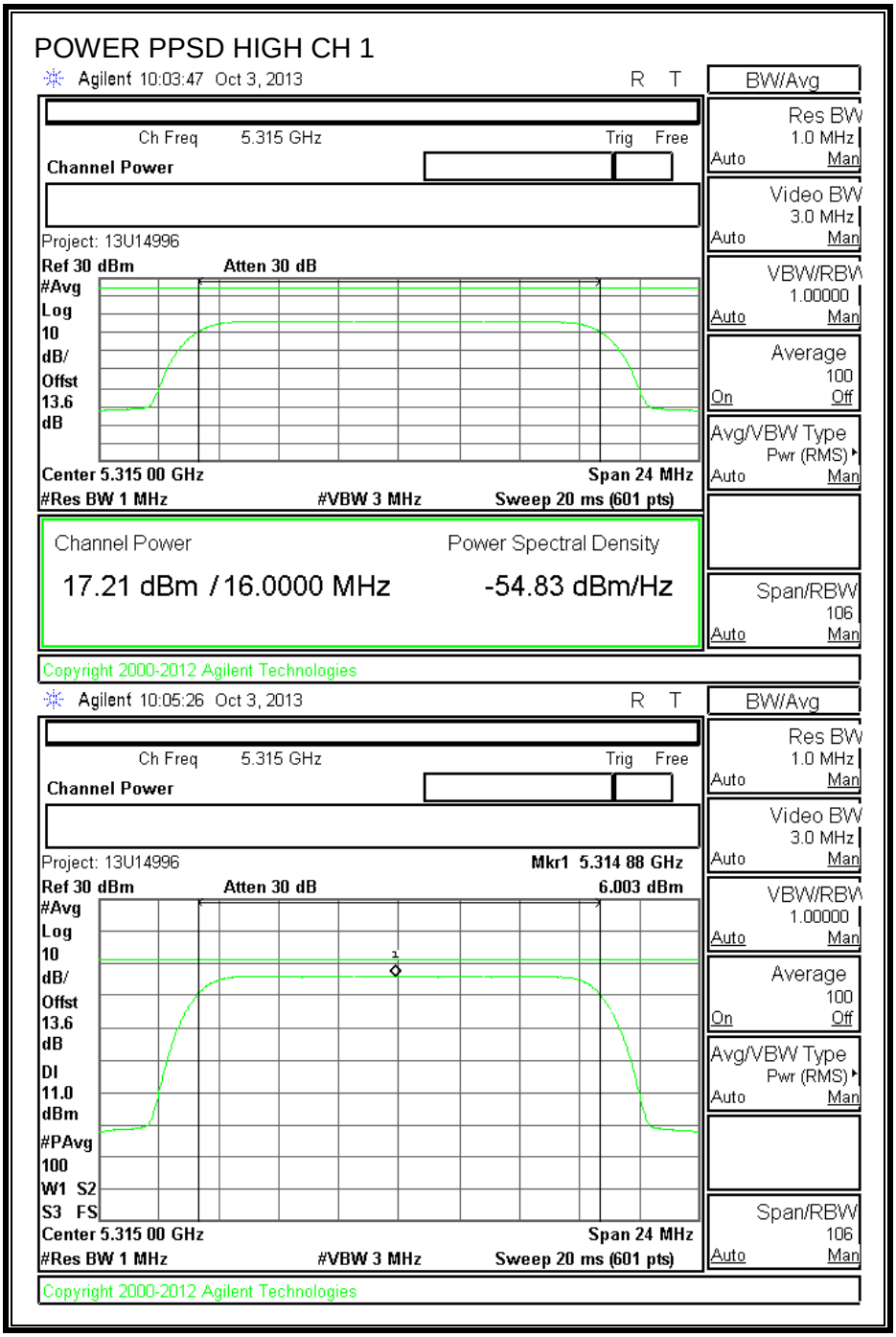
OUTPUT POWER AND PPSD

POWER PPSD LOW CH

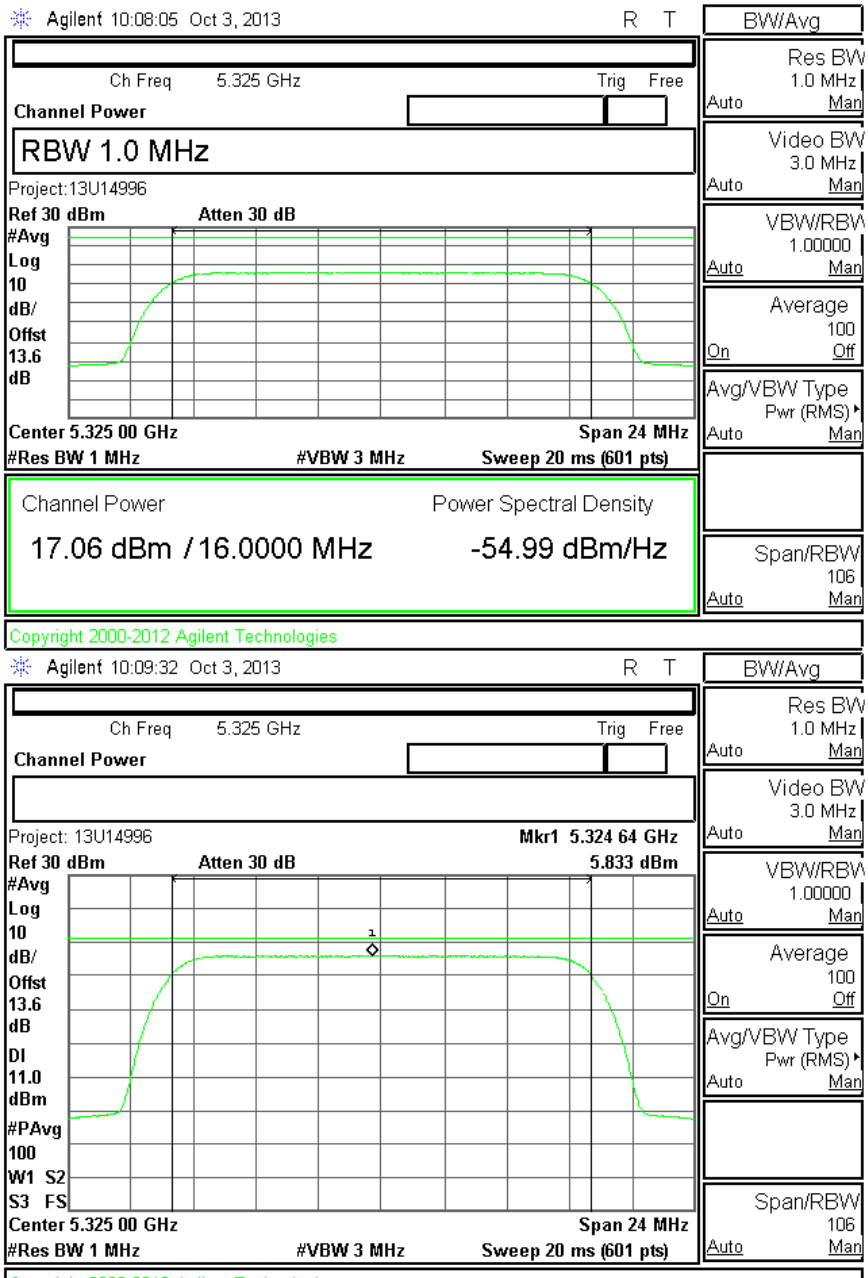


POWER PPSD MID CH

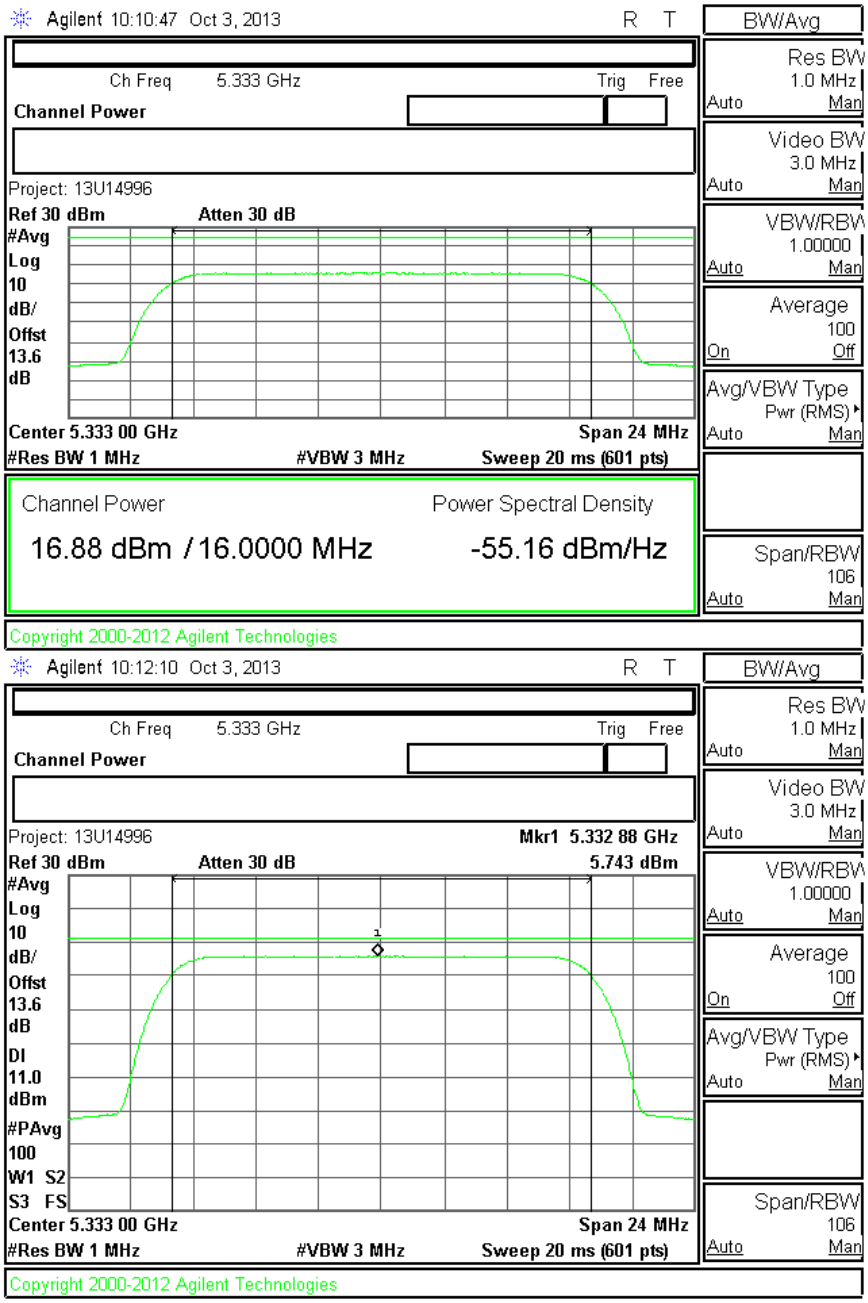




POWER PPSD HIGH CH 2



POWER PPSD HIGH CH 3



RESULTS 9MHz J48 (SISO)

Limits

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Directional Gain (dBi)	Power Limit (dBm)	PPSD Limit (dBm)
Low	5257	24	8.7	20.40	10.50	15.90	6.50
Mid	5291	24	8.7	20.40	10.50	15.90	6.50
High	5325	24	8.7	20.40	10.50	15.90	6.50
High	5333	24	8.7	20.40	10.50	15.90	6.50
High	5341	24	8.7	20.40	10.50	15.90	6.50

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

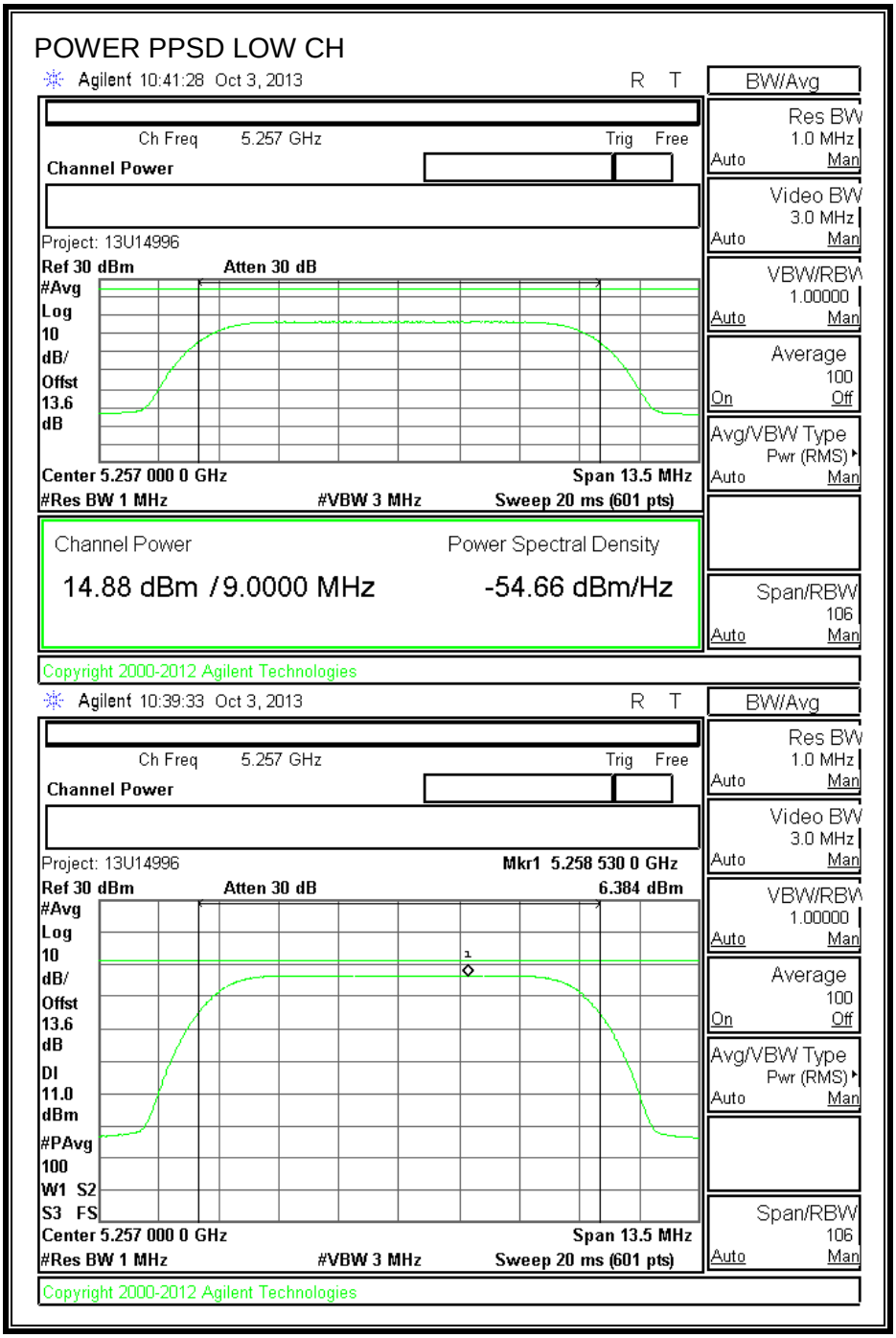
Output Power Results

Channel	Frequency (MHz)	Meas Power (dBm)	Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5257	14.88	14.88	15.90	-1.02
Mid	5291	14.38	14.38	15.90	-1.52
High	5325	14.28	14.28	15.90	-1.62
High	5333	14.07	14.07	15.90	-1.83
High	5341	13.99	13.99	15.90	-1.91

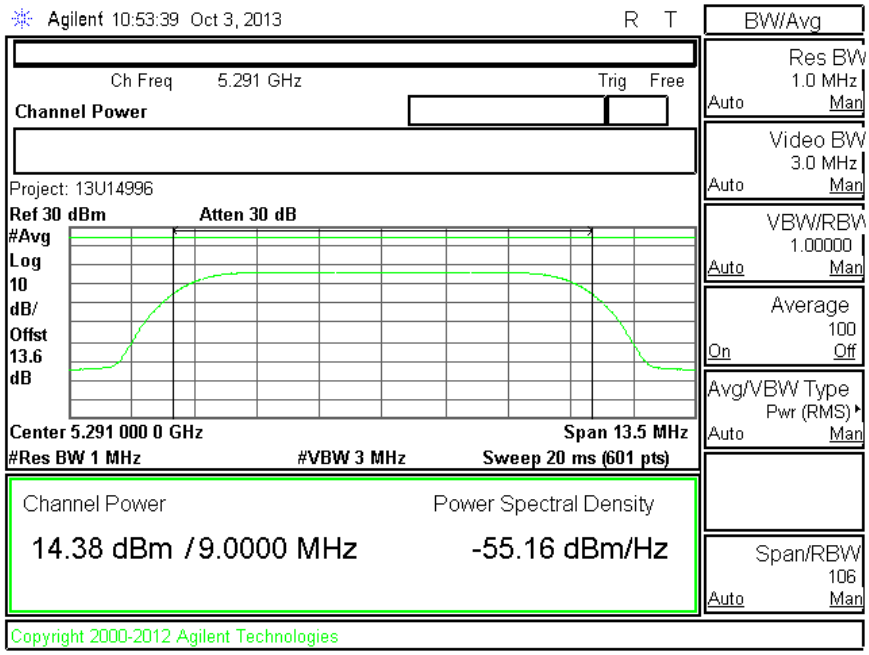
PPSD Results

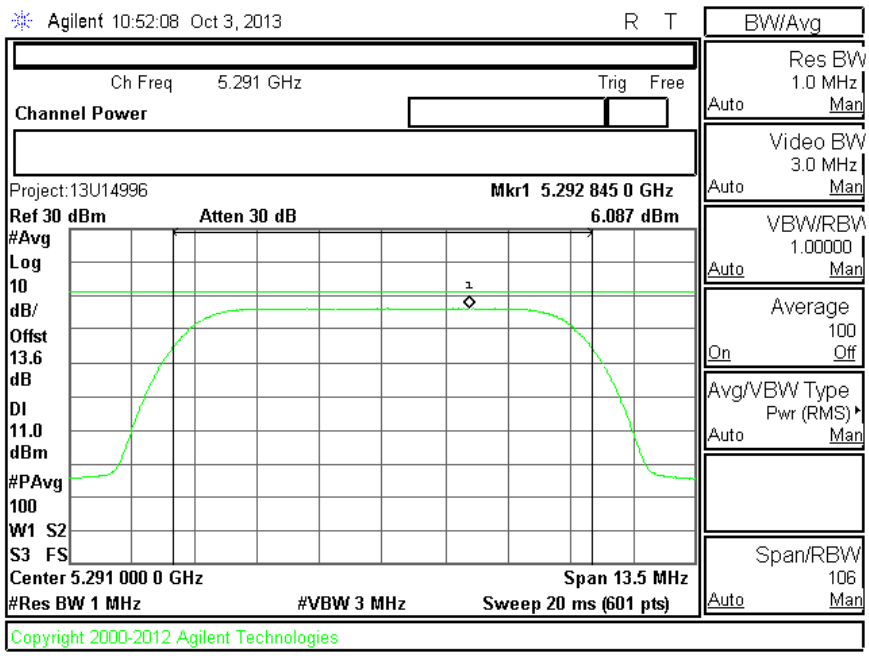
Channel	Frequency (MHz)	Meas PPSD (dBm)	Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5257	6.38	6.38	6.50	-0.12
Mid	5291	6.09	6.09	6.50	-0.41
High	5325	5.87	5.87	6.50	-0.63
High	5333	5.81	5.81	6.50	-0.69
High	5341	5.77	5.77	6.50	-0.73

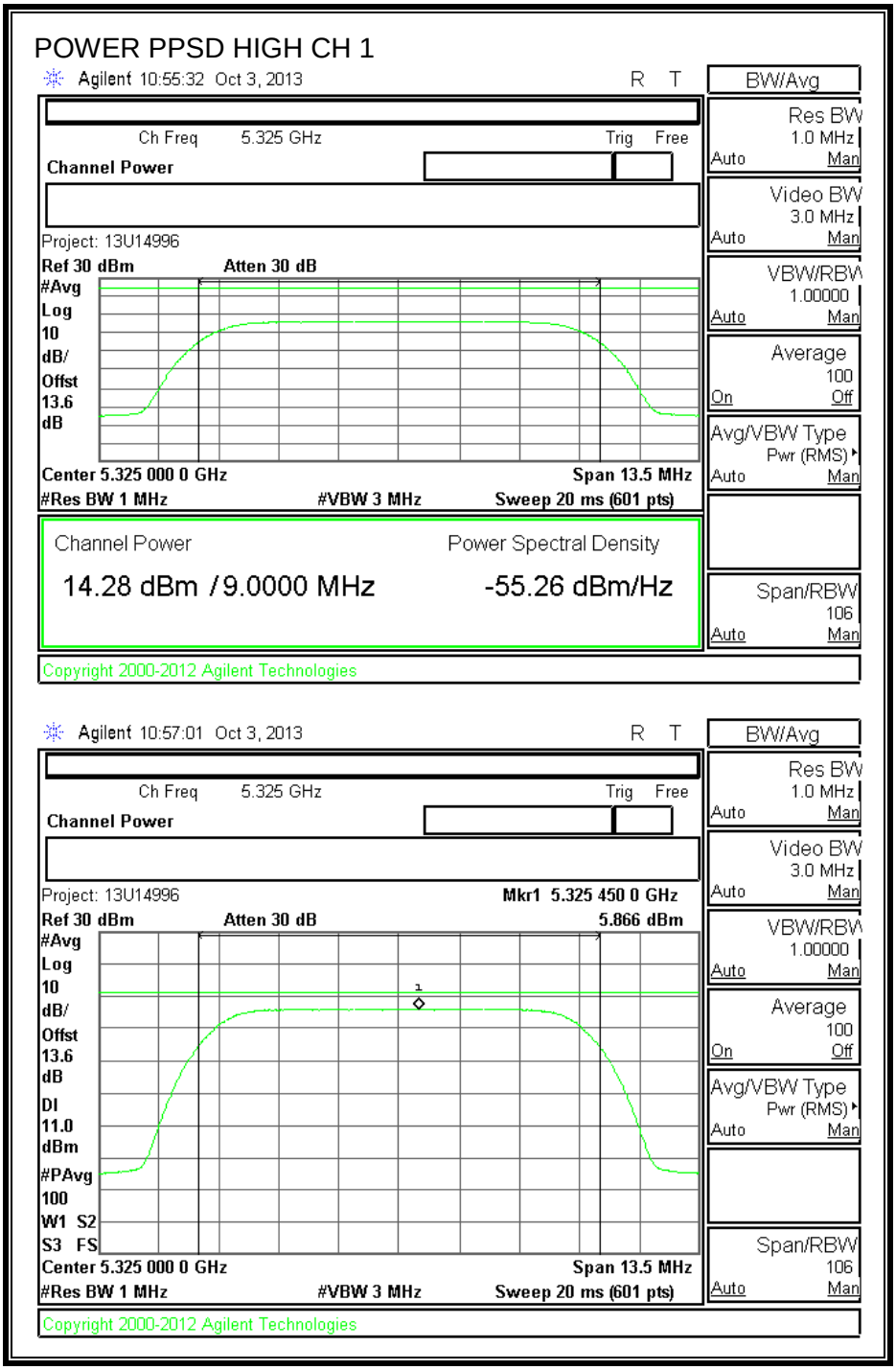
OUTPUT POWER AND PPSD



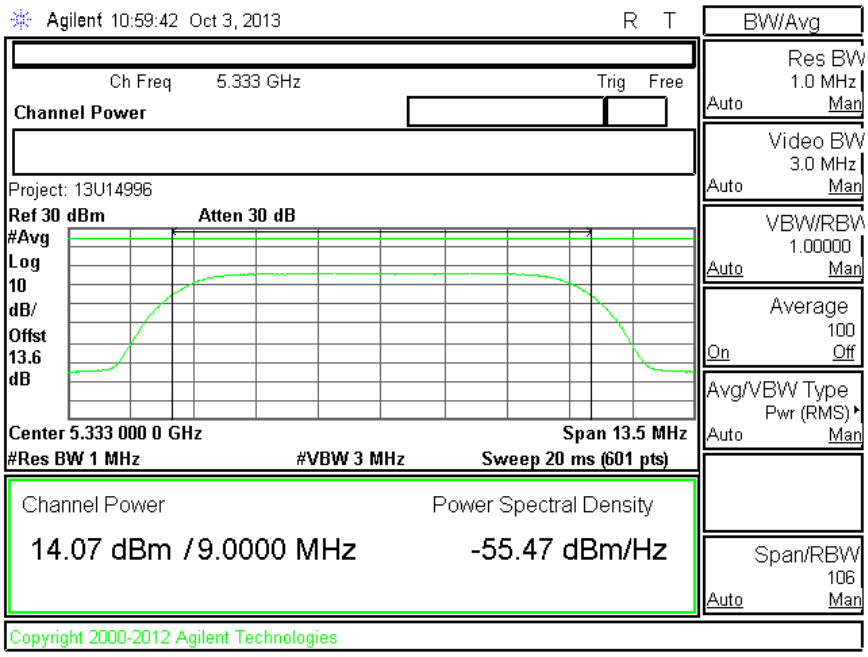
POWER PPSD MID CH

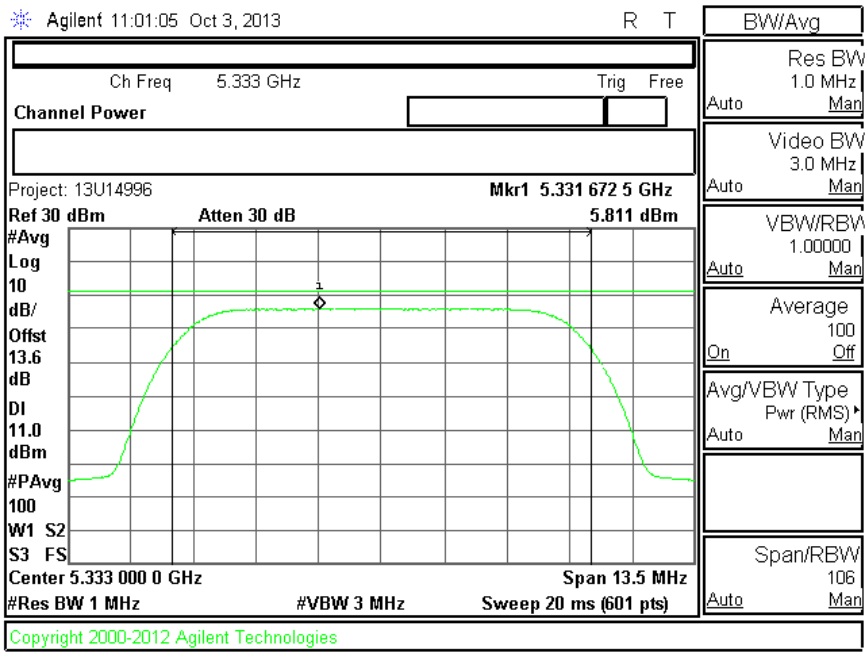




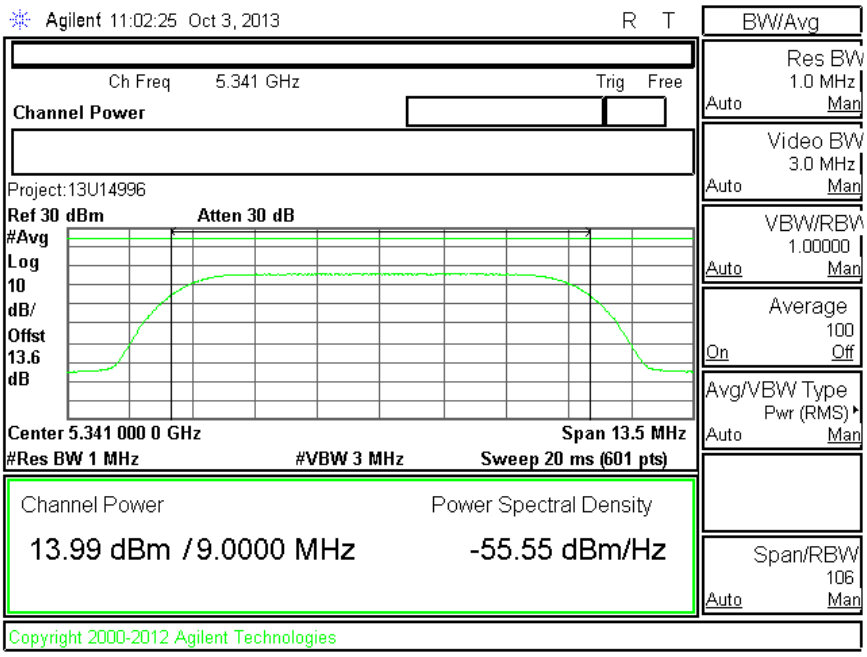


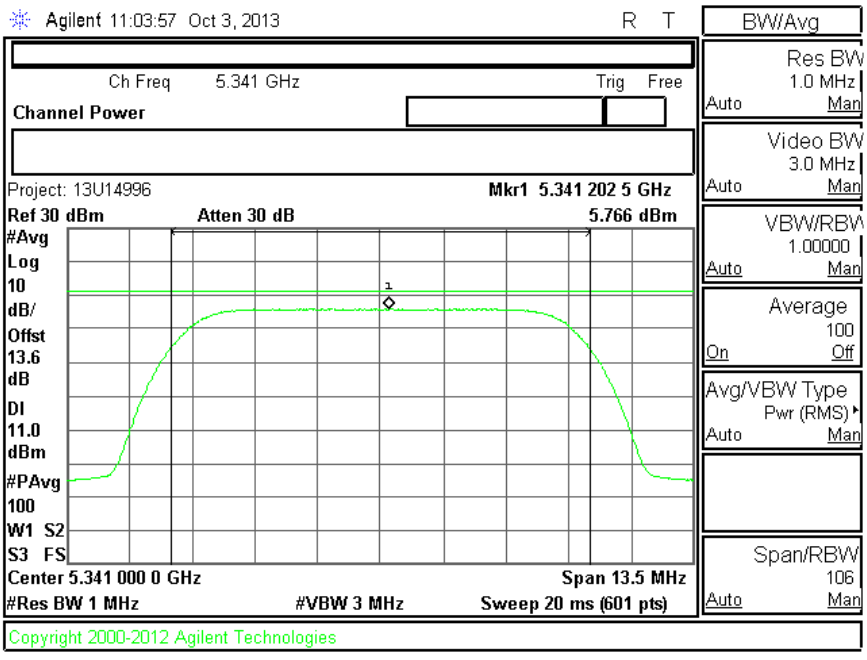
POWER PPSD HIGH CH 2





POWER PPSD HIGH CH 3





RESULTS 9MHz J49 (SISO)

Limits

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Directional Gain (dBi)	Power Limit (dBm)	PPSD Limit (dBm)
Low	5261	24	8.7	20.40	10.50	15.90	6.50
Mid	5291	24	8.7	20.40	10.50	15.90	6.50
High	5325	24	8.7	20.40	10.50	15.90	6.50
High	5333	24	8.7	20.40	10.50	15.90	6.50
High	5341	24	8.7	20.40	10.50	15.90	6.50

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

Output Power Results

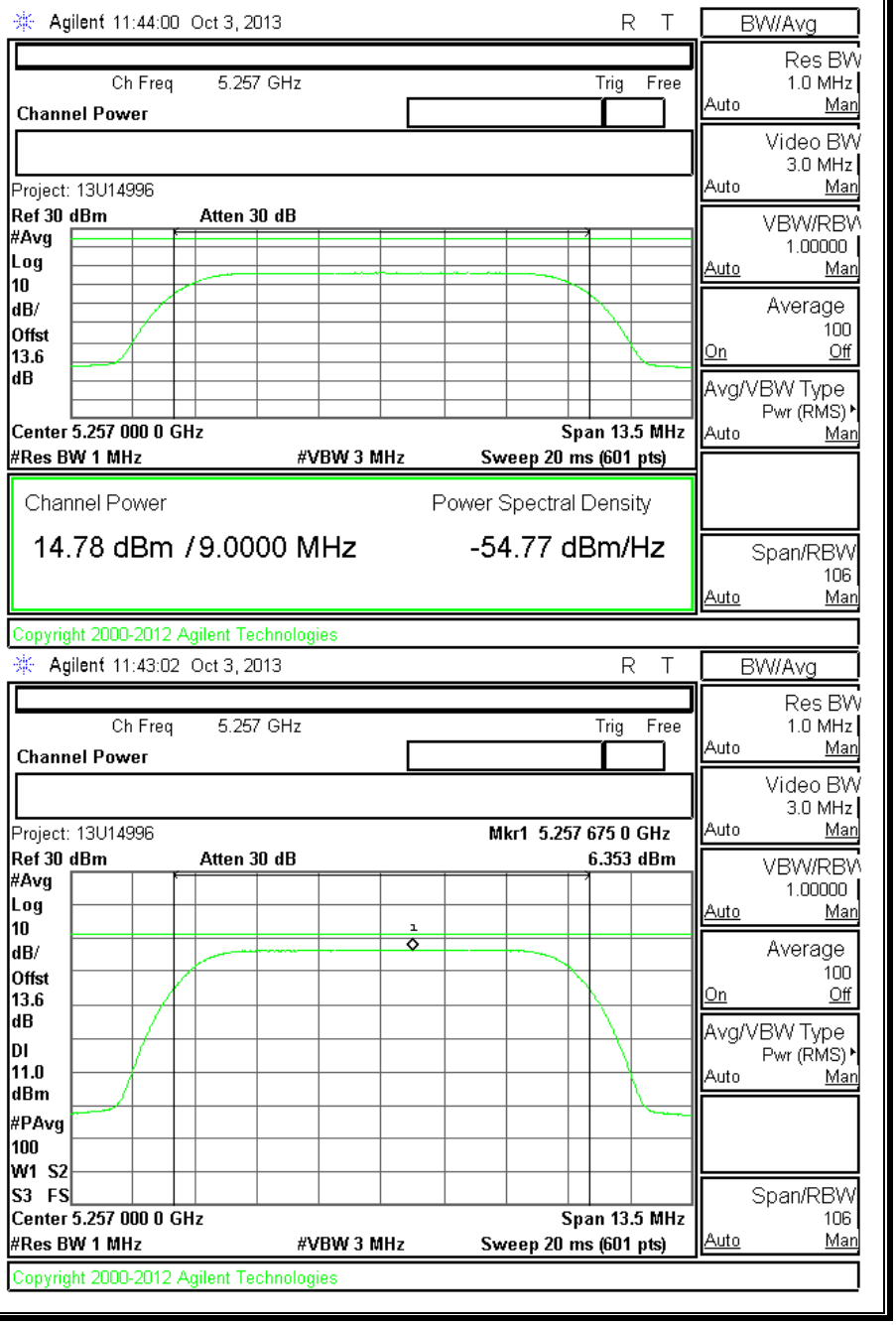
Channel	Frequency (MHz)	Meas Power (dBm)	Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5257	14.78	14.78	15.90	-1.12
Mid	5291	14.46	14.46	15.90	-1.44
High	5325	14.08	14.08	15.90	-1.82
High	5333	13.84	13.84	15.90	-2.06
High	5341	13.93	13.93	15.90	-1.97

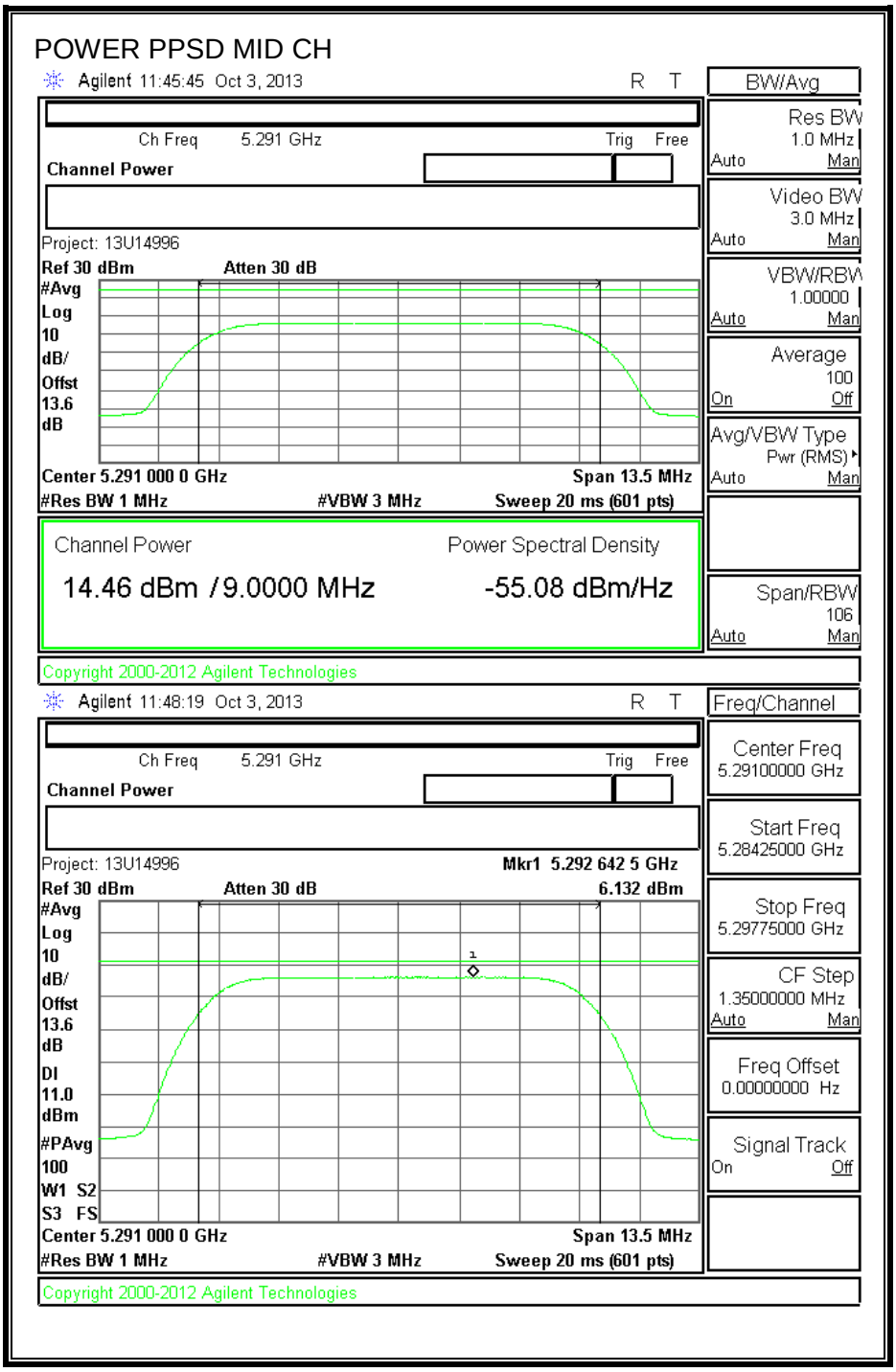
PPSD Results

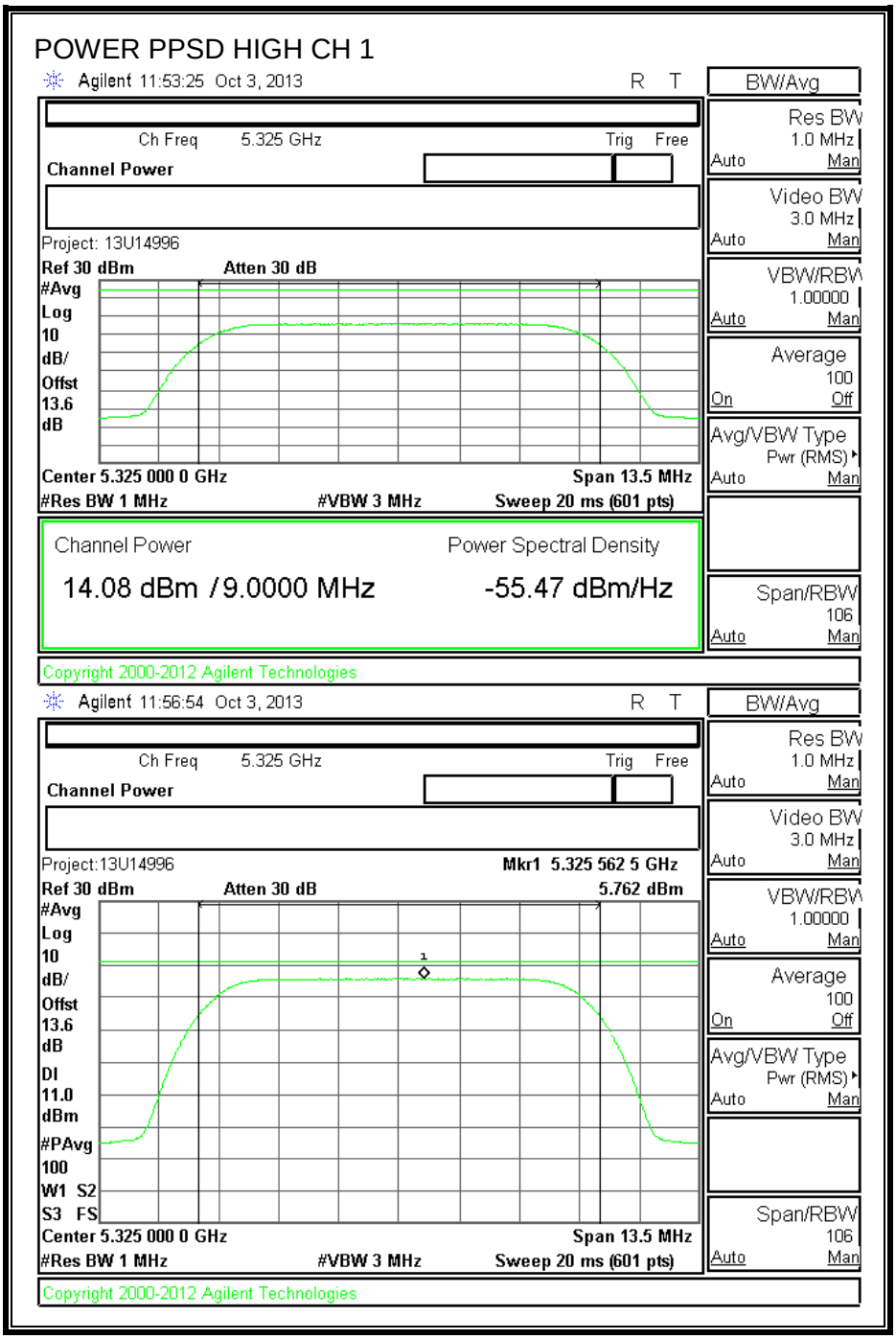
Channel	Frequency (MHz)	Meas PPSD (dBm)	Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5261	6.35	6.35	6.50	-0.15
Mid	5291	6.13	6.13	6.50	-0.37
High	5325	5.73	5.73	6.50	-0.77
High	5333	5.69	5.69	6.50	-0.81
High	5341	5.52	5.52	6.50	-0.98

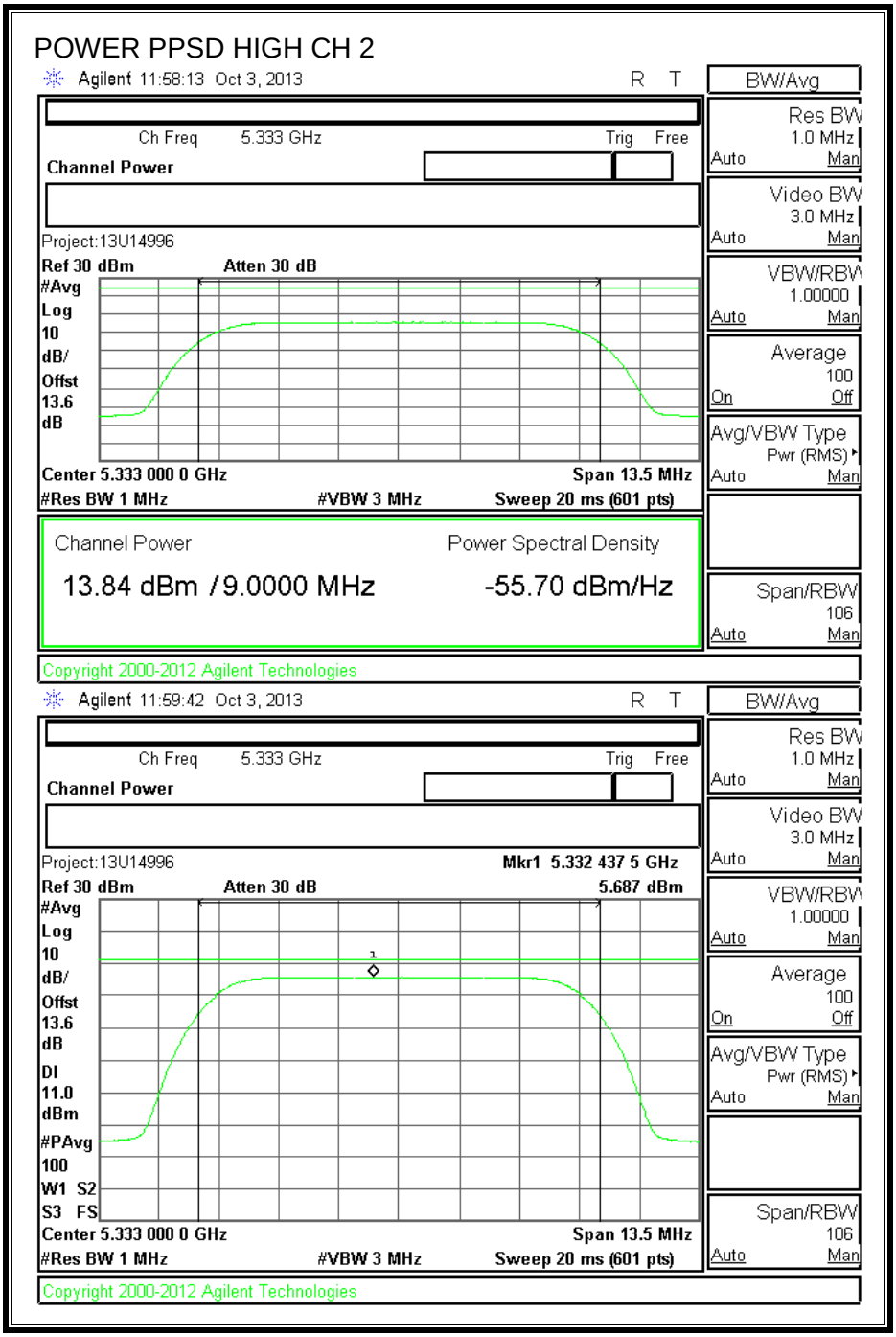
OUTPUT POWER AND PPSD

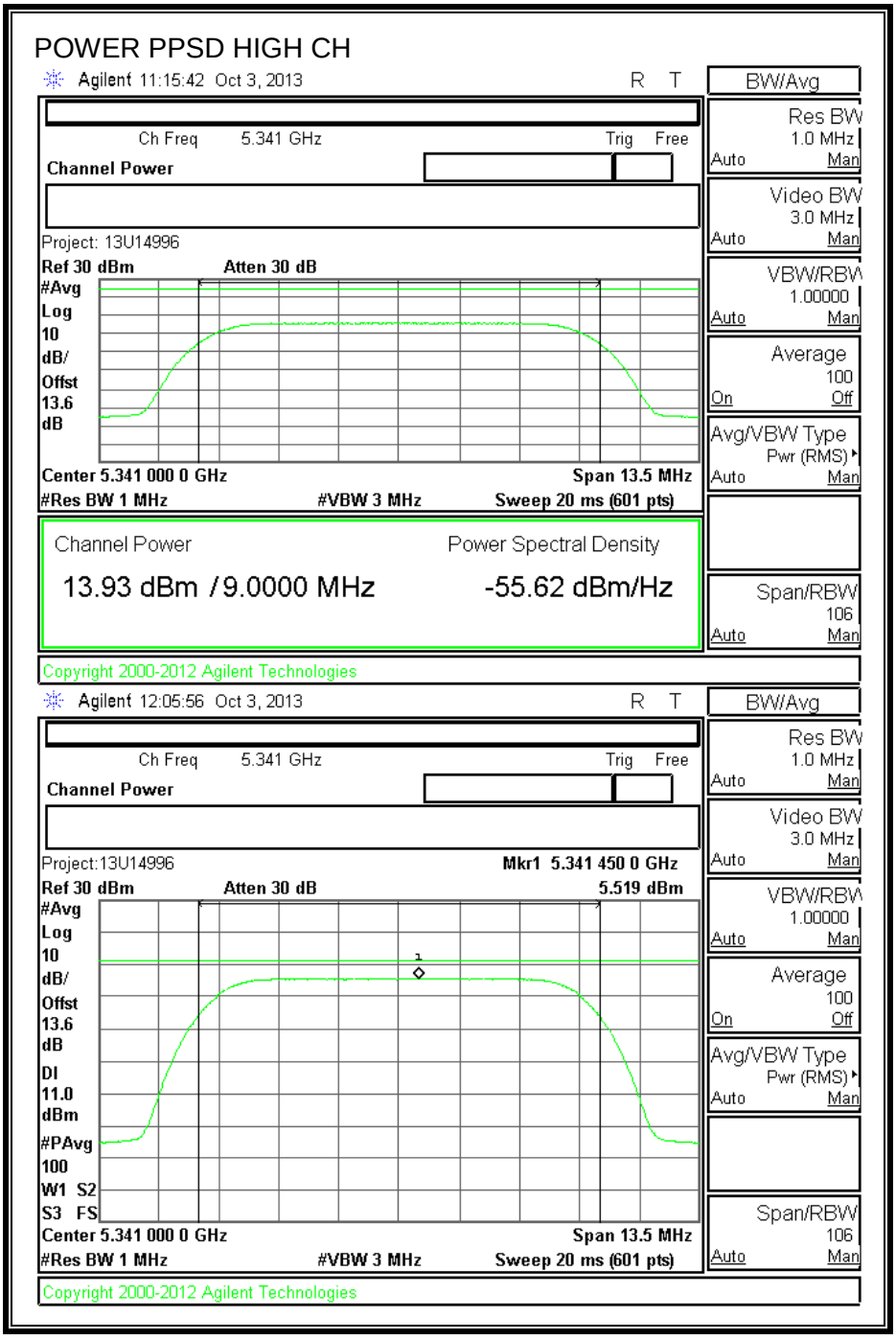
POWER PPSD LOW CH











8.1.5 OUTPUT POWER AND PPSD - MIMO

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

The TX chains are uncorrelated and the antenna gain is the same for each chain. The directional gain is equal to the antenna gain.

Use this table for uncorrelated chains and unequal antenna gain

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
10.50	10.50	10.50

RESULTS 35MHz Stream 2 (MIMO)

Limits

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Directional Gain (dBi)	Power Limit (dBm)	PPSD Limit (dBm)
Low	5269	24	34.5	26.37	10.50	19.50	6.50
Mid	5286	24	34.5	26.37	10.50	19.50	6.50
High	5304	24	34.5	26.37	10.50	19.50	6.50
High	5312	24	34.5	26.37	10.50	19.50	6.50
High	5328	24	34.5	26.37	10.50	19.50	6.50

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

Output Power Results

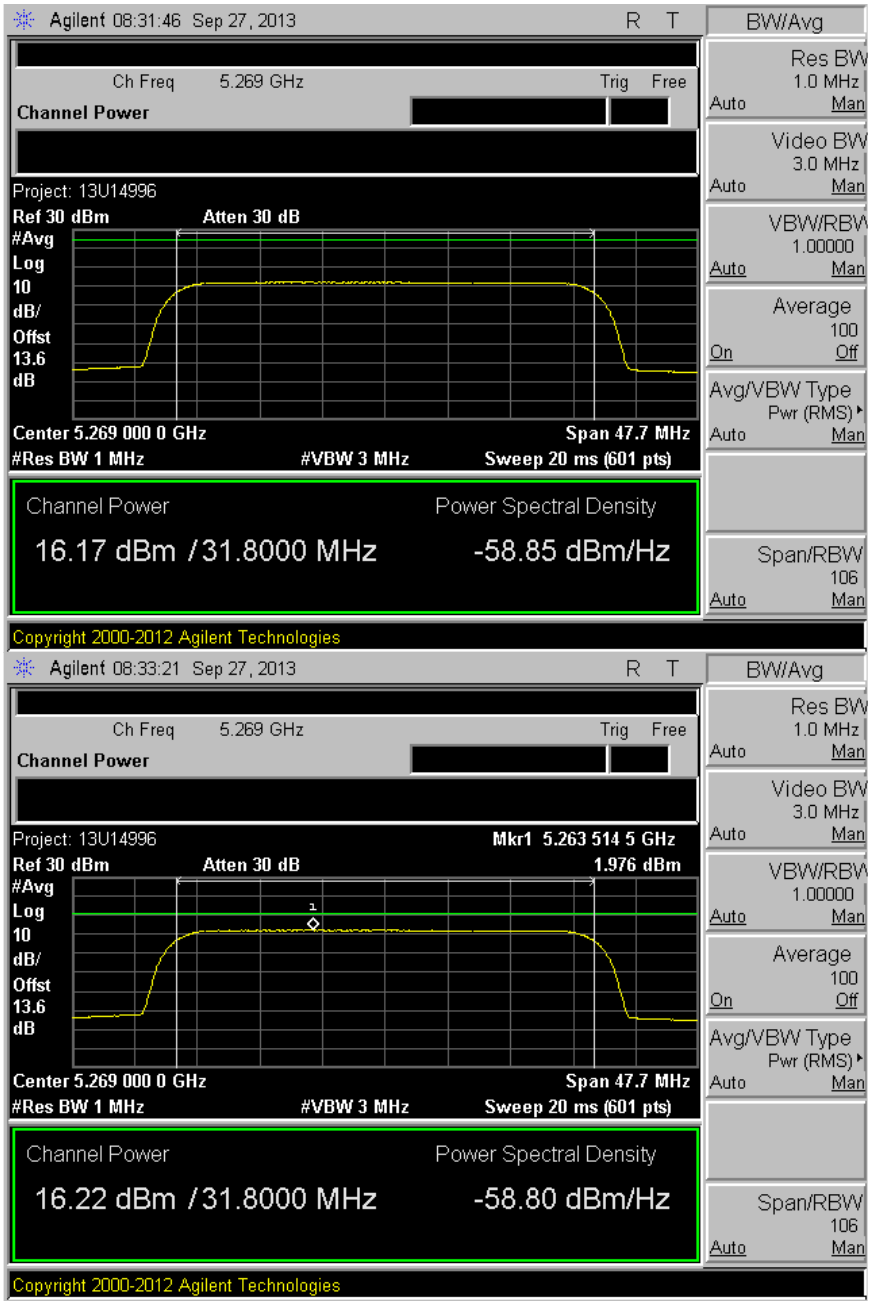
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5269	16.22	16.38	19.31	19.50	-0.19
Mid	5286	16.87	14.01	18.68	19.50	-0.82
High	5304	16.61	15.99	19.32	19.50	-0.18
High	5312	13.64	13.94	16.80	19.50	-2.70
High	5328	10.62	10.82	13.73	19.50	-5.77

PPSD Results

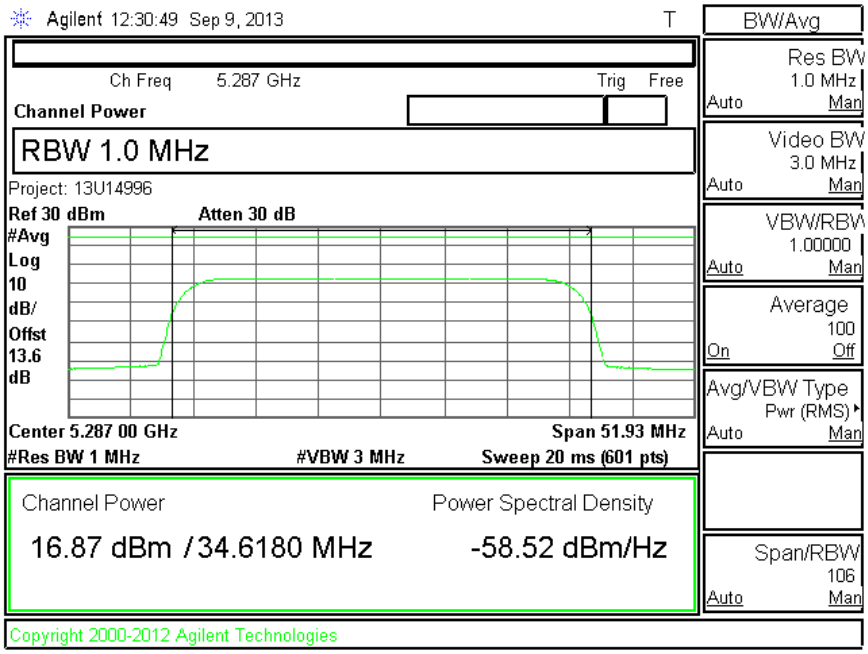
Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5269	1.98	2.14	5.07	6.50	-1.43
Mid	5286	2.66	-0.17	4.49	6.50	-2.01
High	5304	2.29	1.72	5.02	6.50	-1.48
High	5312	-0.60	-0.28	2.57	6.50	-3.93
High	5328	-3.60	-3.32	-0.44	6.50	-6.94

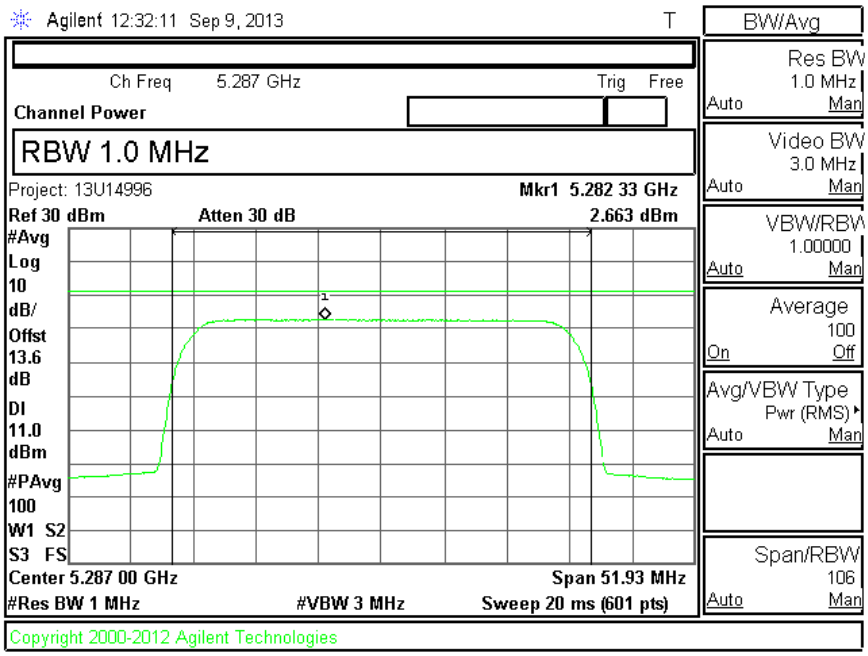
OUTPUT POWER AND PPSD, Chain 0 35MHz

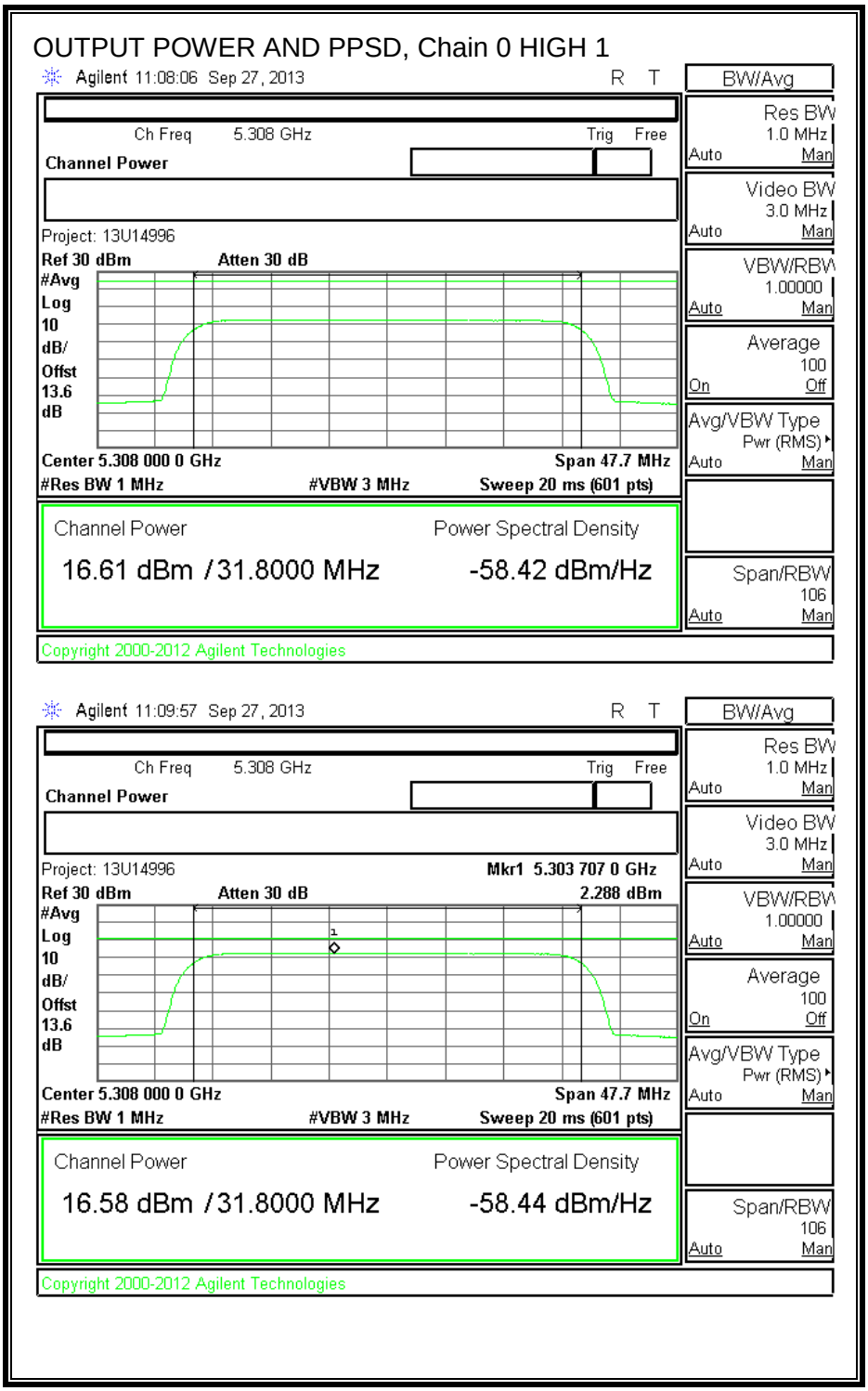
OUTPUT POWER AND PPSD, Chain 0 LOW CH



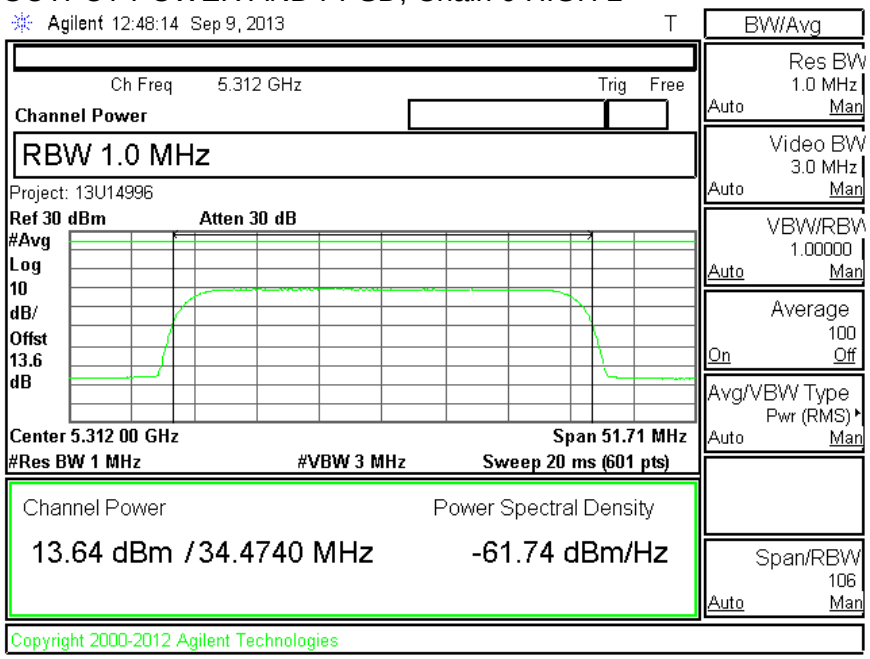
OUTPUT POWER AND PPSD, Chain 0 MID CH

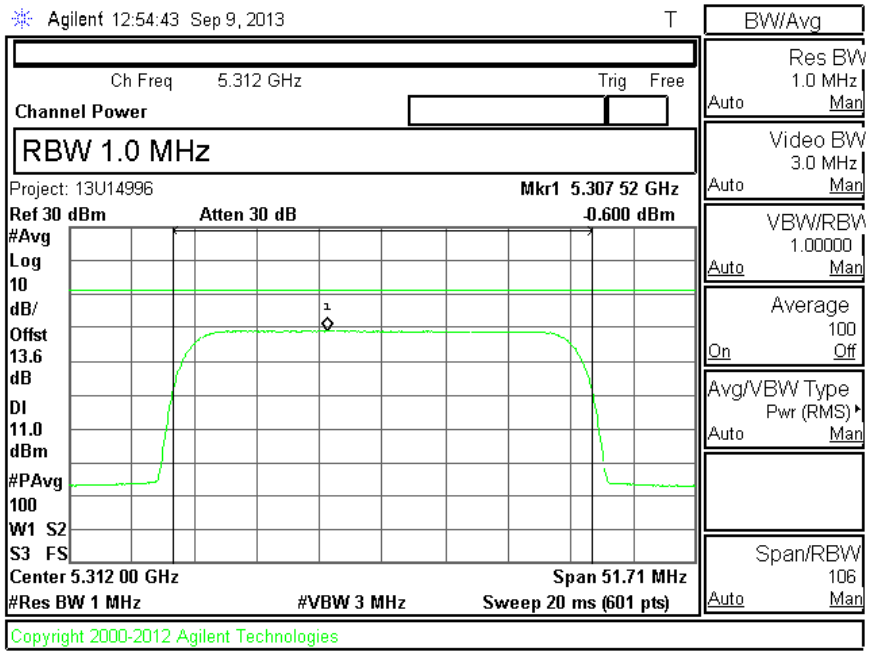




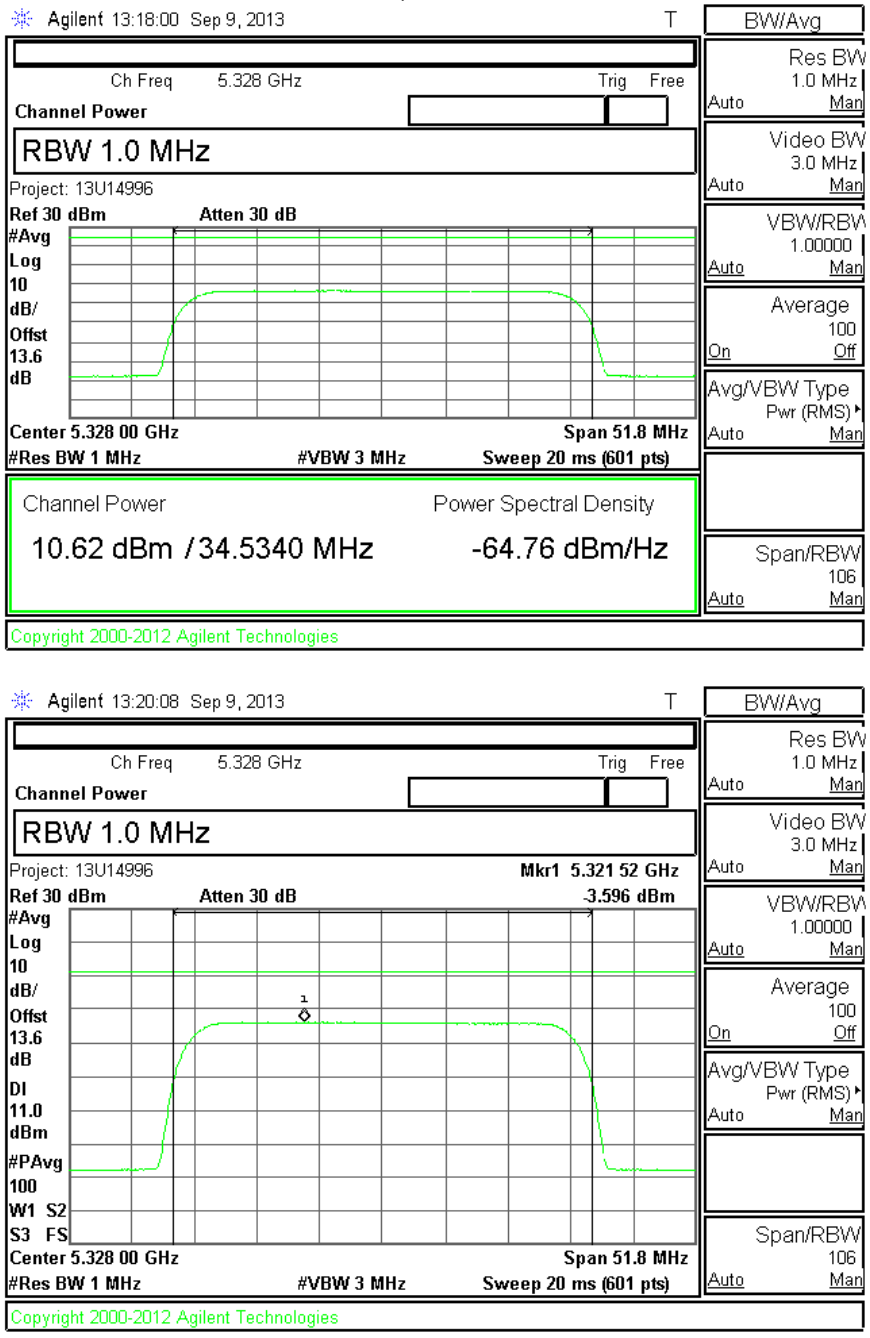


OUTPUT POWER AND PPSD, Chain 0 HIGH 2

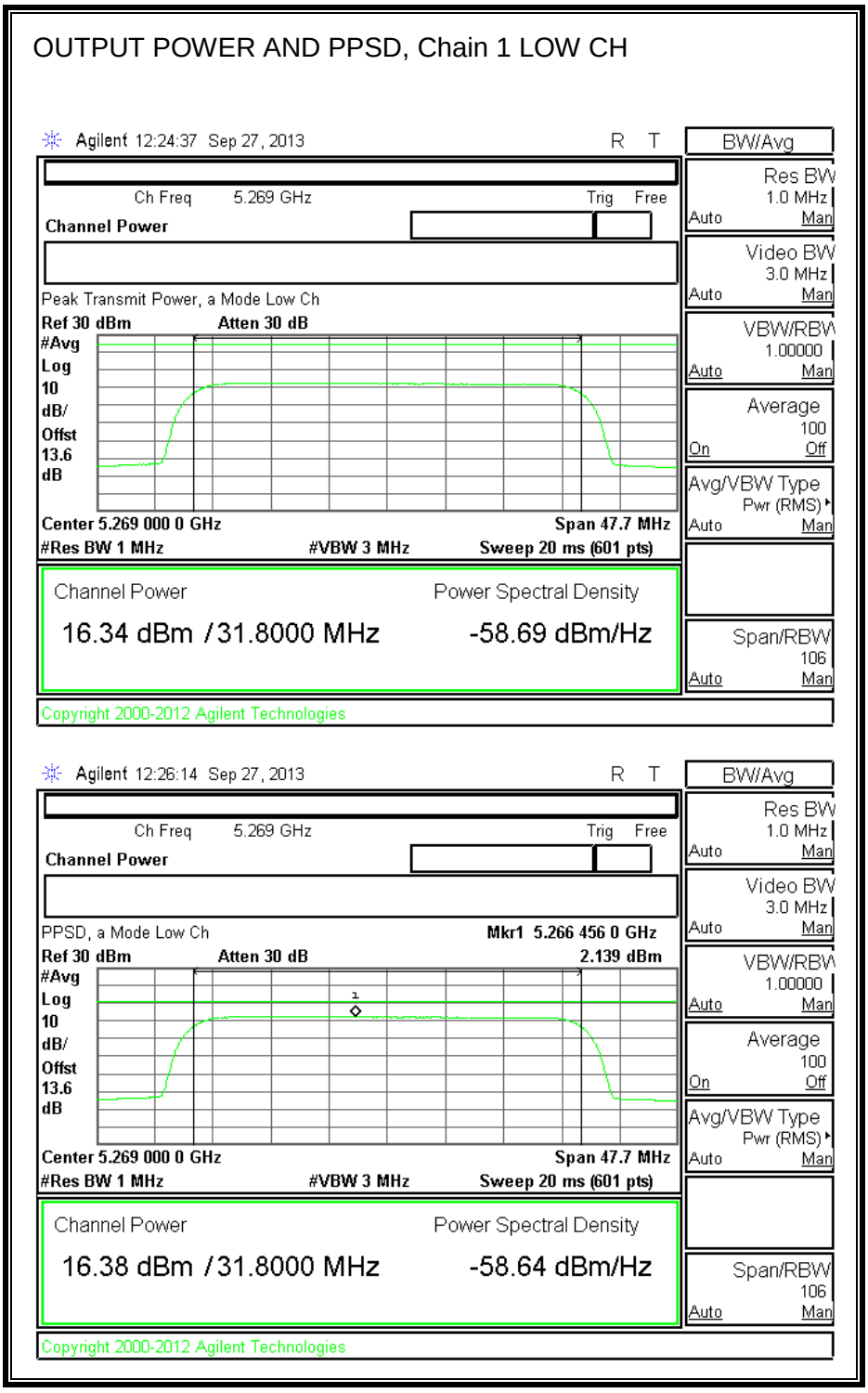




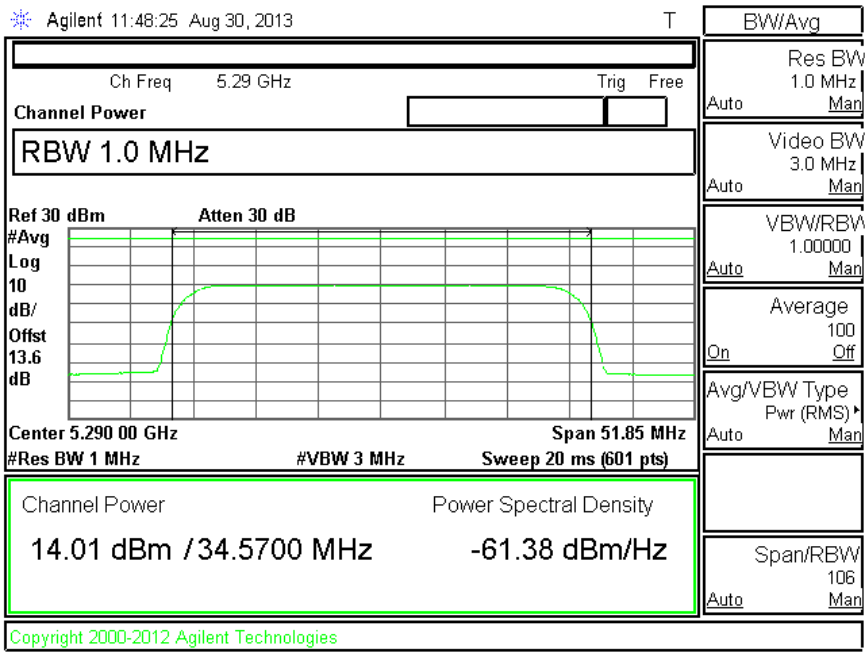
OUTPUT POWER AND PPSD, Chain 0 HIGH 3

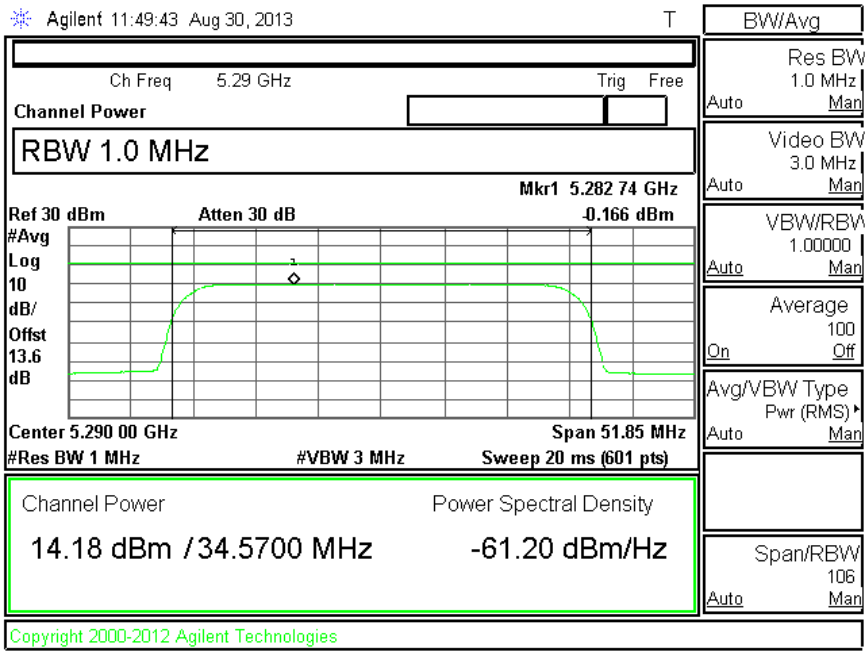


OUTPUT POWER AND PPSD, Chain 1

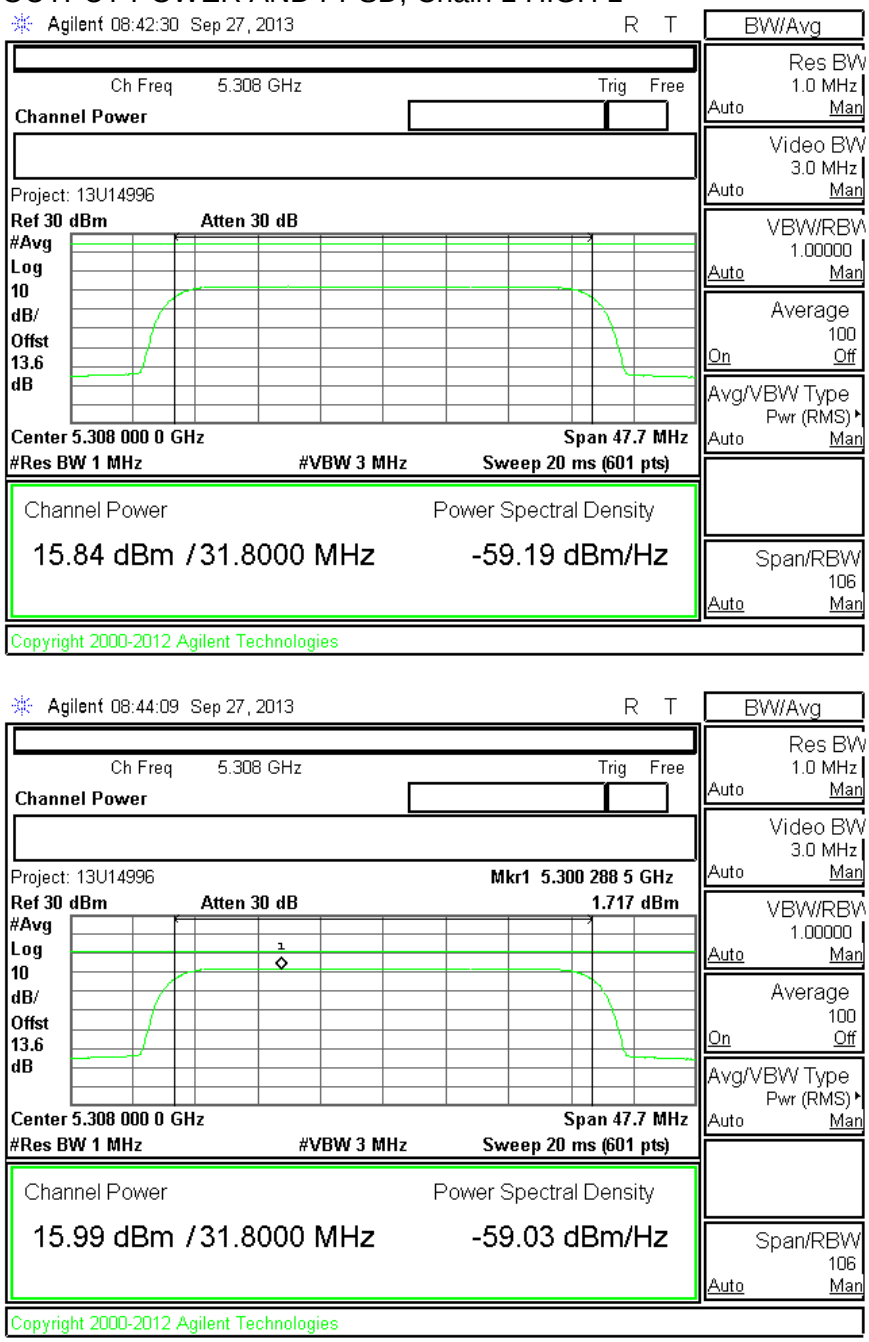


OUTPUT POWER AND PPSD, Chain 1 MID CH

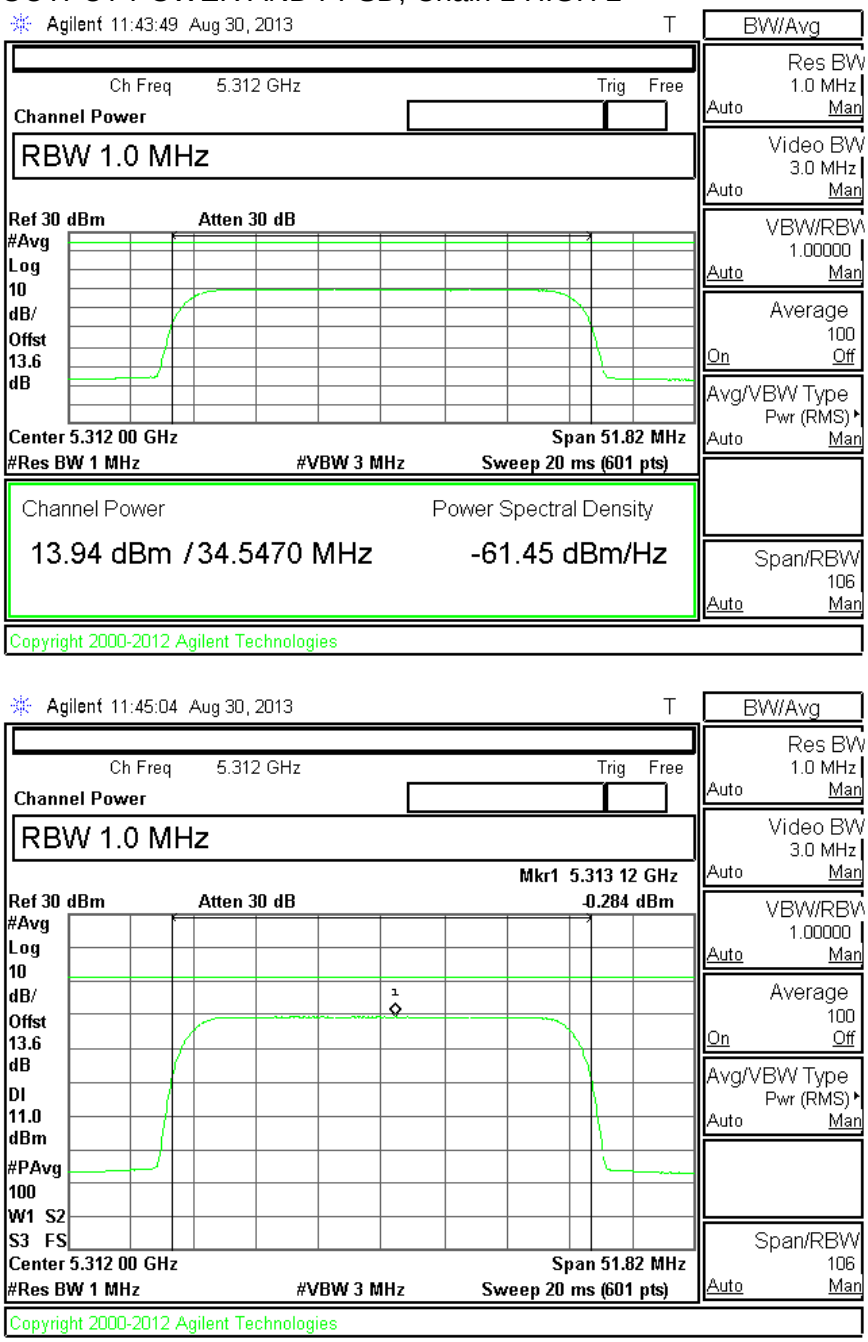




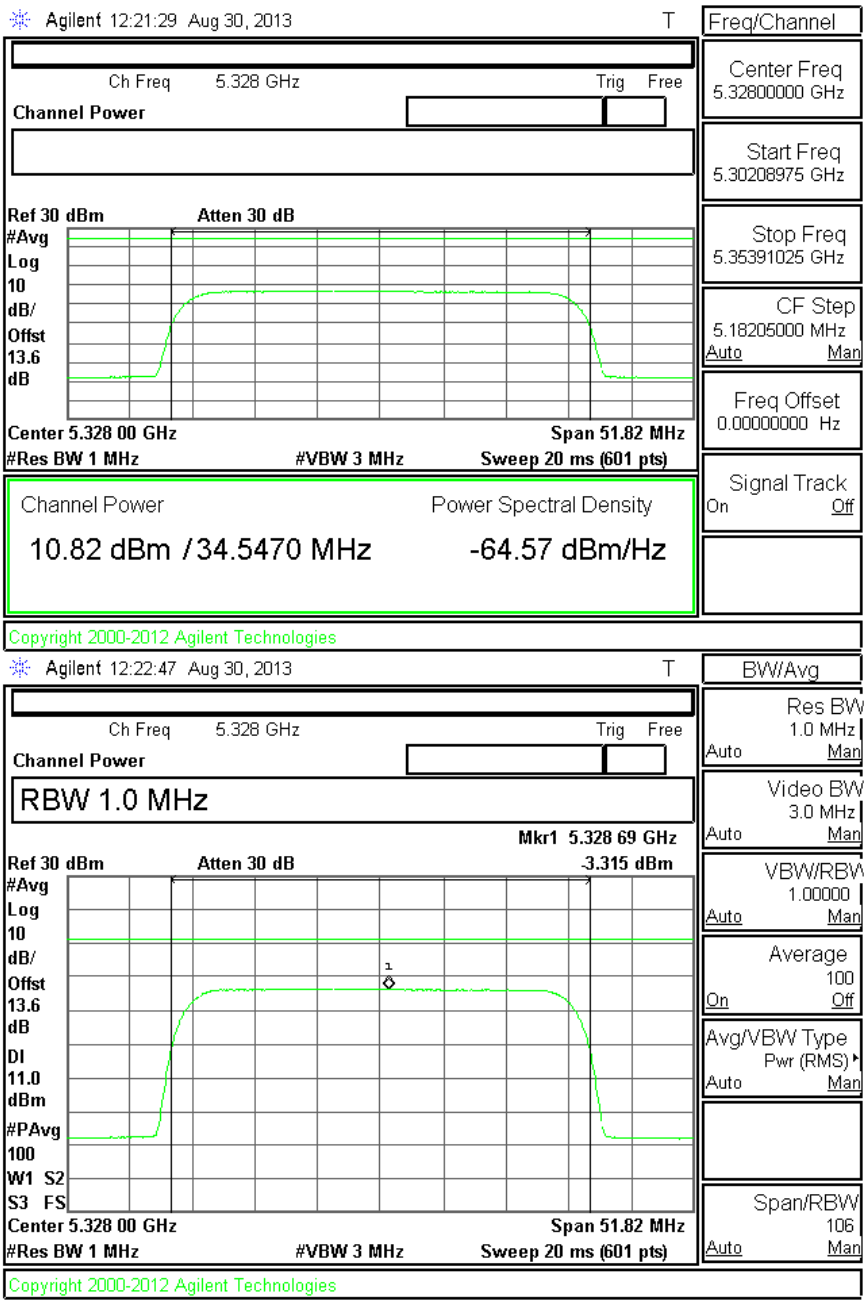
OUTPUT POWER AND PPSD, Chain 1 HIGH 1



OUTPUT POWER AND PPSD, Chain 1 HIGH 2



OUTPUT POWER AND PPSD, Chain 1 HIGH 3



RESULTS 18MHz Stream 2 (MIMO)

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Directional Gain (dBi)	Power Limit (dBm)	PPSD Limit (dBm)
Low	5261	24	17.3	23.38	10.50	18.88	6.50
Mid	5289	24	17.2	23.36	10.50	18.86	6.50
High	5315	24	17.3	23.38	10.50	18.88	6.50
High	5325	24	17.3	23.38	10.50	18.88	6.50
High	5337	24	17.3	23.38	10.50	18.88	6.50

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

Output Power Results

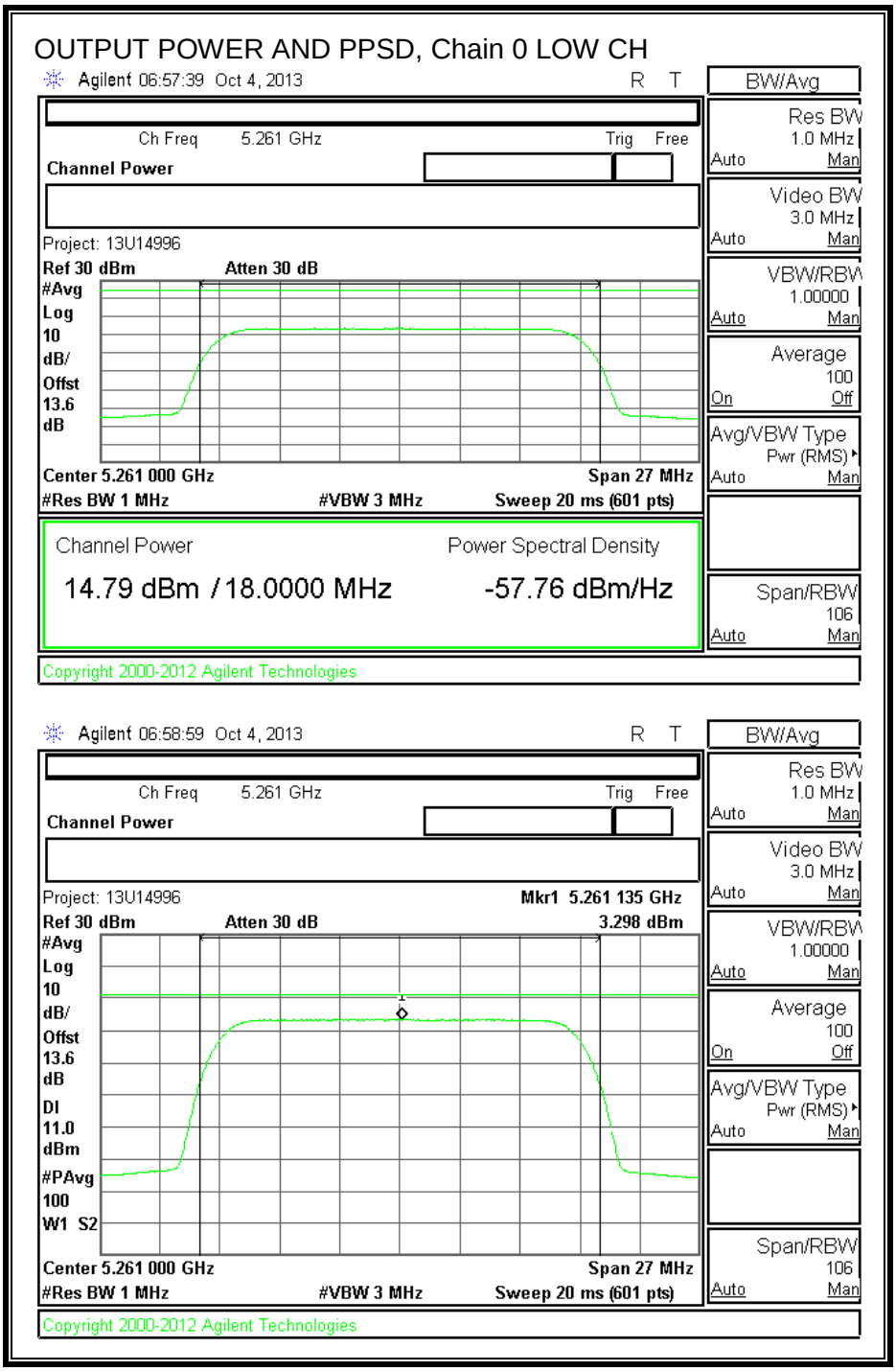
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5261	14.79	14.55	17.68	18.88	-1.20
Mid	5289	14.34	14.31	17.34	18.86	-1.52
High	5315	14.23	14.11	17.18	18.88	-1.70
High	5325	13.27	13.16	16.23	18.88	-2.65
High	5337	12.71	12.86	15.80	18.88	-3.08

PPSD Results

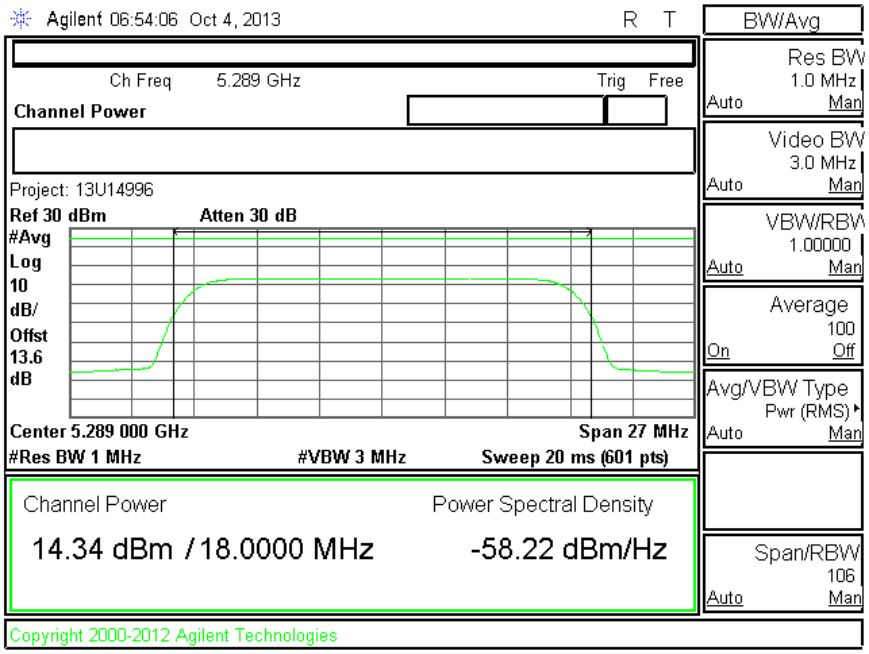
Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5261	3.30	3.14	6.23	6.50	-0.27
Mid	5289	3.06	3.00	6.04	6.50	-0.46
High	5315	2.94	2.80	5.88	6.50	-0.62
High	5325	1.94	1.93	4.95	6.50	-1.55
High	5337	1.52	1.40	4.47	6.50	-2.03

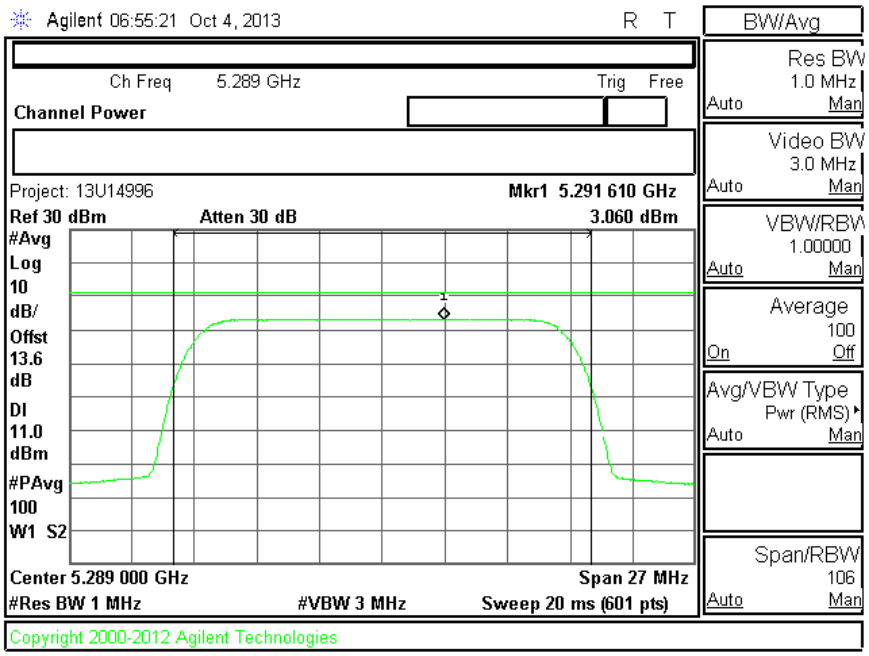
OUTPUT POWER AND PPSD

OUTPUT POWER AND PPSD, Chain 0

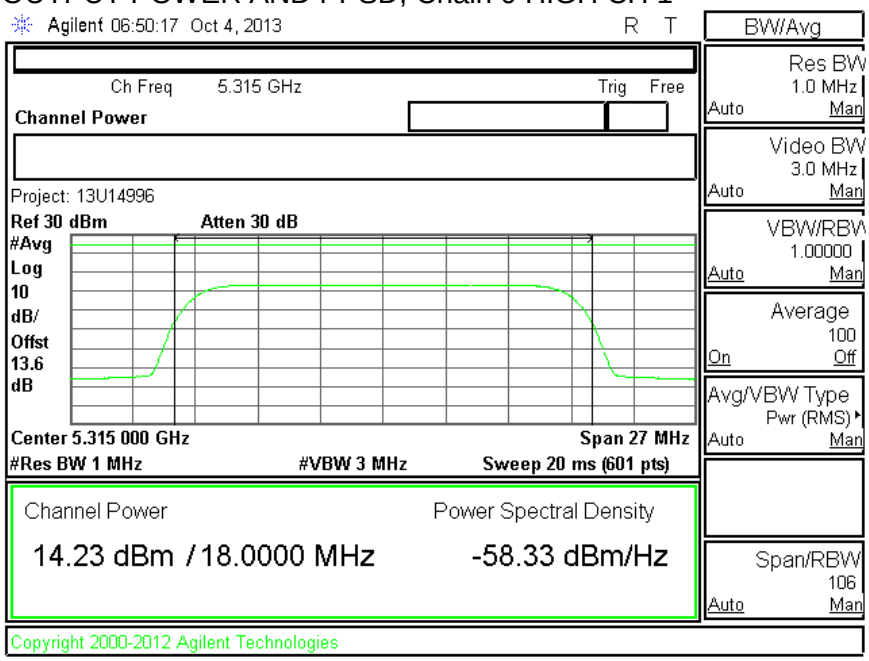


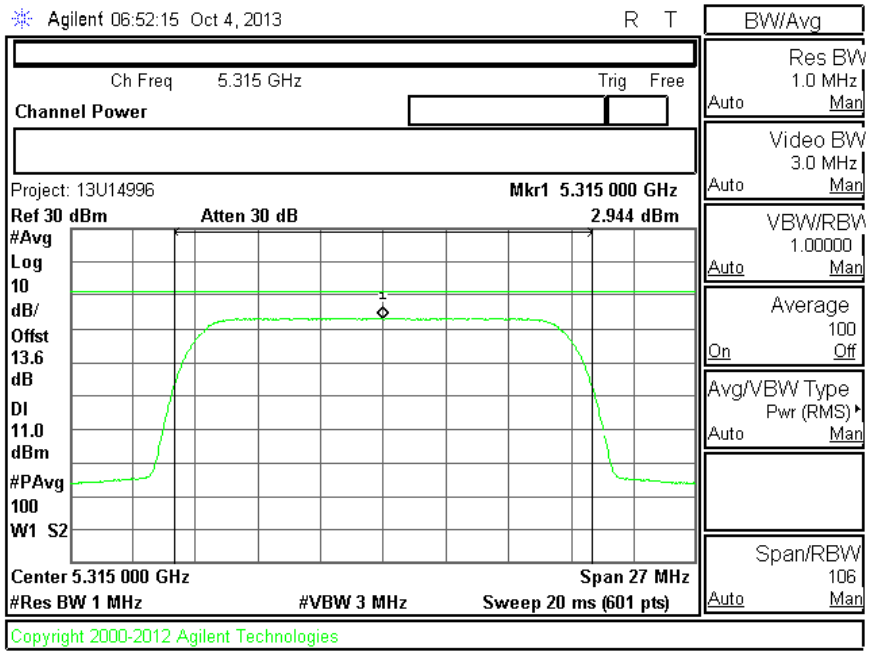
OUTPUT POWER AND PPSD, Chain 0 MID CH



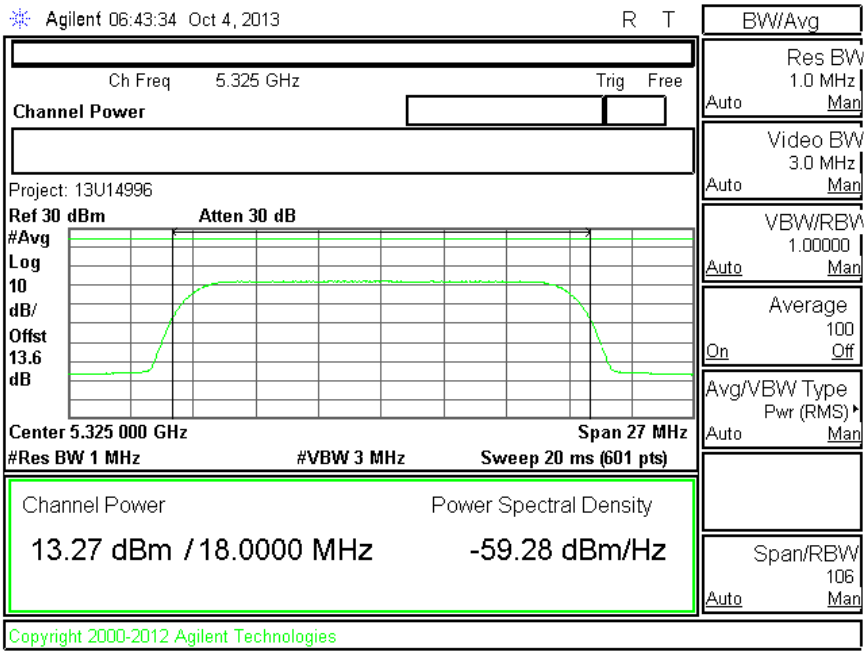


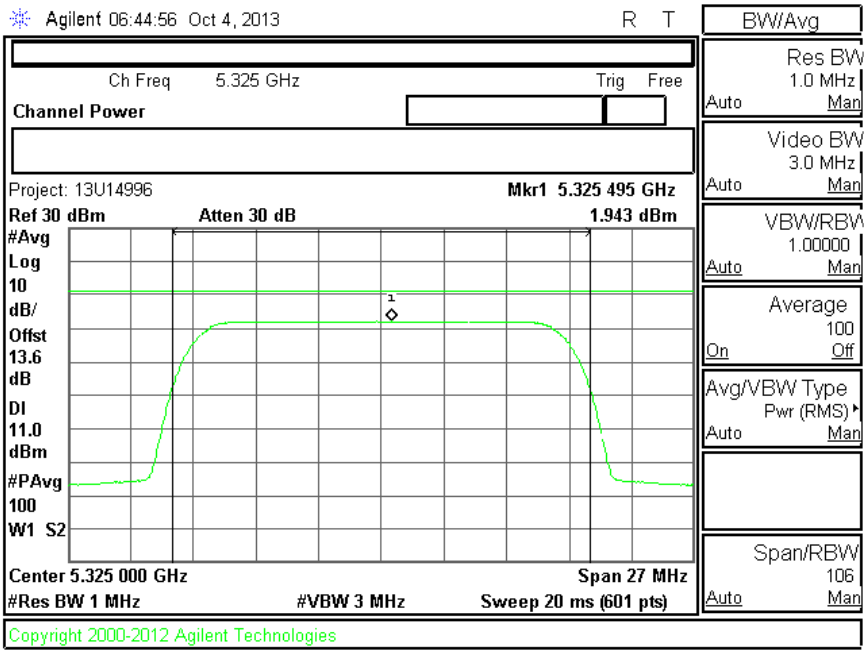
OUTPUT POWER AND PPSD, Chain 0 HIGH CH 1



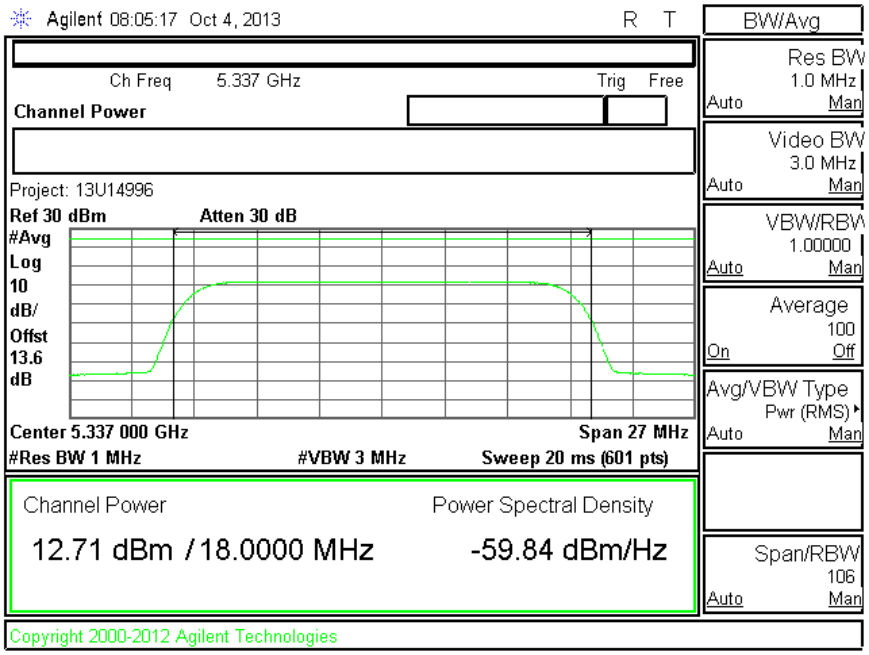


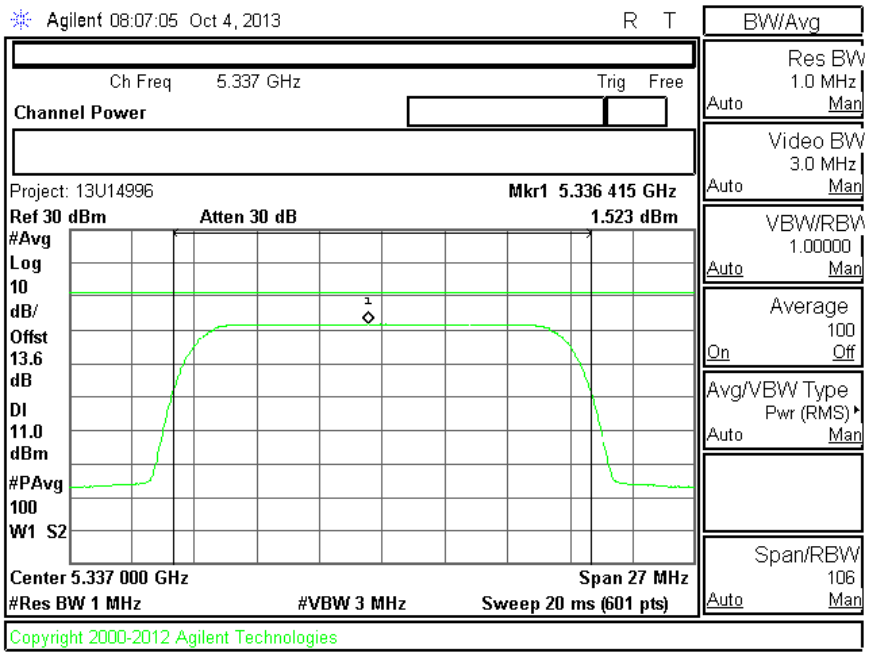
OUTPUT POWER AND PPSD, Chain 0 HIGH CH 2





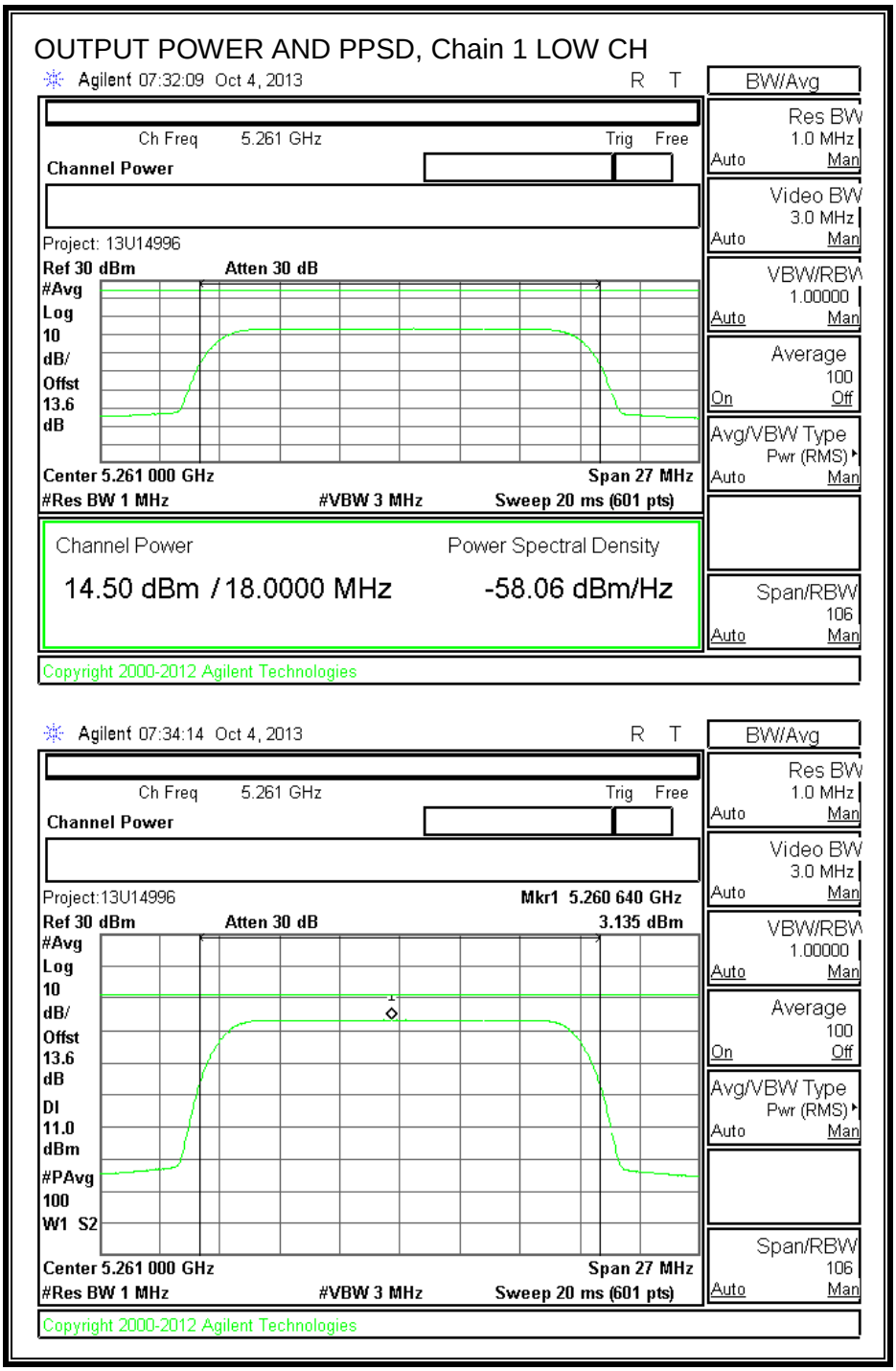
OUTPUT POWER AND PPSD, Chain 0 HIGH 3



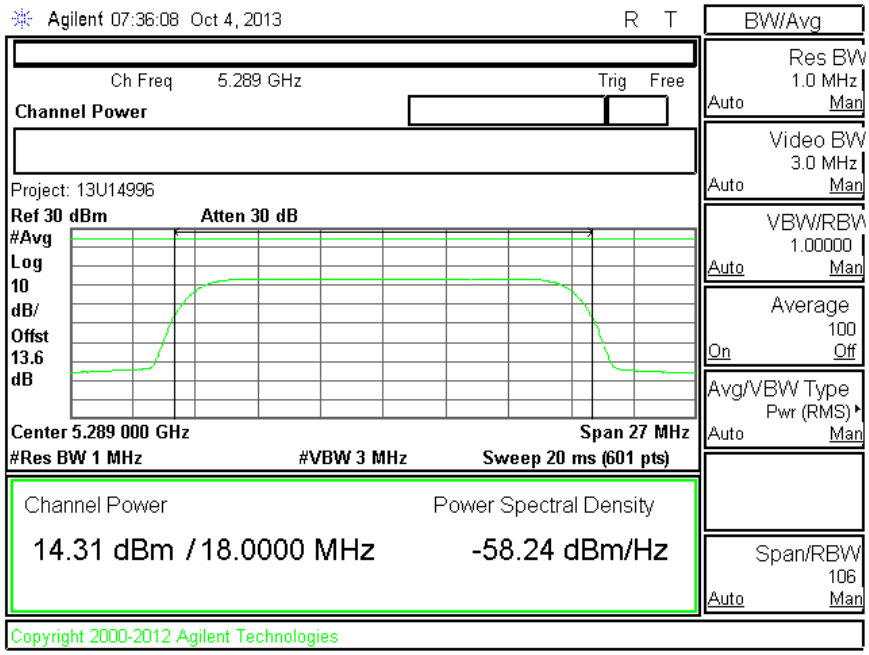


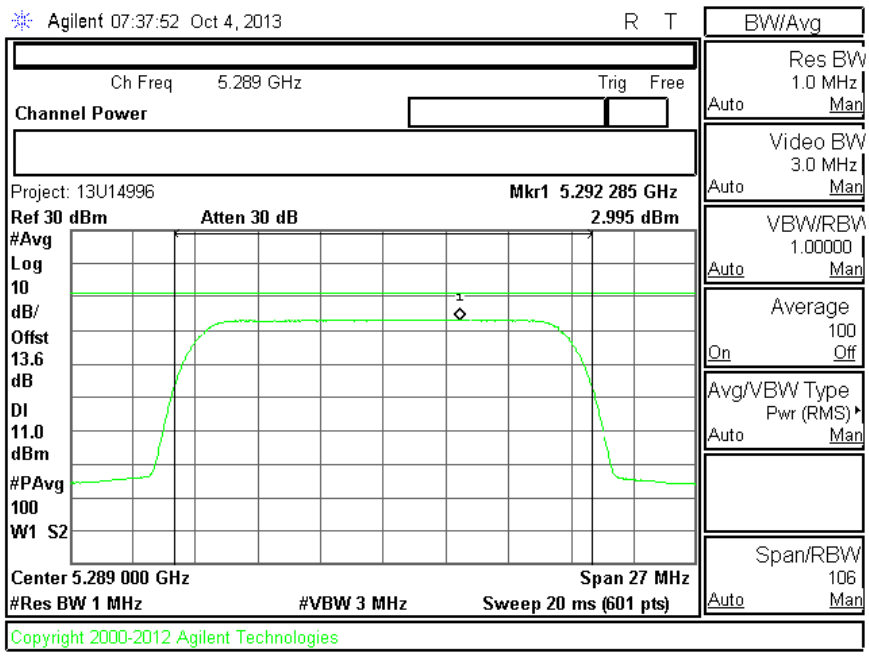
OUTPUT POWER AND PPSD

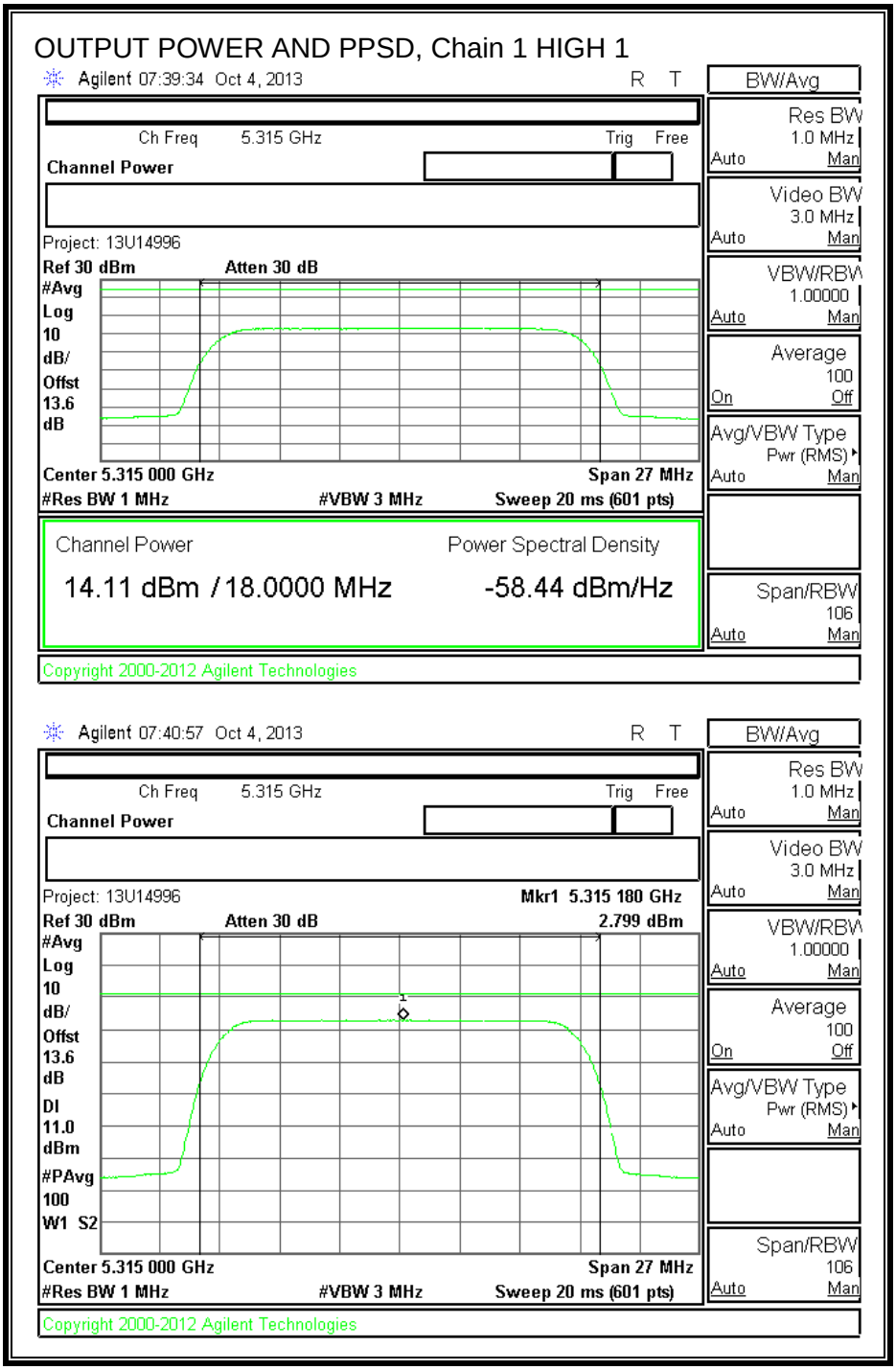
OUTPUT POWER AND PPSD, Chain 1



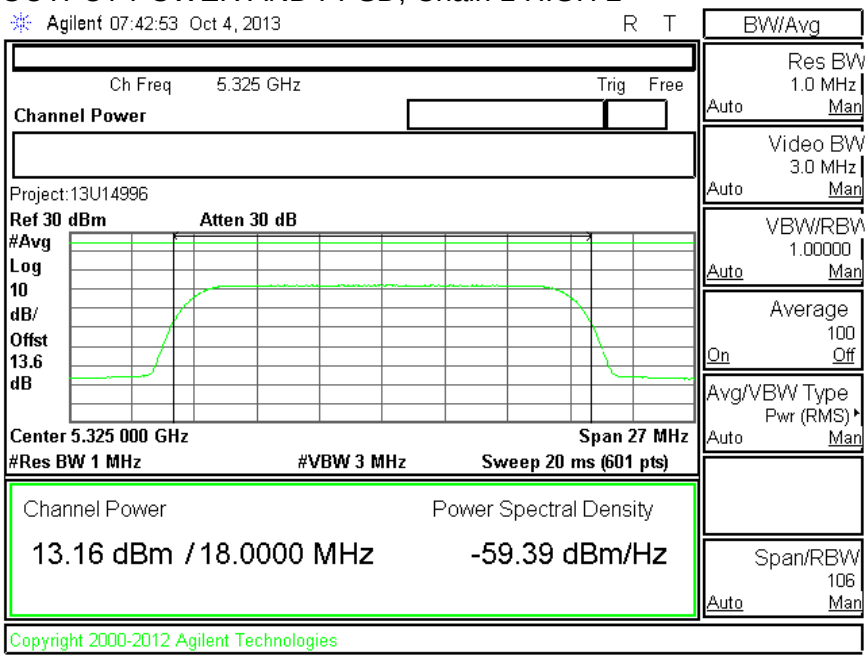
OUTPUT POWER AND PPSD, Chain 1 MID CH

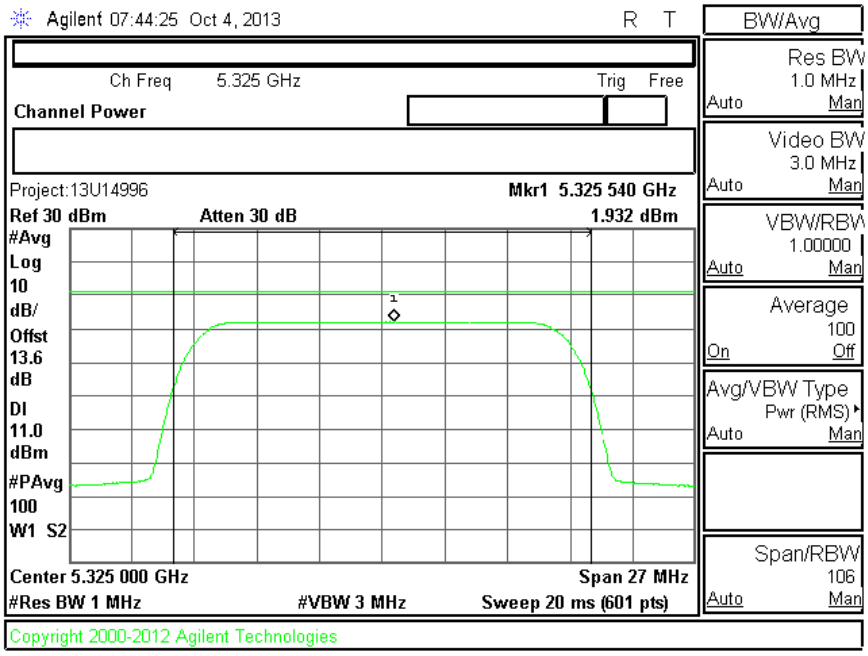




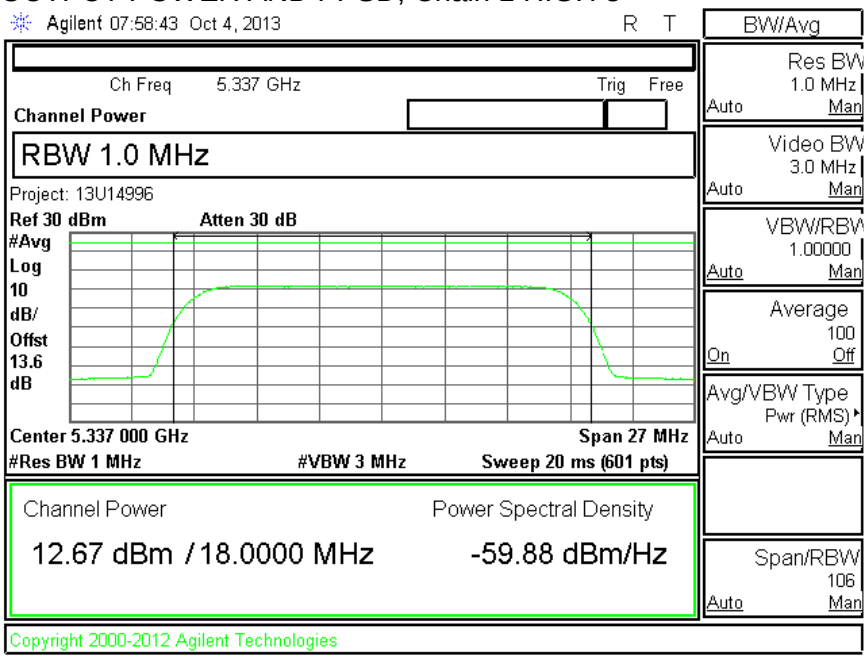


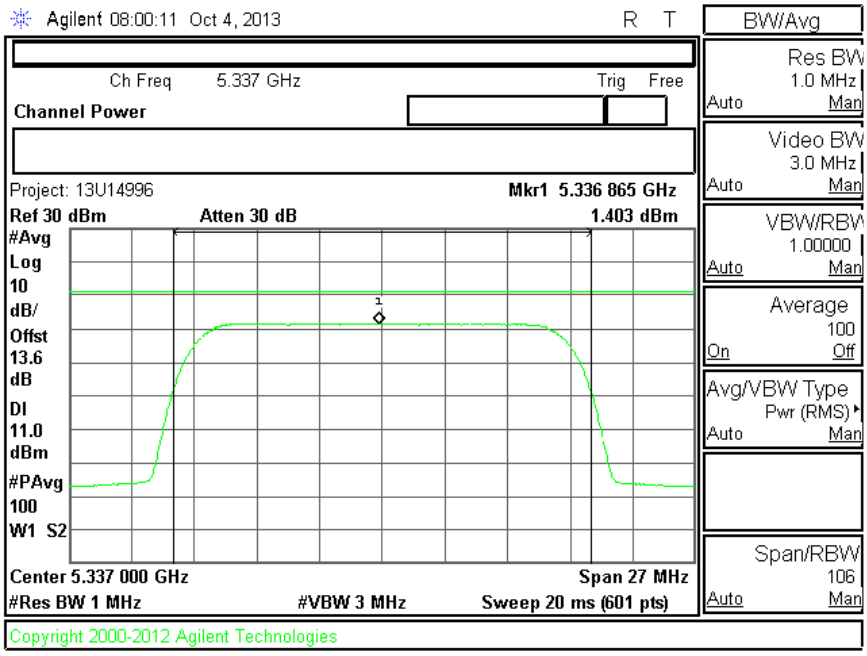
OUTPUT POWER AND PPSD, Chain 1 HIGH 2





OUTPUT POWER AND PPSD, Chain 1 HIGH 3





RESULTS 9MHz Stream 2 (MIMO)

Limits

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Directional Gain (dBi)	Power Limit (dBm)	PPSD Limit (dBm)
Low	5257	24	8.7	20.40	10.50	15.90	6.50
Mid	5291	24	8.7	20.40	10.50	15.90	6.50
High	5325	24	8.7	20.40	10.50	15.90	6.50
High	5341	24	8.7	20.40	10.50	15.90	6.50
High	5343	24	8.7	20.40	10.50	15.90	6.50

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd Power & PPSD

Output Power Results

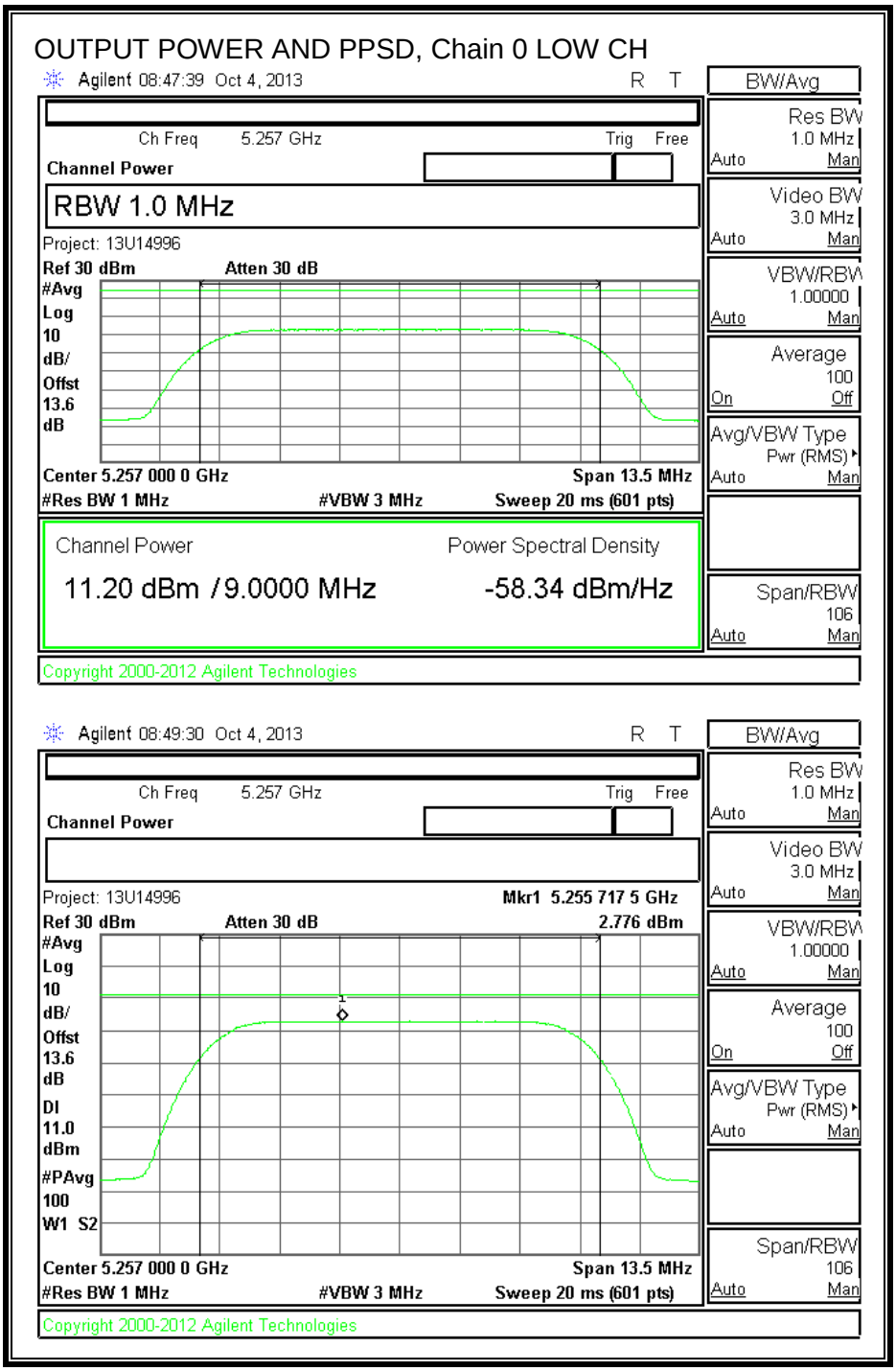
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5257	11.20	12.16	14.72	15.90	-1.18
Mid	5291	10.72	11.82	14.32	15.90	-1.58
High	5325	10.48	11.54	14.05	15.90	-1.84
High	5341	10.21	11.11	13.69	15.90	-2.20
High	5343	10.15	11.15	13.69	15.90	-2.21

PPSD Results

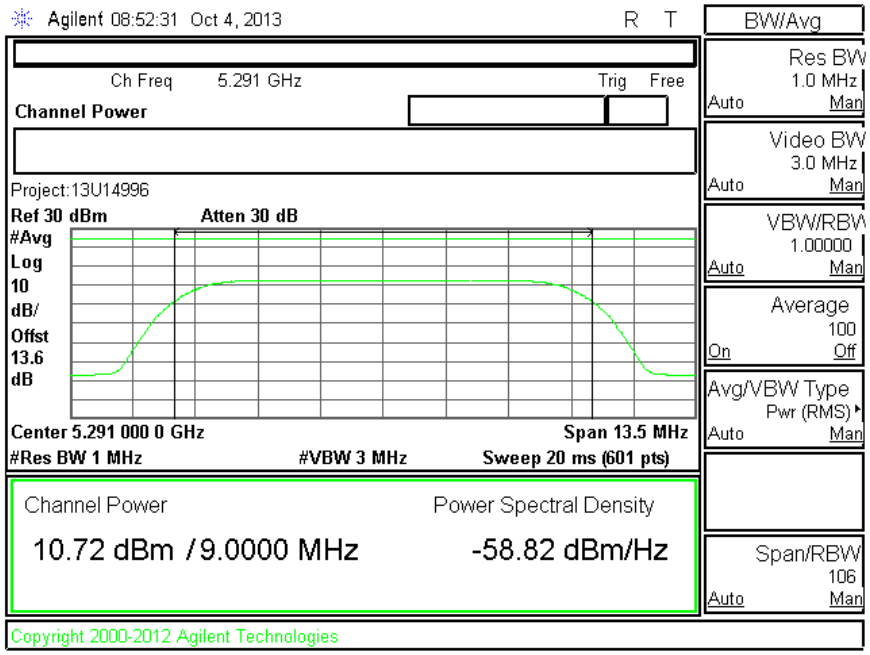
Channel	Frequency (MHz)	Chain 0 Meas PPSD (dBm)	Chain 1 Meas PPSD (dBm)	Total Corr'd PPSD (dBm)	PPSD Limit (dBm)	PPSD Margin (dB)
Low	5257	2.78	3.74	6.29	6.50	-0.21
Mid	5291	2.38	3.56	6.02	6.50	-0.48
High	5325	2.23	3.18	5.74	6.50	-0.76
High	5341	2.06	2.97	5.55	6.50	-0.95
High	5343	1.99	2.96	5.51	6.50	-0.99

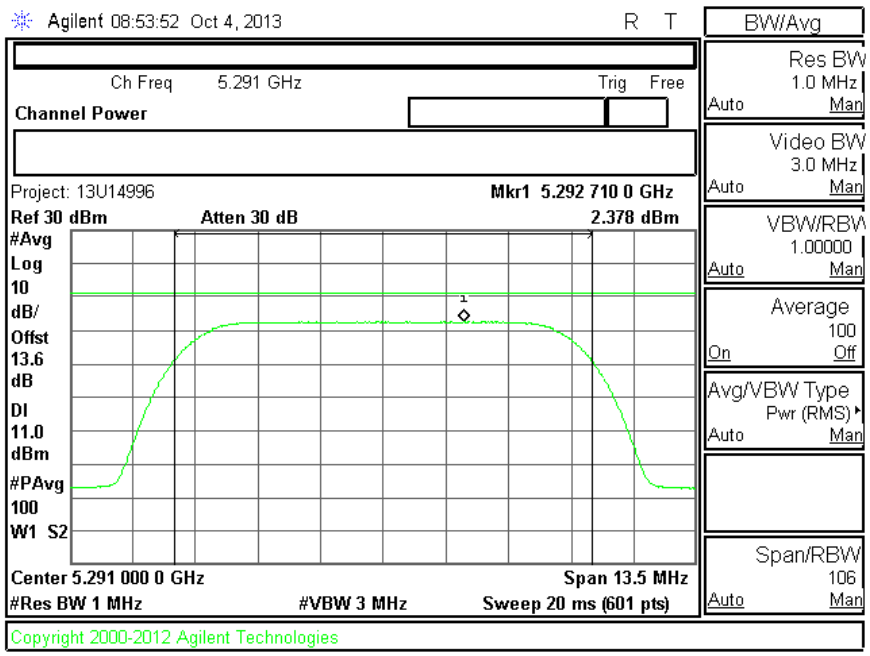
OUTPUT POWER AND PPSD

OUTPUT POWER AND PPSD, Chain 0

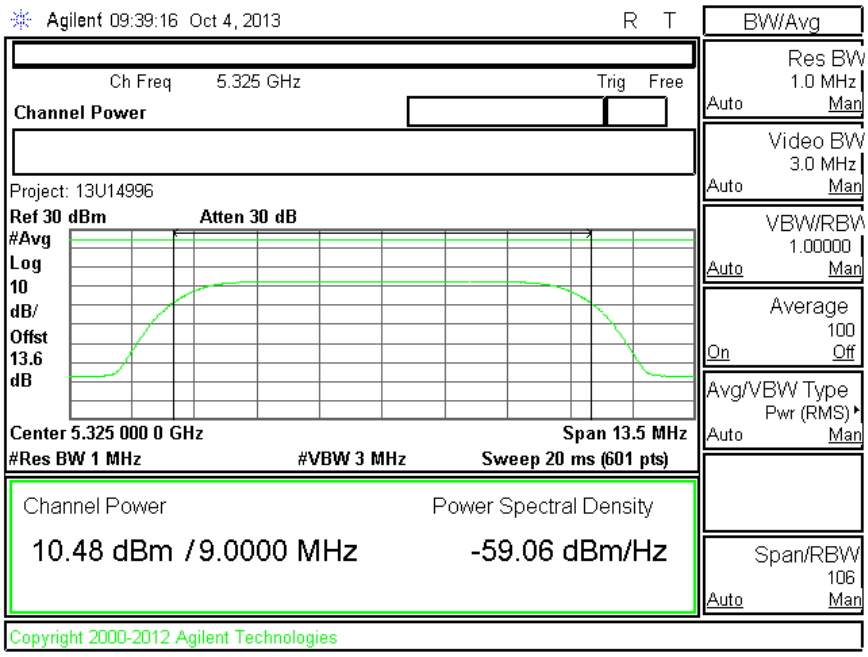


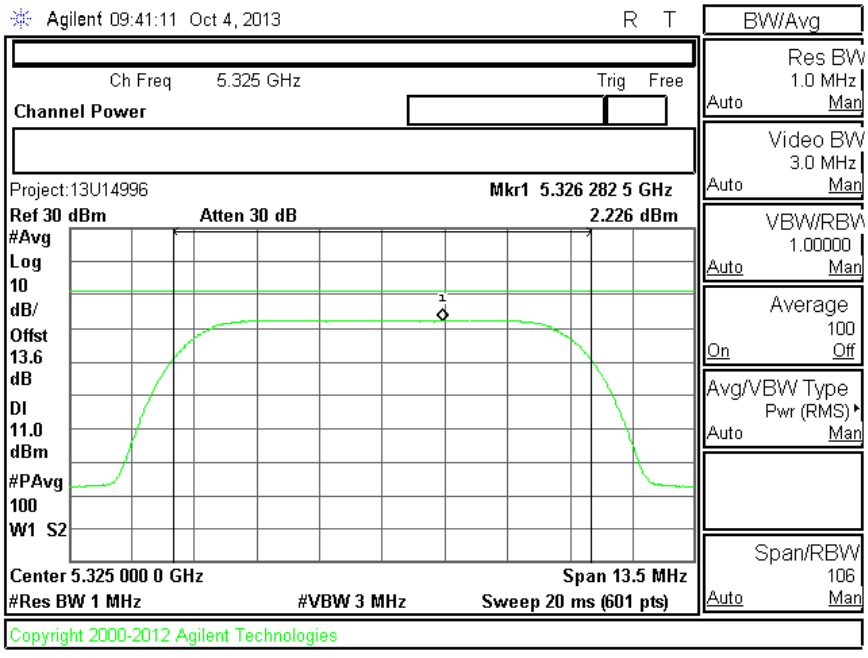
OUTPUT POWER AND PPSD, Chain 0 MID CH



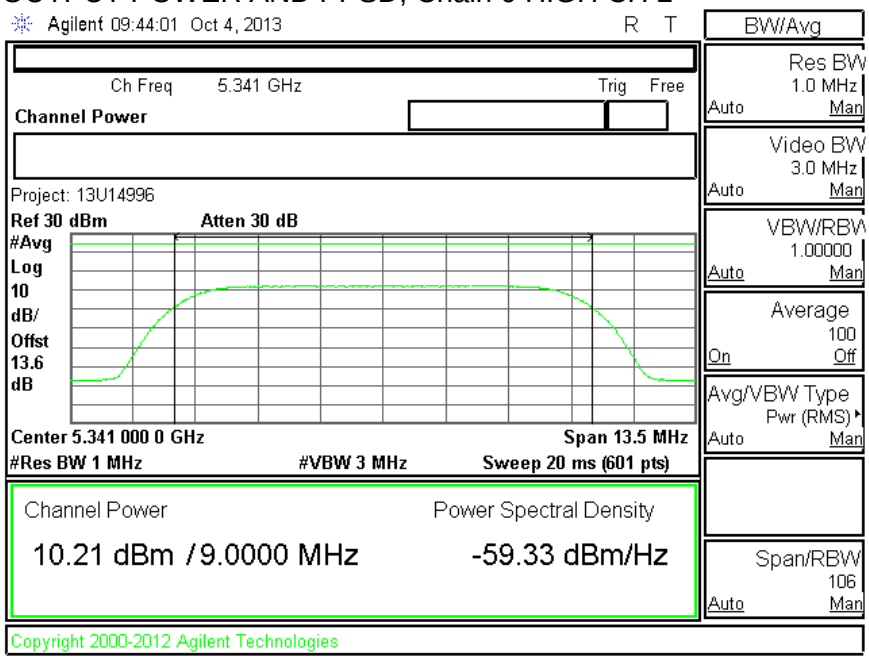


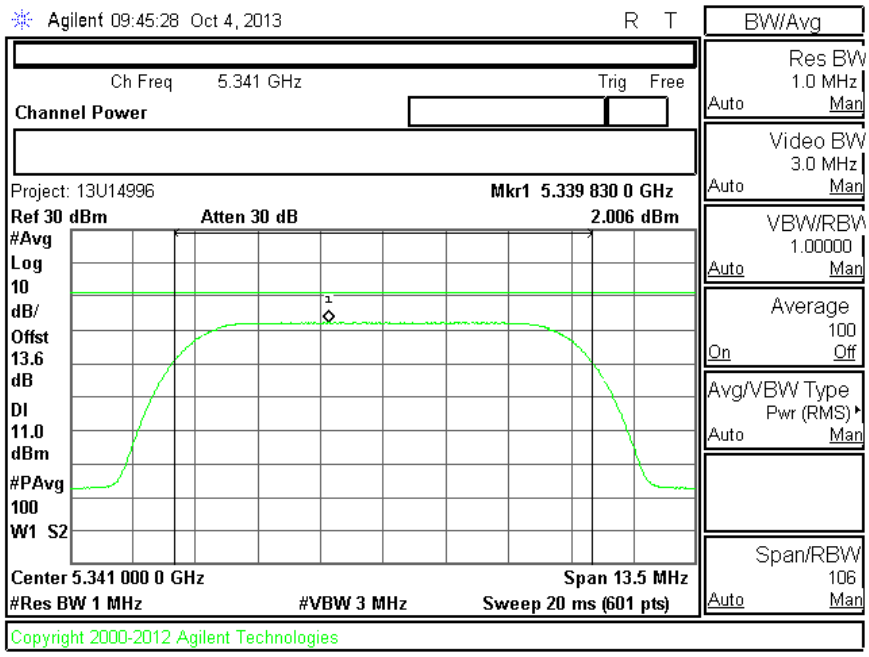
OUTPUT POWER AND PPSD, Chain 0 HIGH CH1



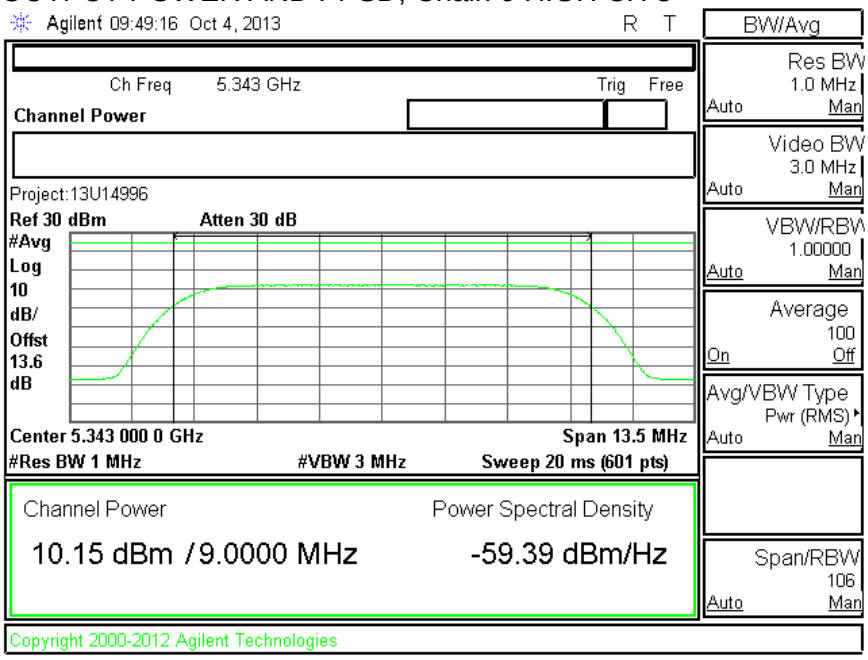


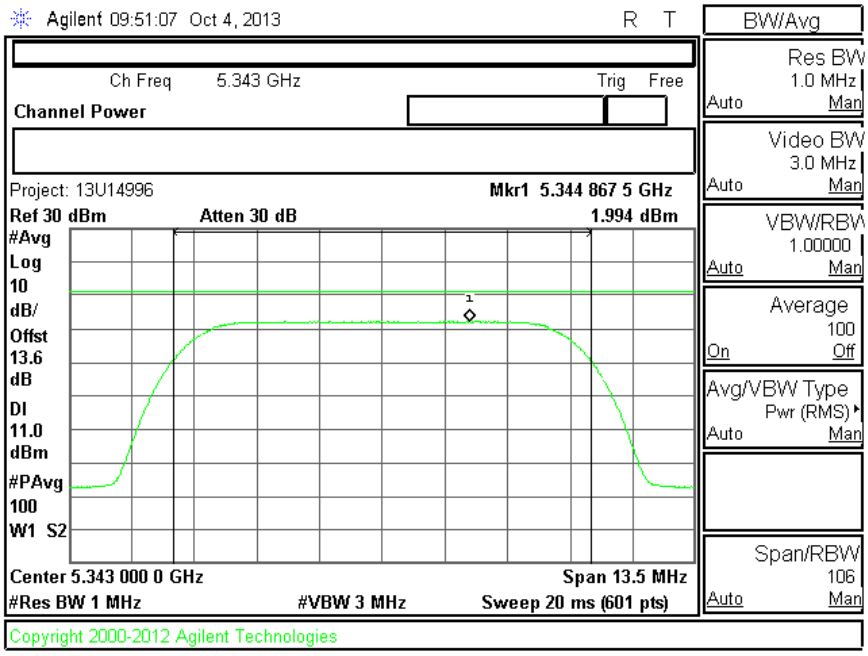
OUTPUT POWER AND PPSD, Chain 0 HIGH CH 2



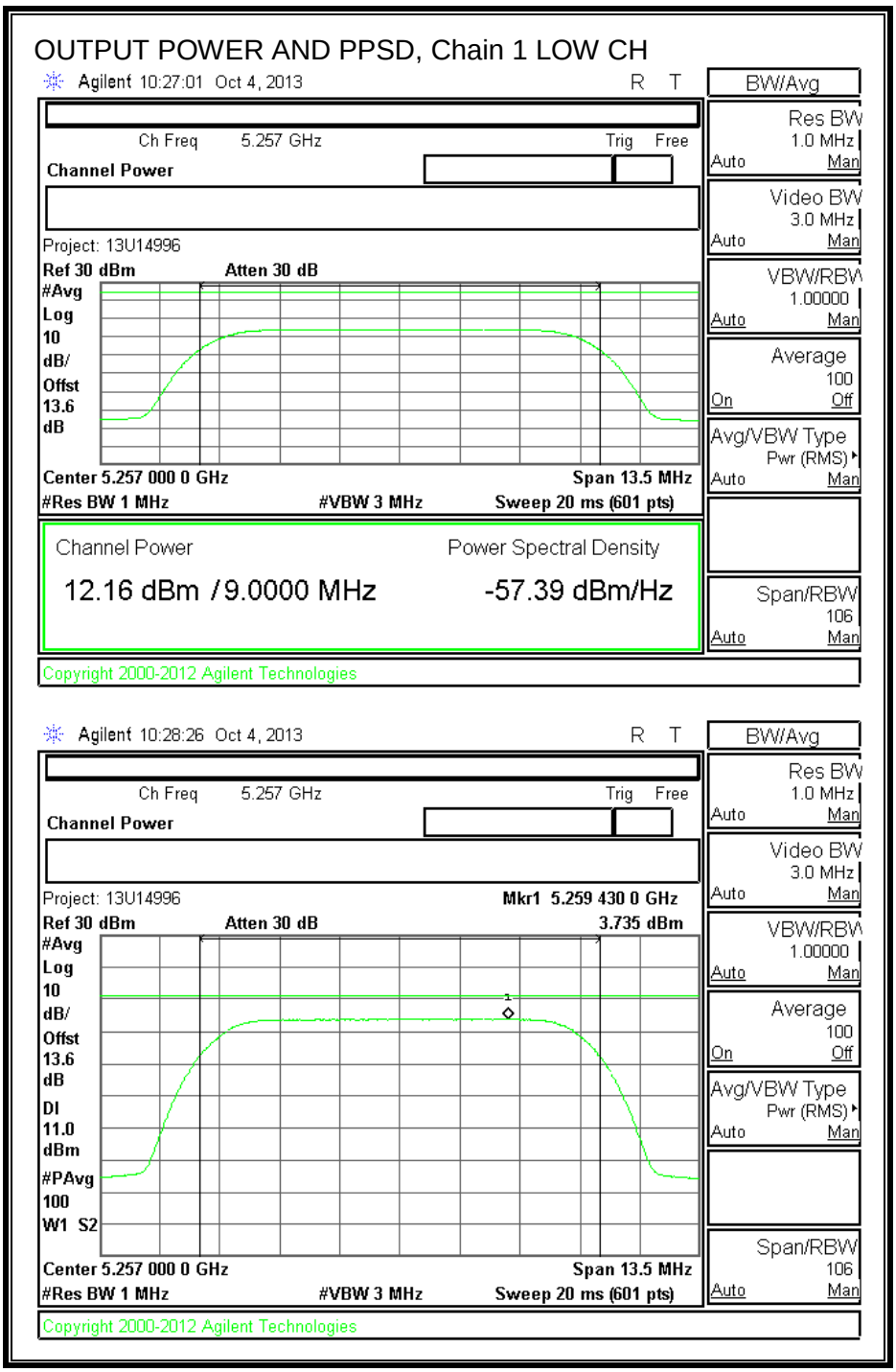


OUTPUT POWER AND PPSD, Chain 0 HIGH CH 3

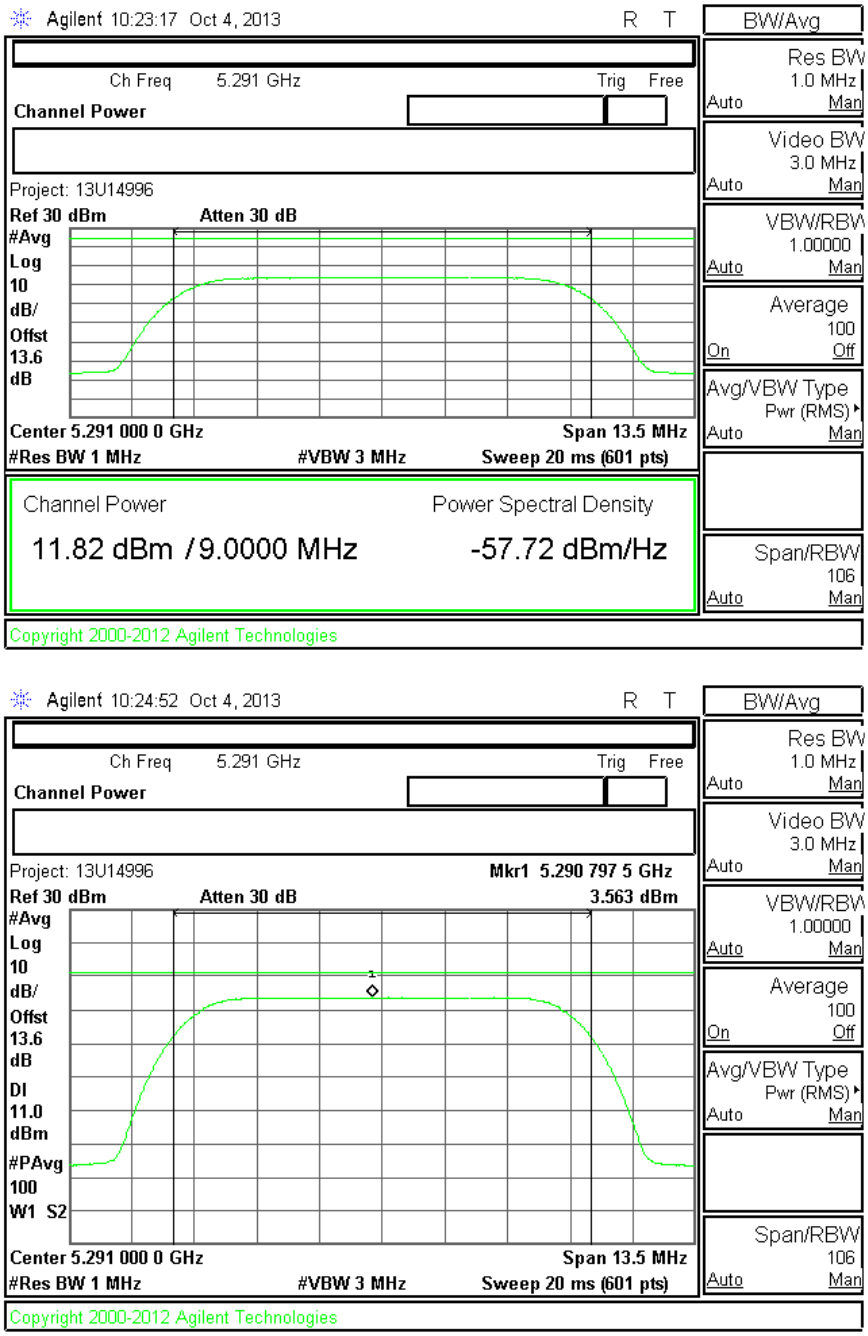


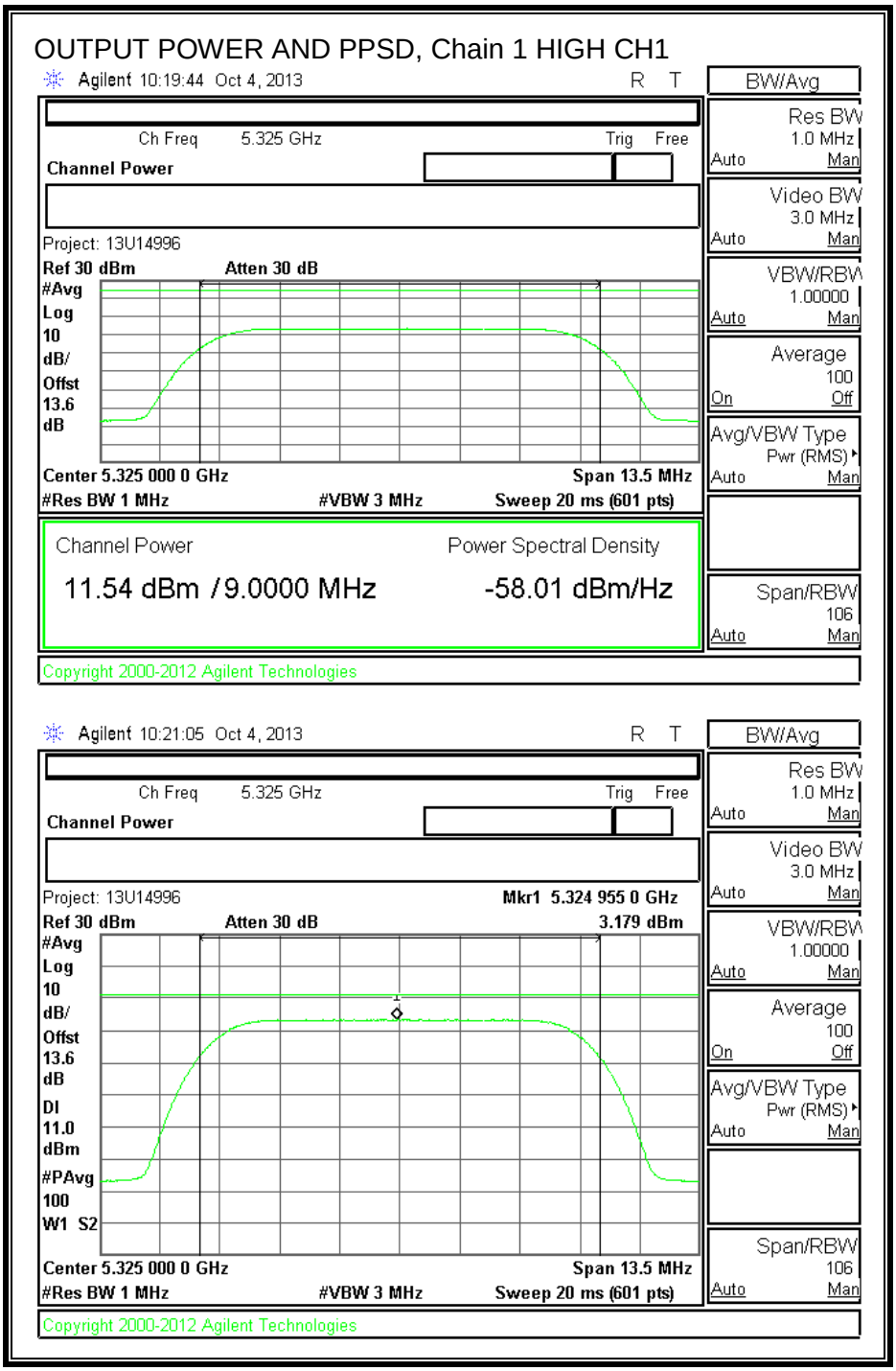


OUTPUT POWER AND PPSD, Chain 1

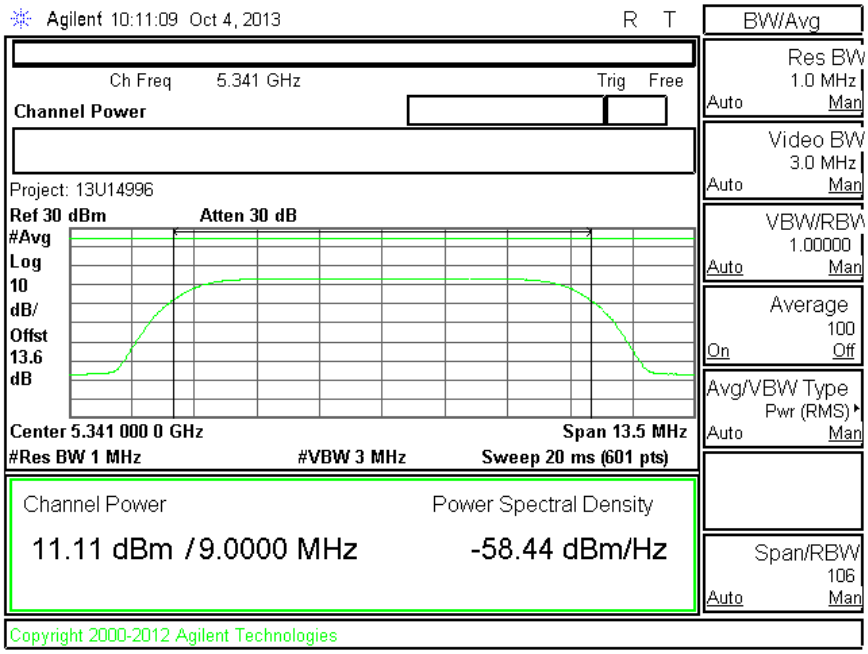


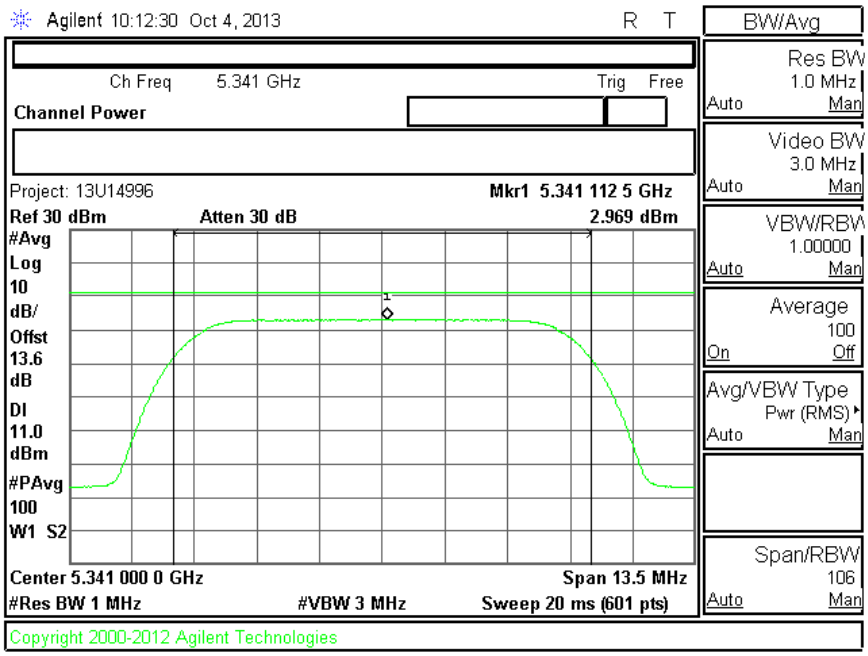
OUTPUT POWER AND PPSD, Chain 1 MID CH



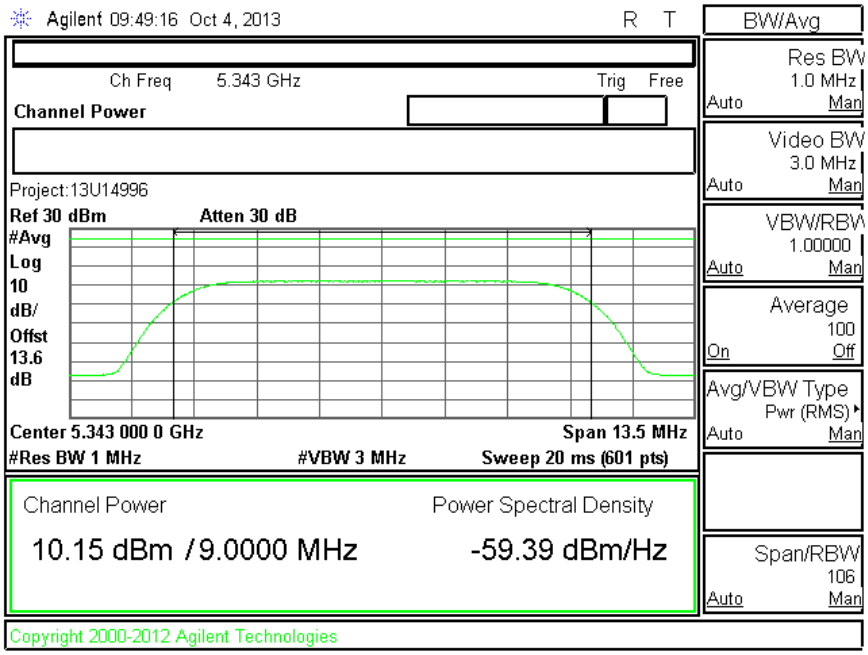


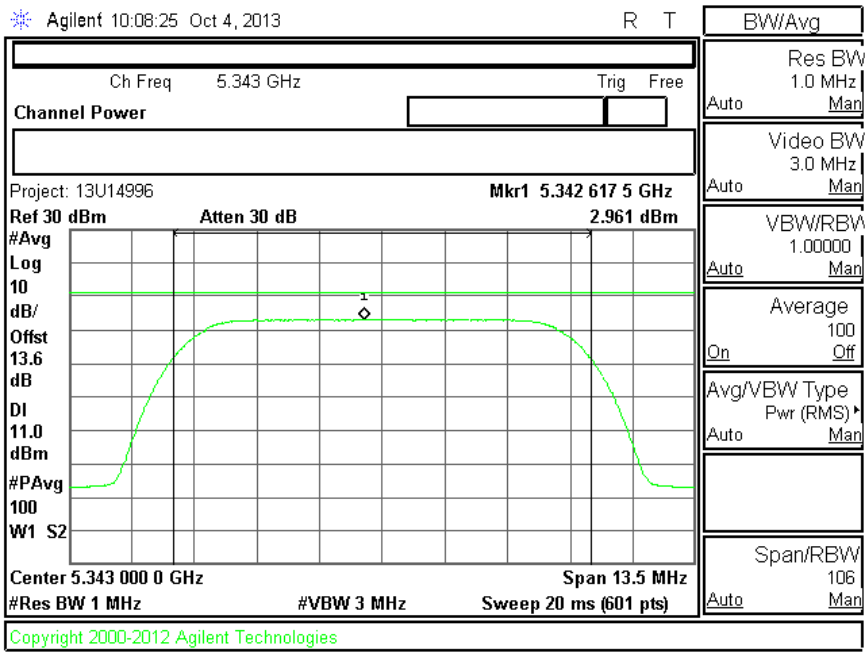
OUTPUT POWER AND PPSD, Chain 1 HIGH CH2





OUTPUT POWER AND PPSD, Chain 1 HIGH CH3





8.1.6 PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Note:

1. QAM 16, 64, and 256 were only tested at mid channel to show compliance
2. All test were conducted at worst case highest power.

RESULTS 35MHz

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5269	10.74	13	-2.26
Mid	5286	10.69	13	-2.31
High	5328	10.81	13	-2.19

Note: Chain 0=J48 35MHz bandwidth QAM4

Chain 1

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5269	10.98	13	-2.02
Mid	5286	10.39	13	-2.61
High	5328	10.48	13	-2.52

Note:Chain1=J49 35MHz bandwidth QAM4

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	0	0.00	0	0.00
Mid	5286	11.09	13	-1.91
High	0	0.00	0	0.00

Note: Chain 0=J48 35MHz bandwidth QAM16

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	0	0.00	0	0.00
Mid	5286	10.81	13	-2.19
High	0	0.00	0	0.00

Note: Chain 0=J48 35MHz bandwidth QAM64

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	0	0.00	0	0.00
Mid	5286	10.54	13	-2.46
High	0	0.00	0	0.00

Note: Chain 0=J48 35MHz bandwidth QAM256

RESULTS 18MHz

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5261	9.72	13	-3.28
Mid	5289	9.92	13	-3.08
High	5337	9.73	13	-3.27

Note: Chain 0=J48 18MHz bandwidth QAM4

Chain 1

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5261	9.77	13	-3.23
Mid	5289	10.34	13	-2.66
High	5337	9.78	13	-3.22

Note: Chain1=J49 18MHz bandwidth QAM4

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5261	0	0	0
Mid	5263	10.21	13	-2.79
High	5337	0	0	0

Note: Chain 0=J48 18MHz bandwidth QAM16

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5261	0	0	0
Mid	5263	10.53	13	-2.47
High	5337	0	0	0

Note: Chain 0=J48 18MHz bandwidth QAM64

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5261	0	0	0
Mid	5263	10.84	13	-2.16
High	5337	0	0	0

Note: Chain 0=J48 18MHz bandwidth QAM256

RESULTS 9MHz

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5257	8.21	13	-4.79
Mid	5291	8.17	13	-4.83
High	5343	8.42	13	-4.58

Note: Chain 0=J48 9MHz bandwidth QAM4

Chain 1

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5257	8.34	13	-4.66
Mid	5291	8.61	13	-4.39
High	5343	8.45	13	-4.55

Note: Chain1=J49 9MHz bandwidth QAM4

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5257	0	13	0
Mid	5291	9.61	13	-3.39
High	5343	0	13	0

Note: Chain 0=J48 9MHz bandwidth QAM16

Chain 0

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5257	0	13	0
Mid	5291	9.88	13	-3.12
High	5343	0	13	0

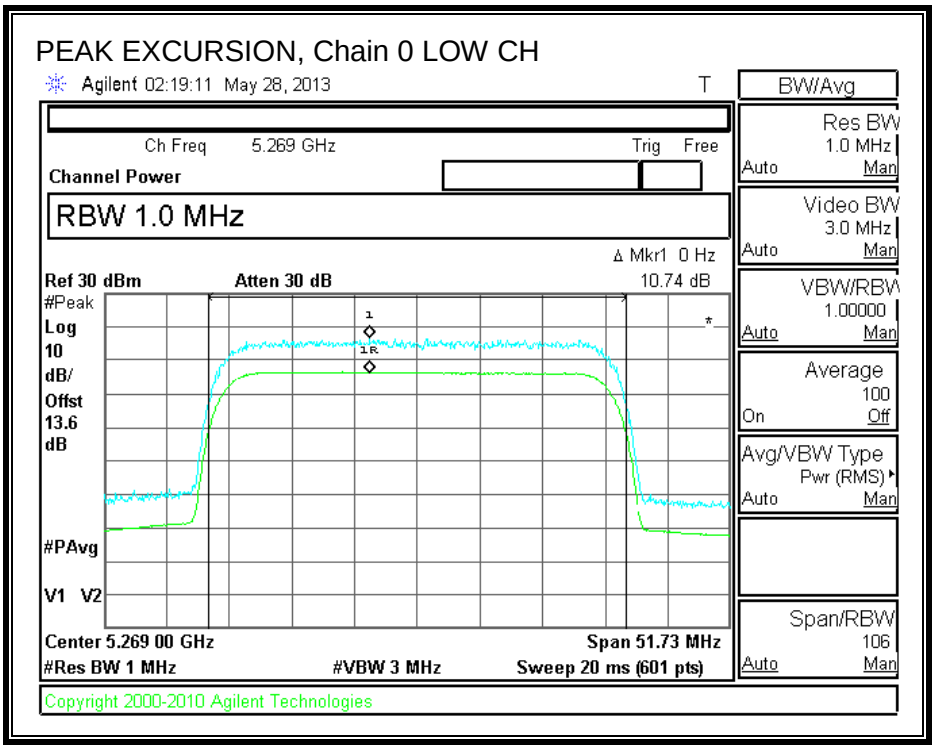
Note: Chain 0=J48 9MHz bandwidth QAM64

Chain 0

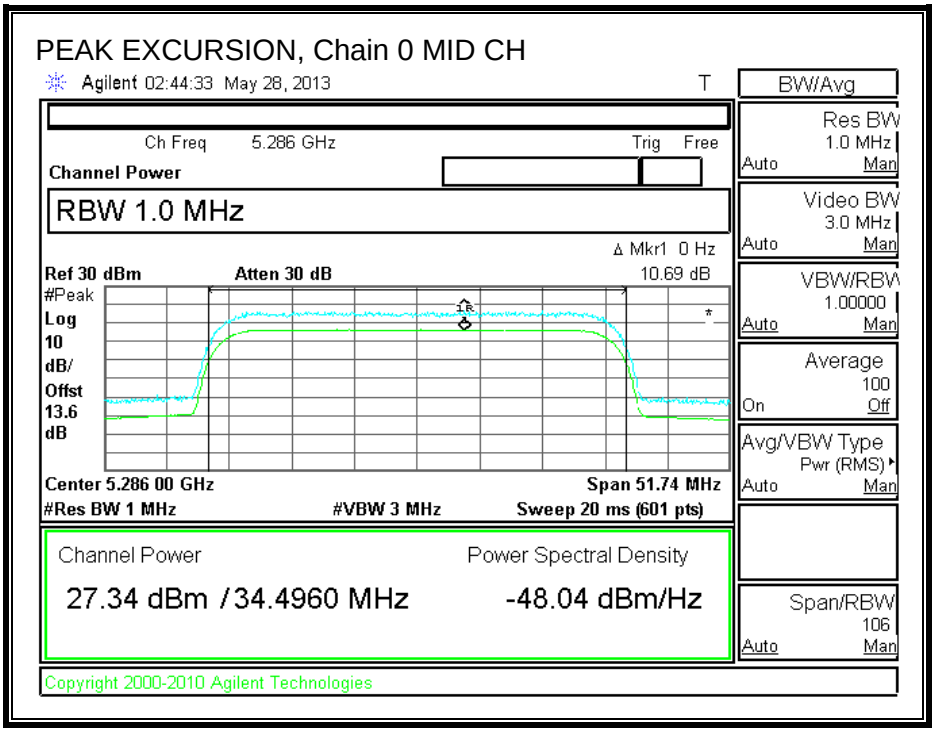
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5257	0	13	0
Mid	5291	9.46	13	-3.54
High	5343	0	13	0

Note: Chain 0=J48 9MHz bandwidth QAM256

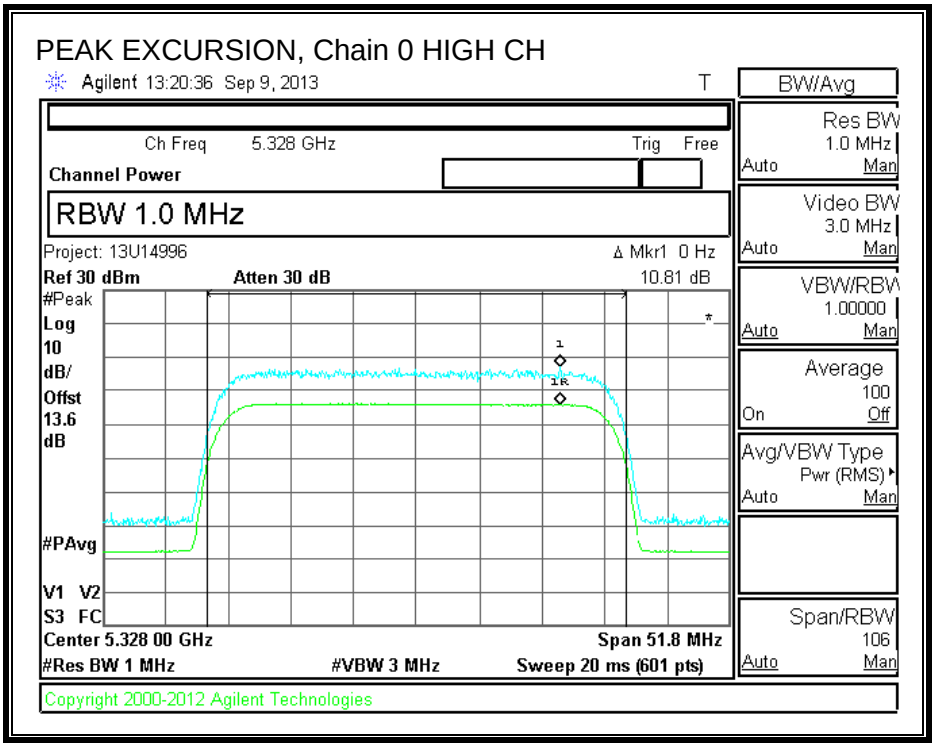
PEAK EXCURSION 35MHz Chain 0



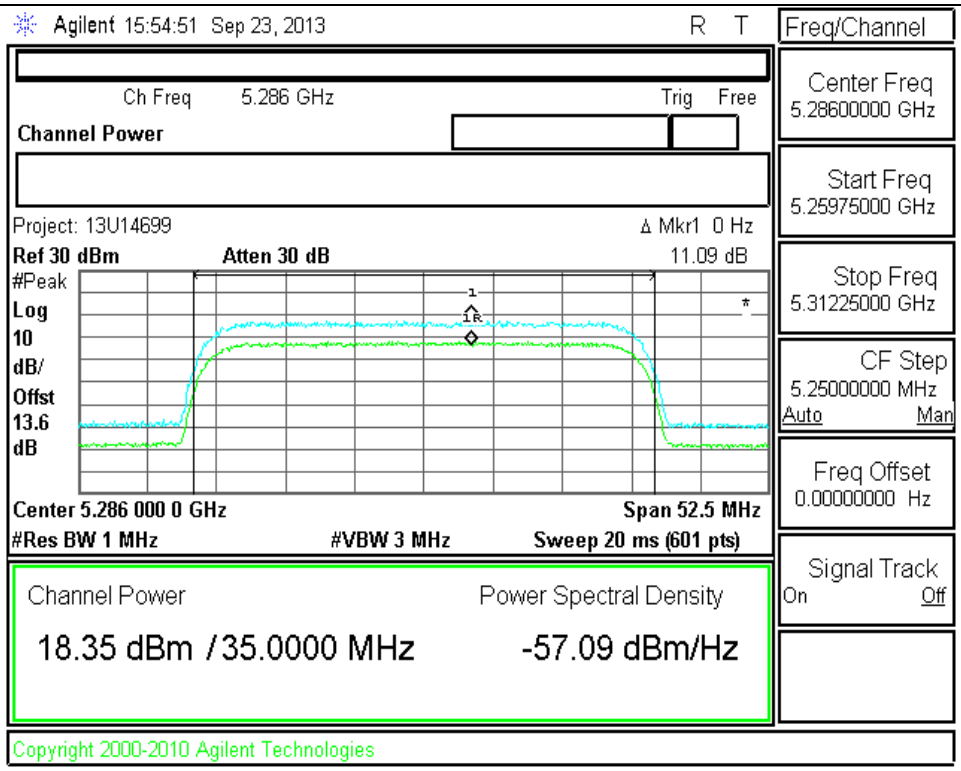
QAM 4



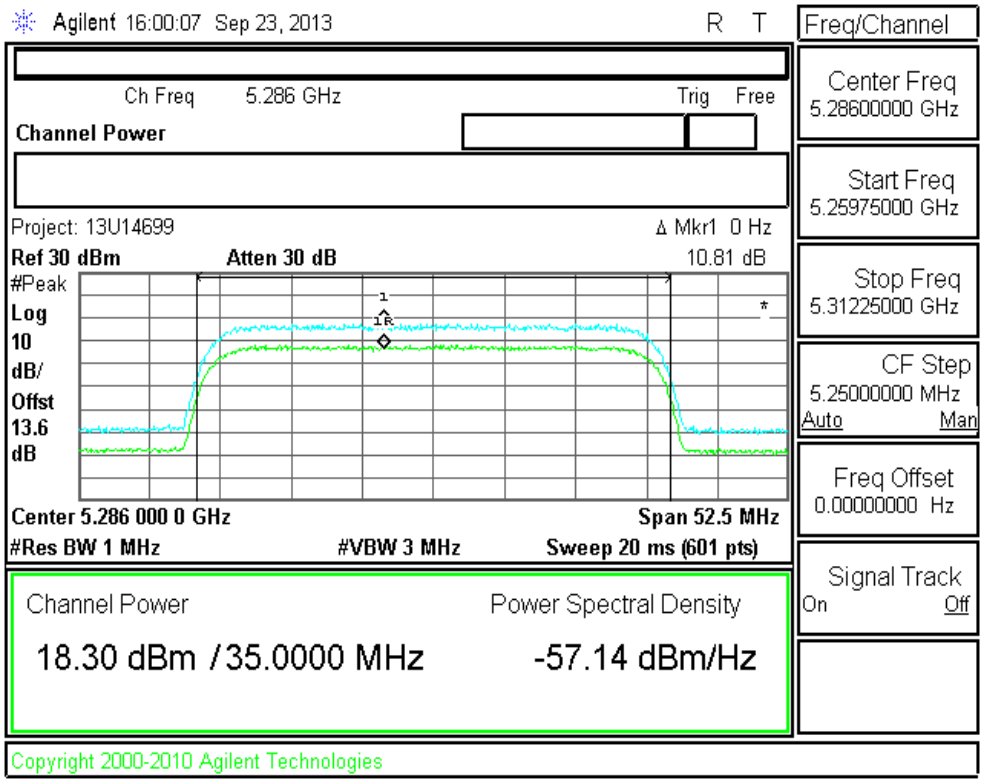
QAM 4



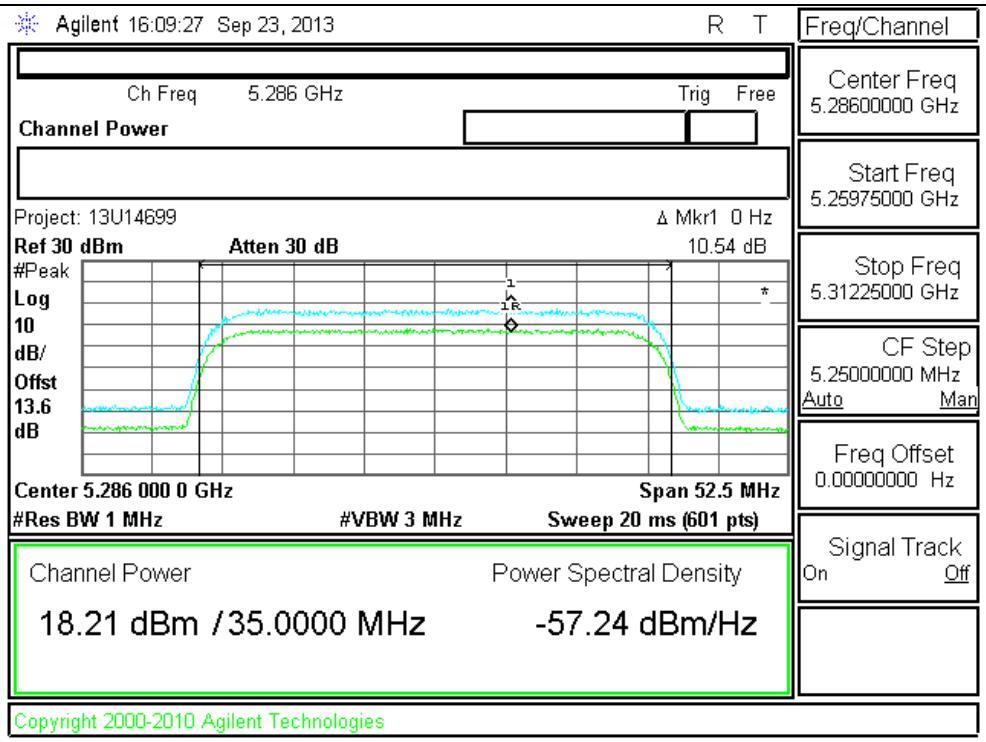
QAM 4



QAM 16

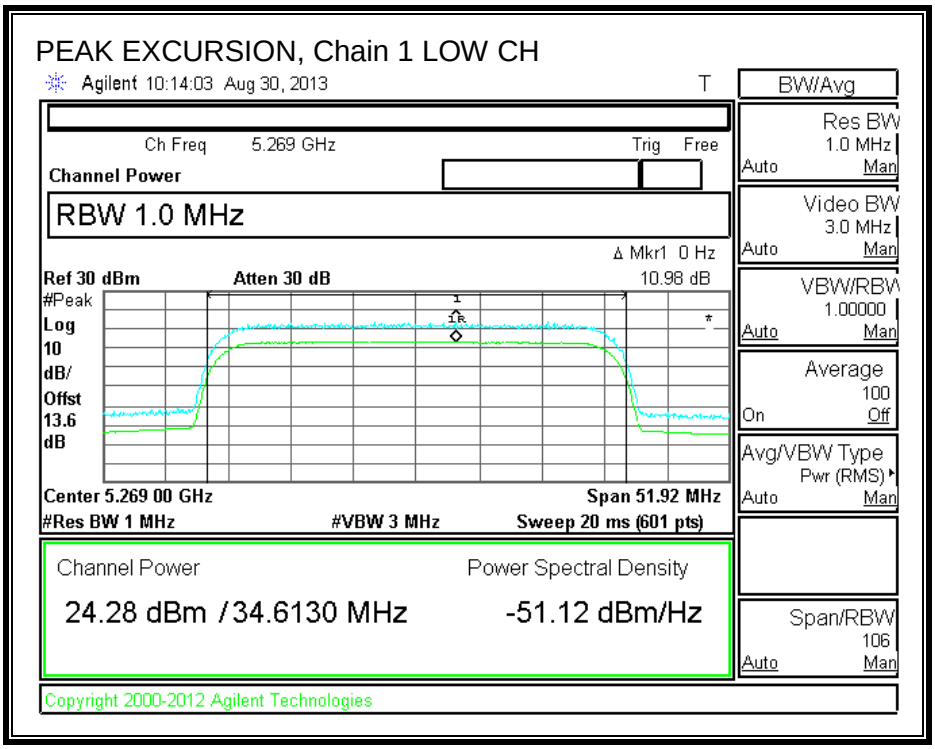


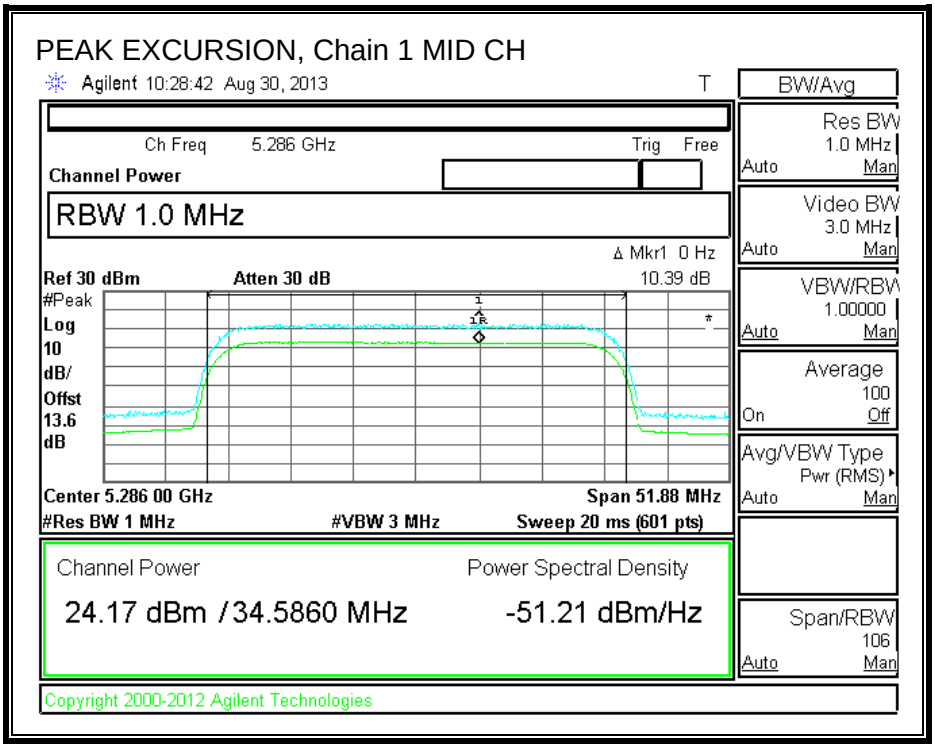
QAM 64

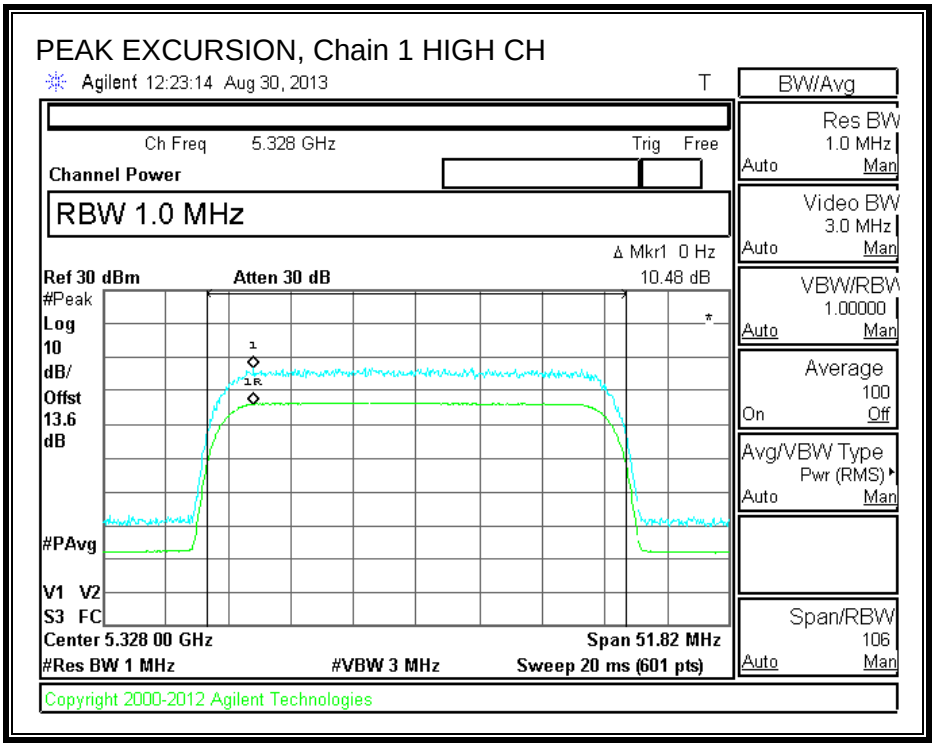


QAM 256

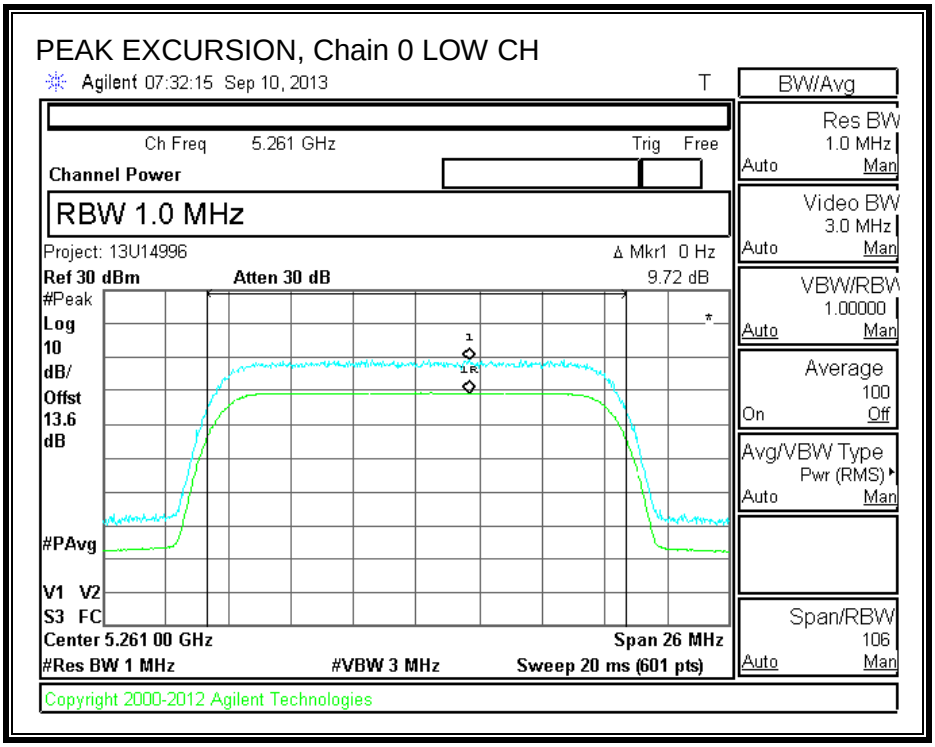
PEAK EXCURSION, Chain 1



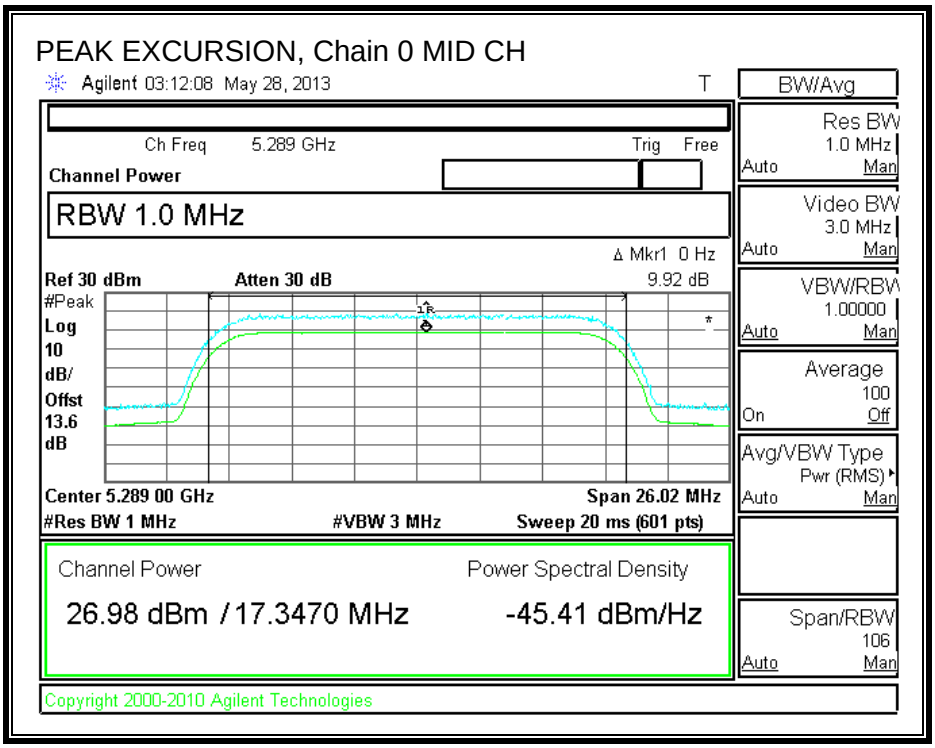




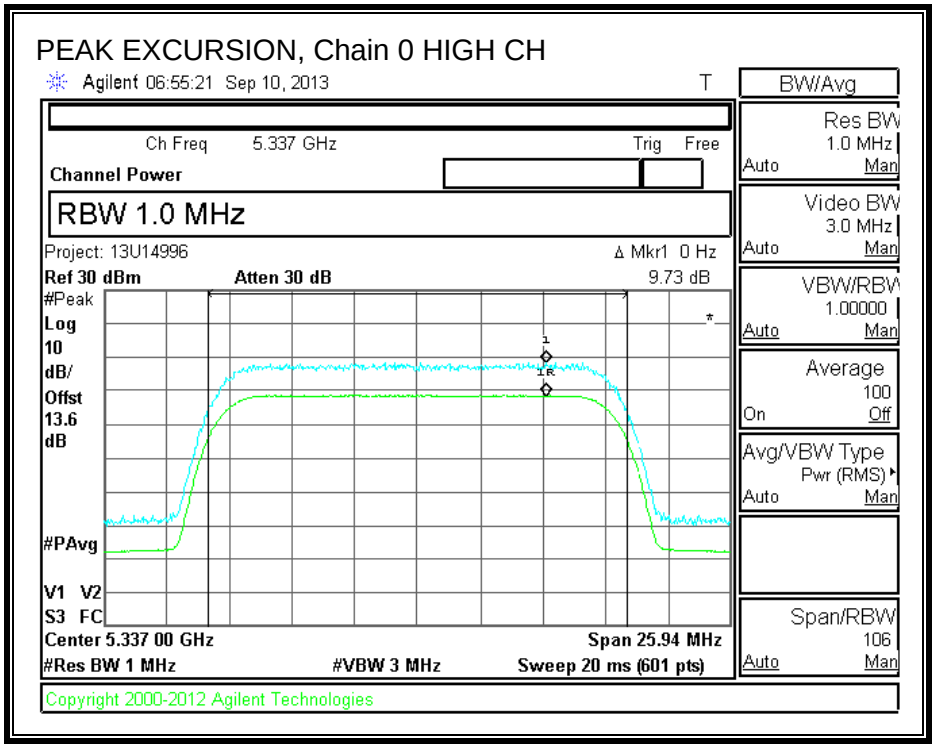
PEAK EXCURSION 18MHz Chain 0



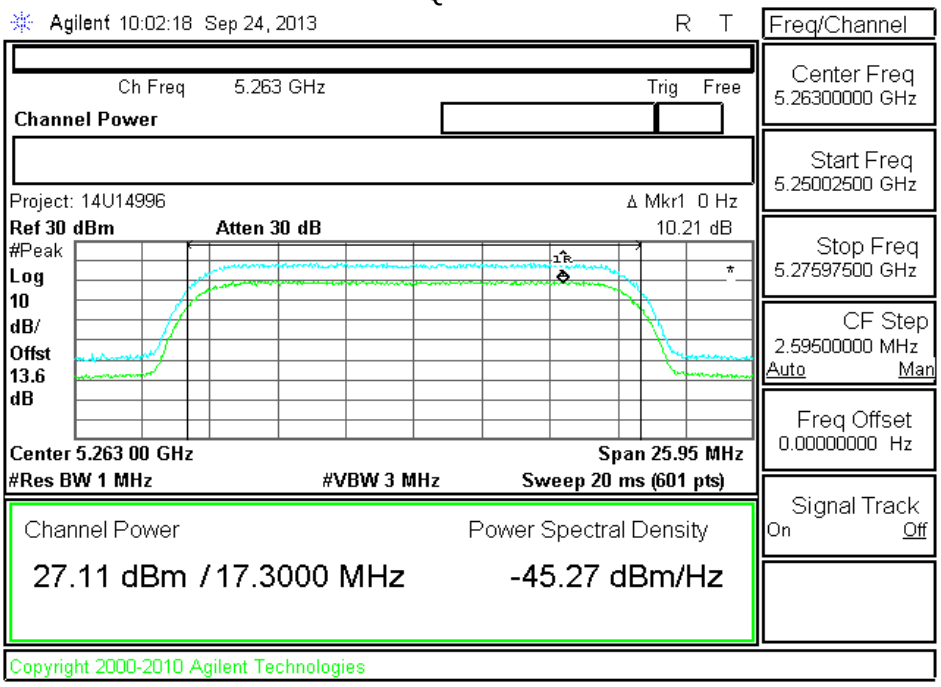
QAM 4



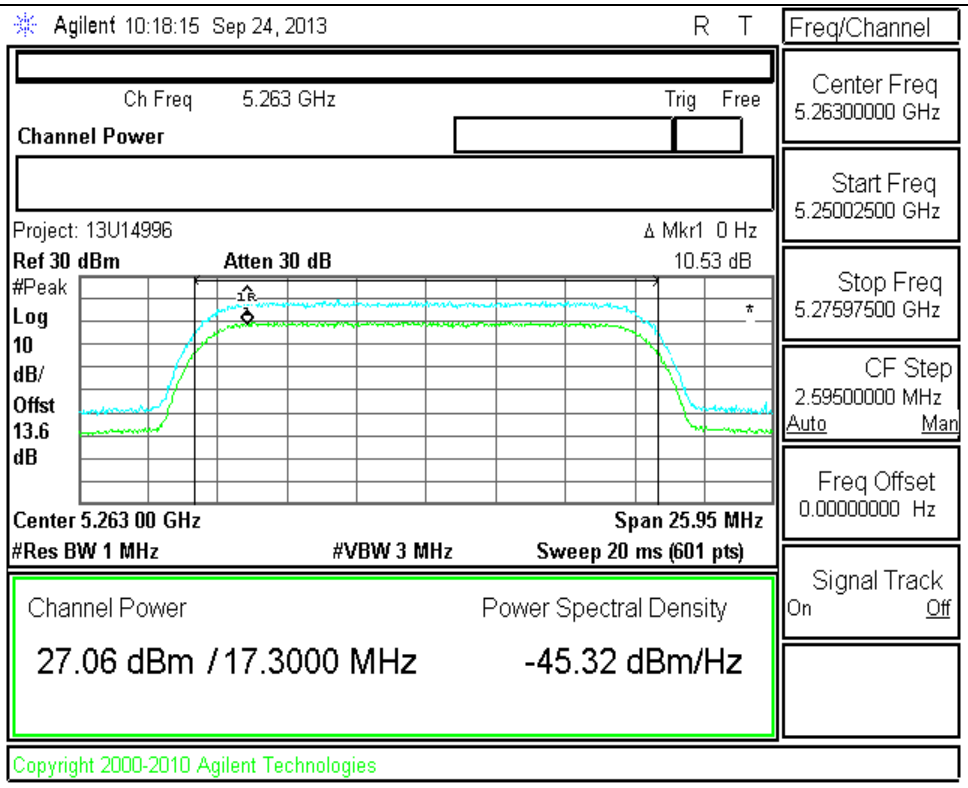
QAM 4



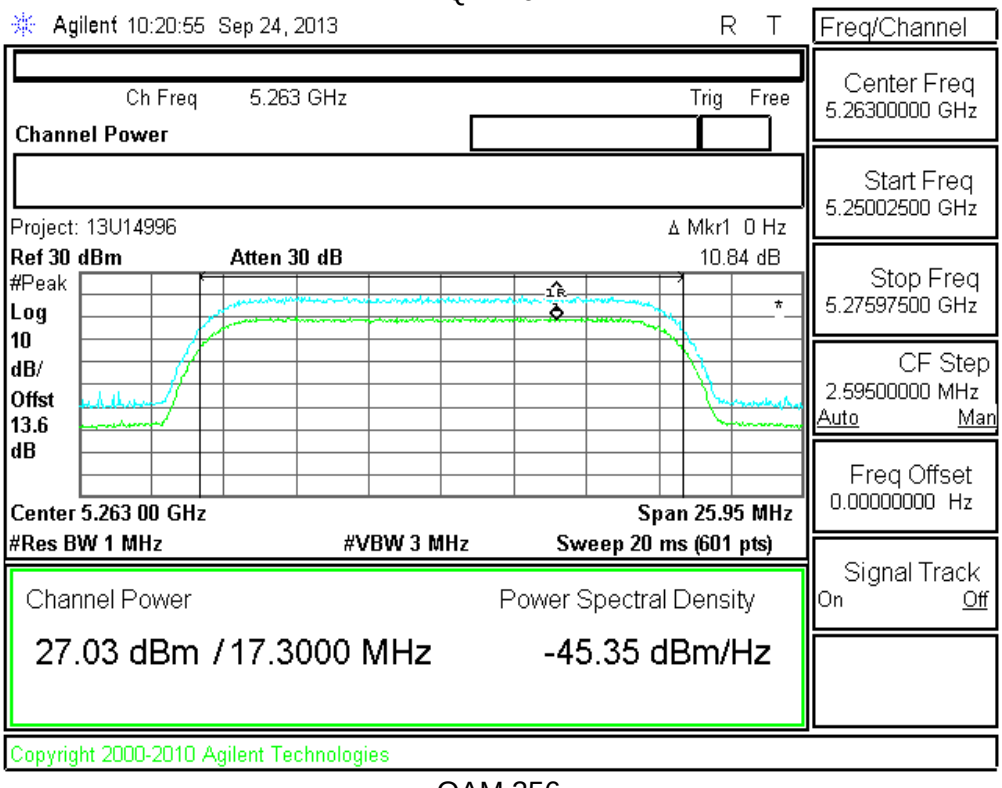
QAM 4



QAM 16



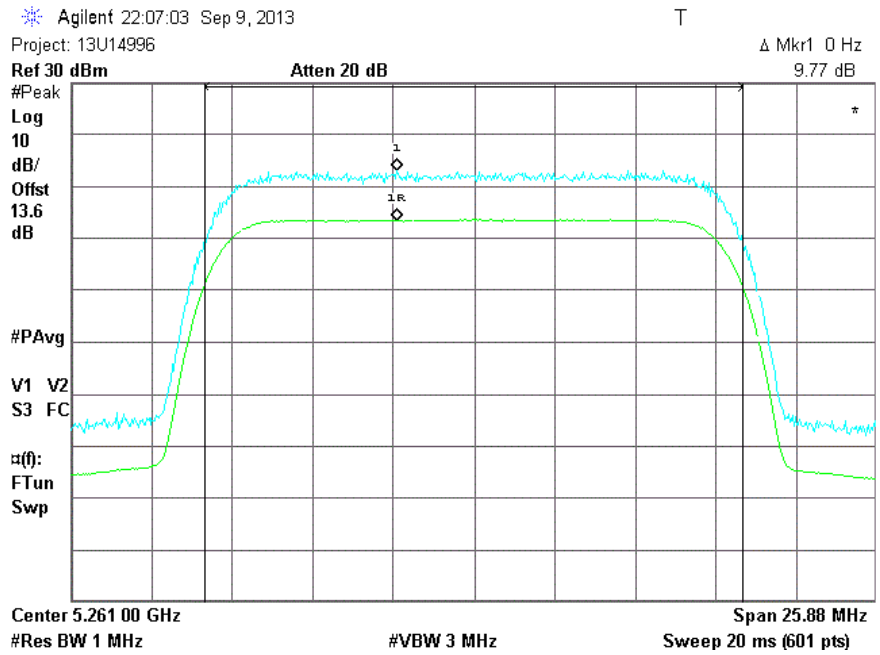
QAM 64



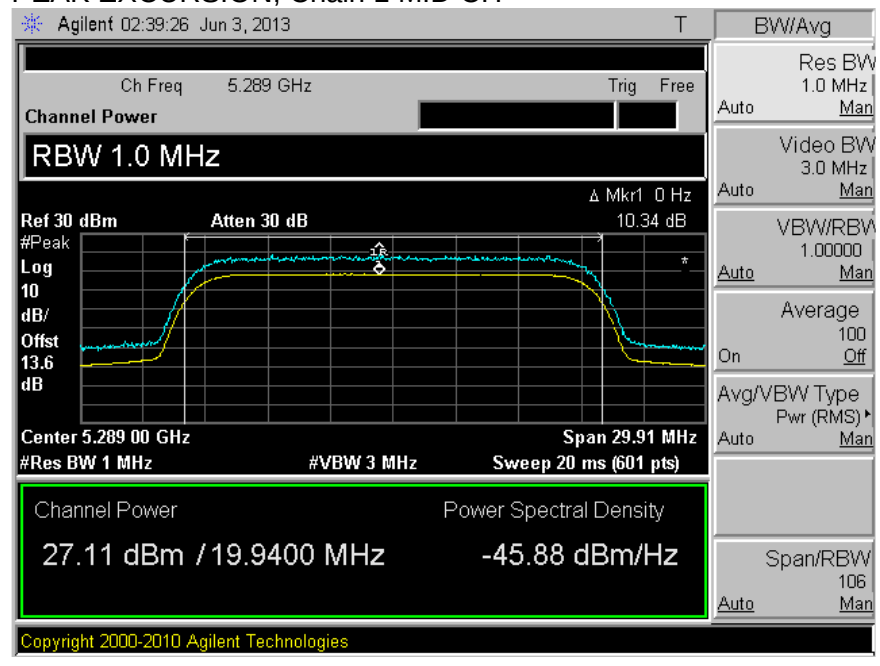
QAM 256

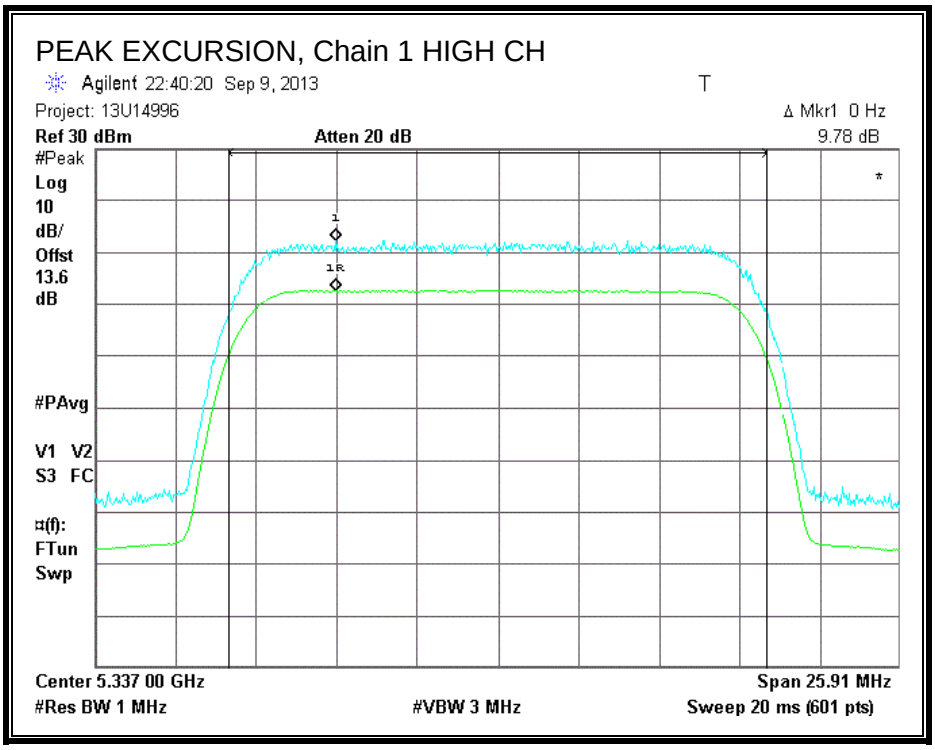
PEAK EXCURSION, Chain 1

PEAK EXCURSION, Chain 1 LOW CH

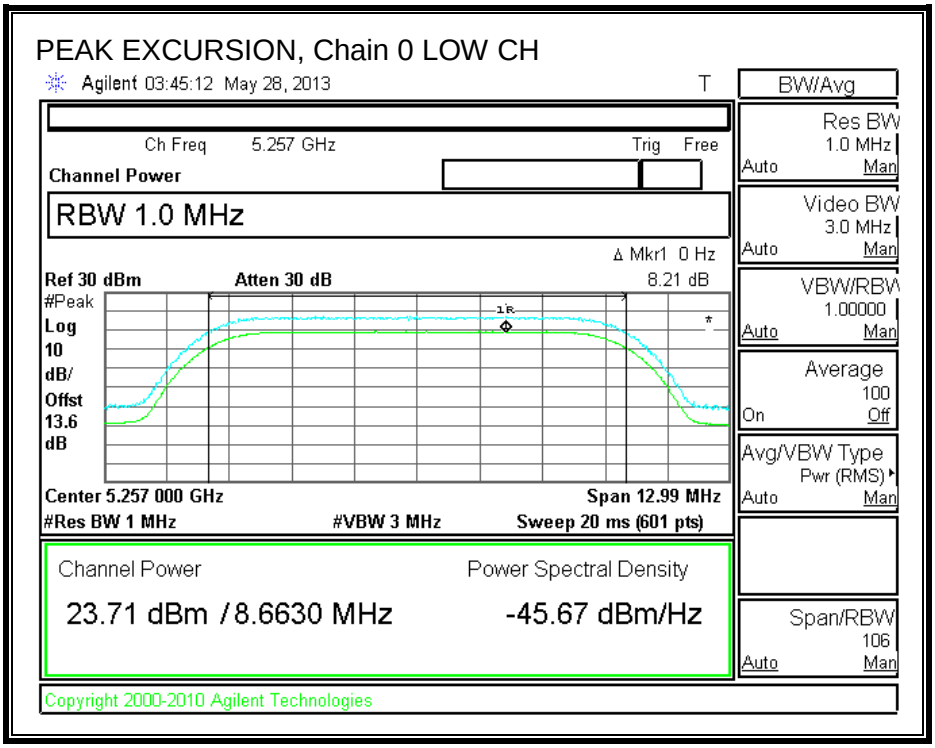


PEAK EXCURSION, Chain 1 MID CH

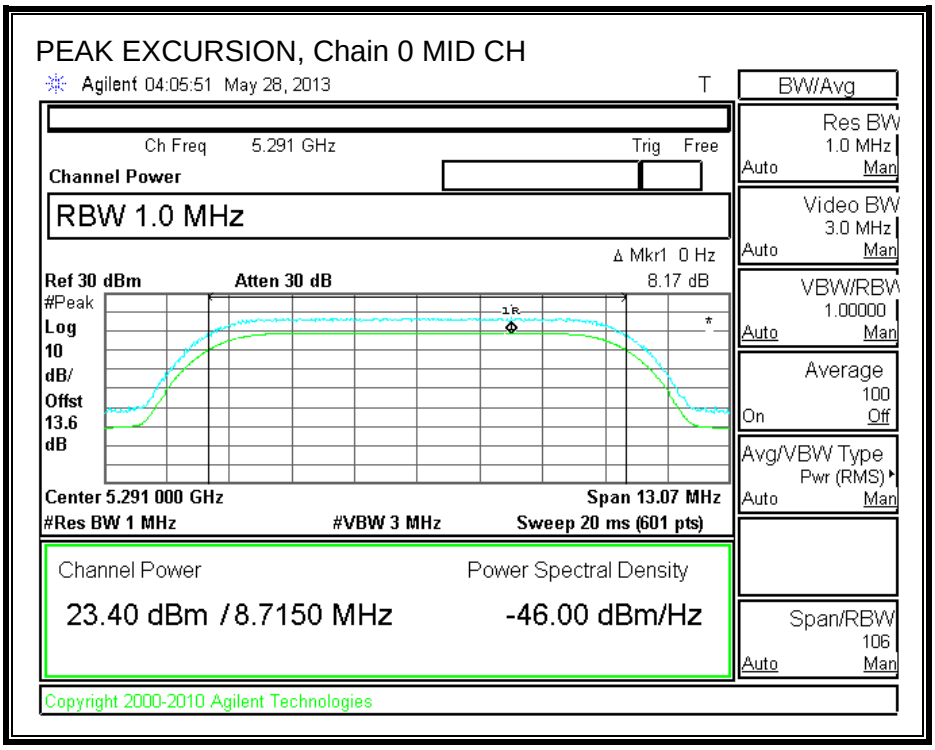




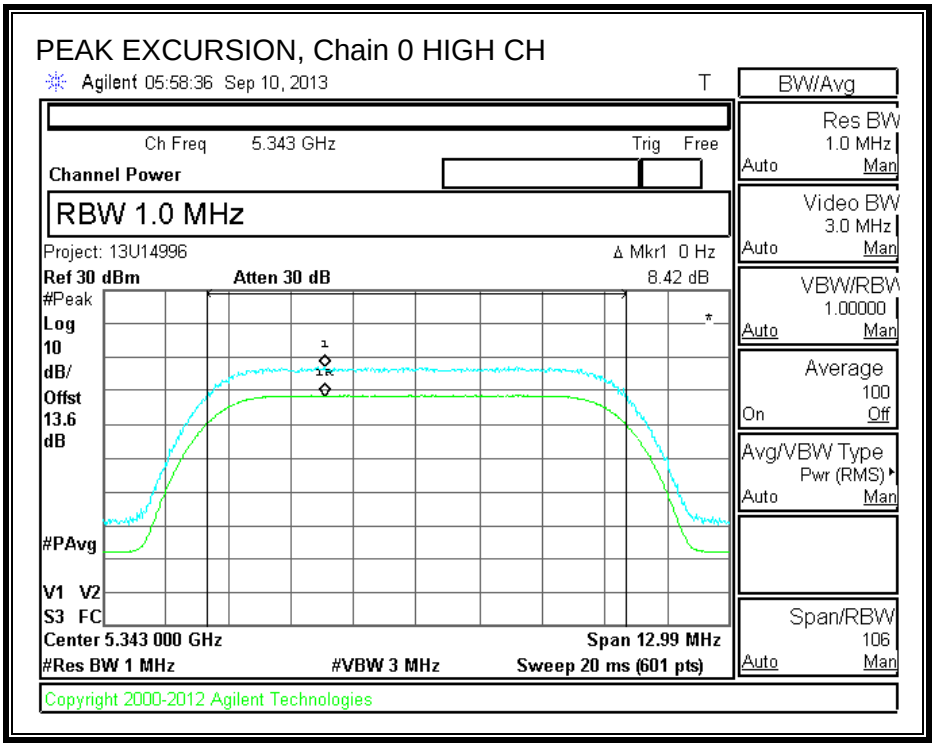
PEAK EXCURSION 9MHz, Chain 0



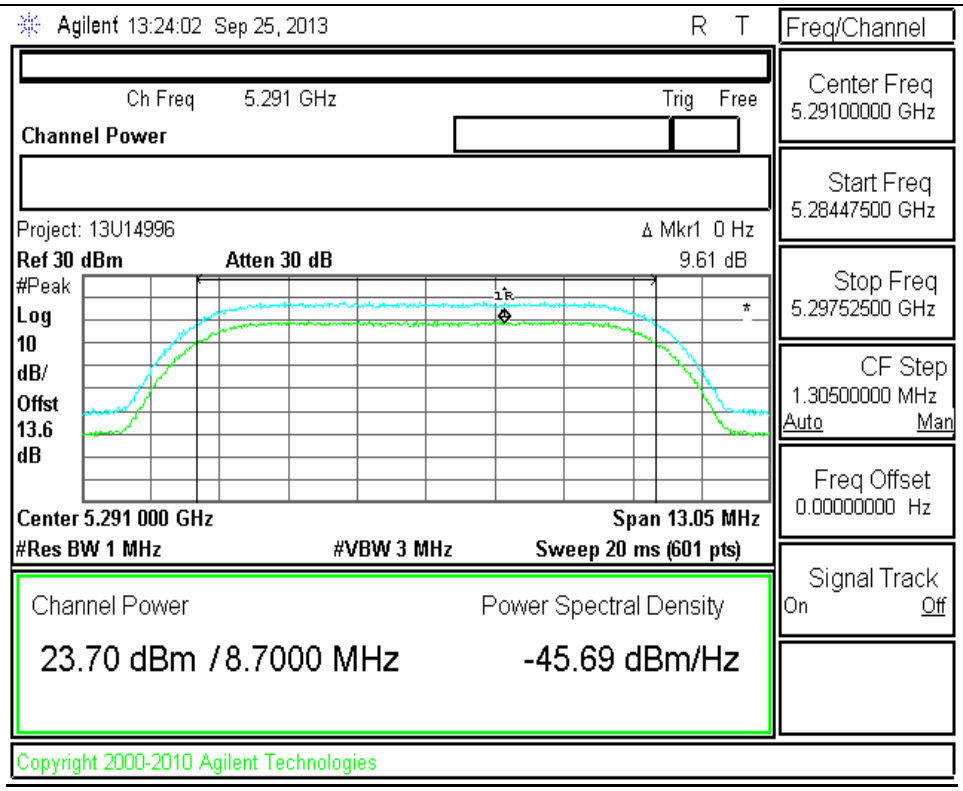
QAM 4



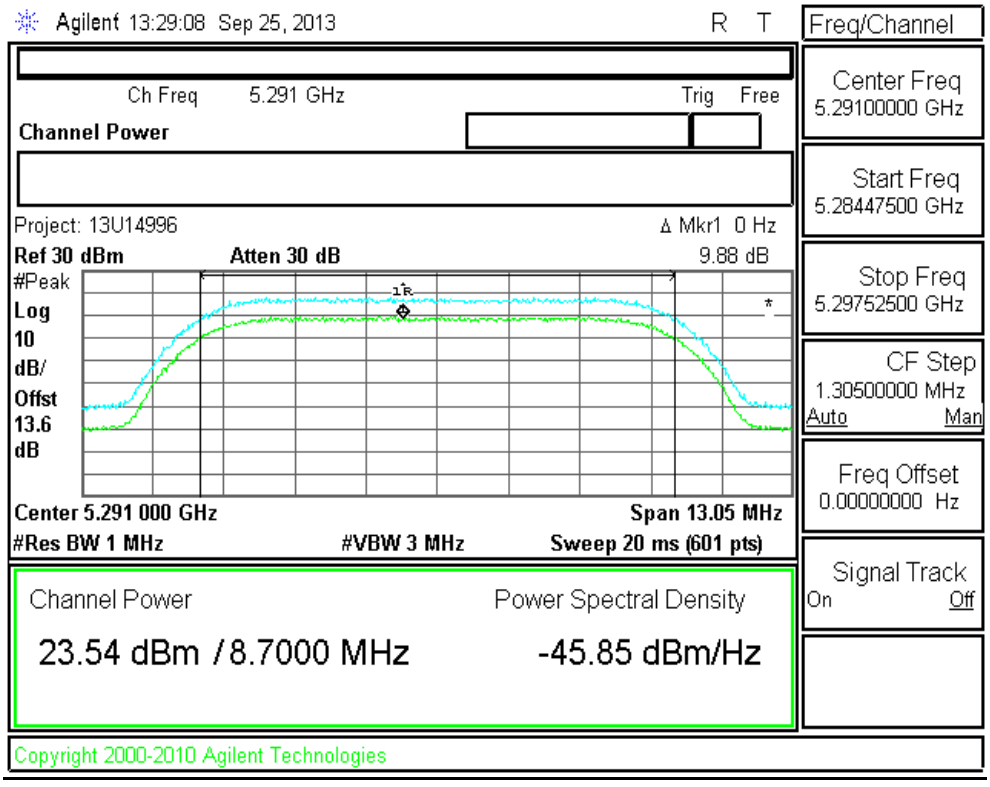
QAM 4



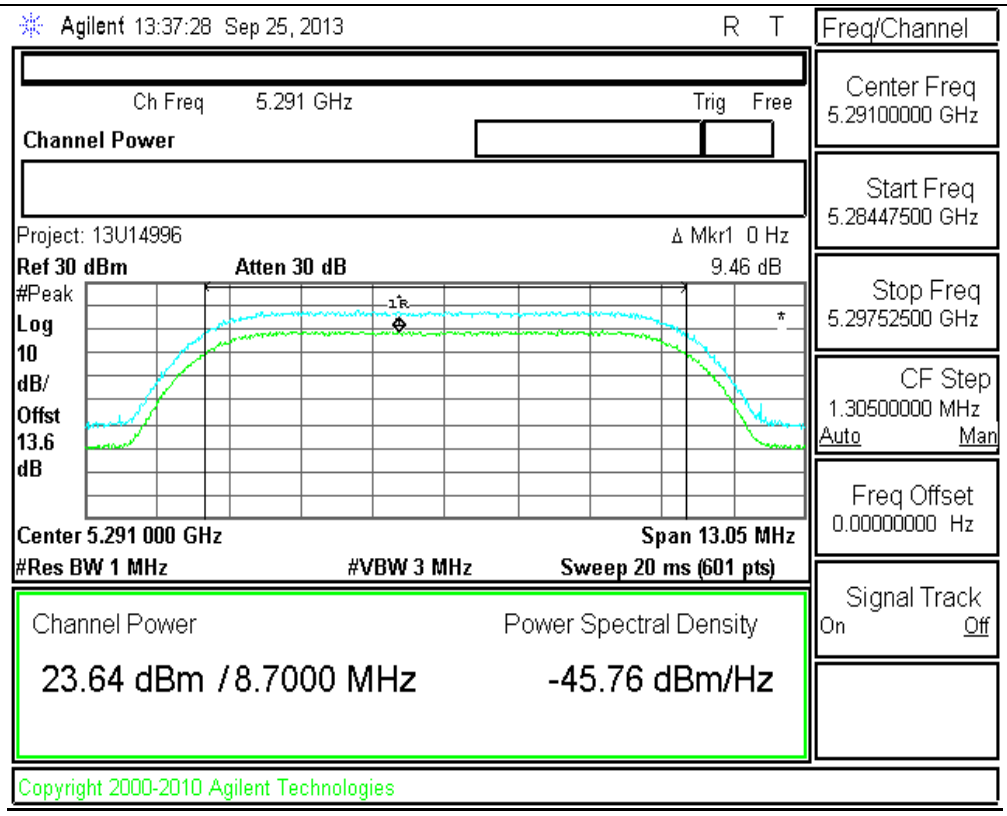
QAM 4



QAM 16

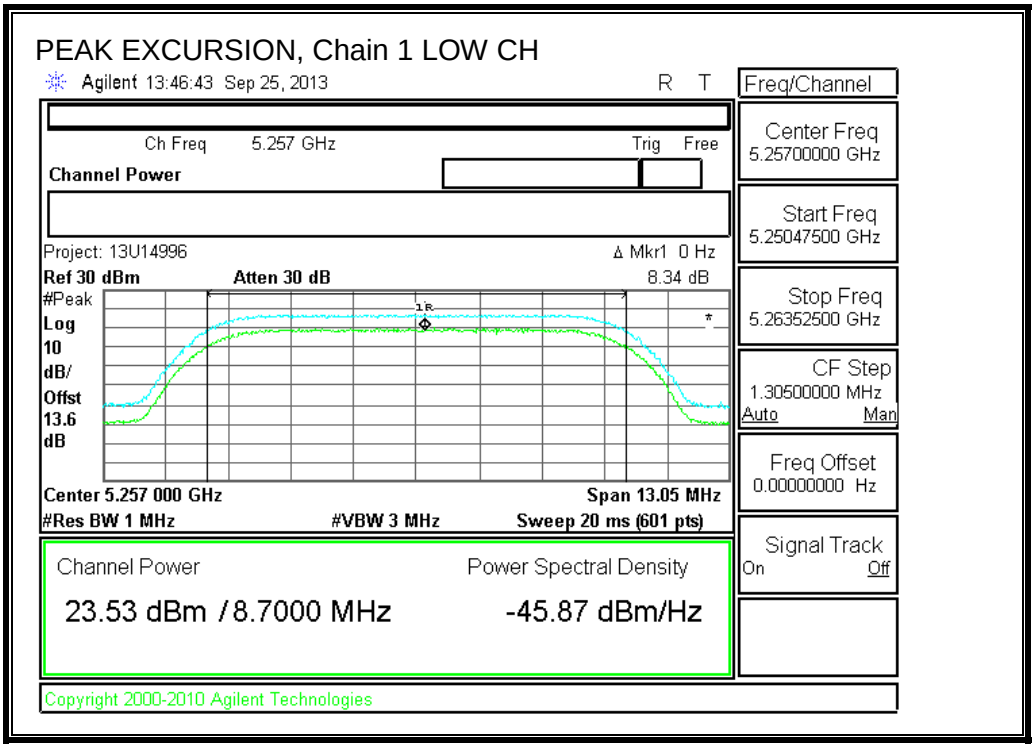


QAM 64

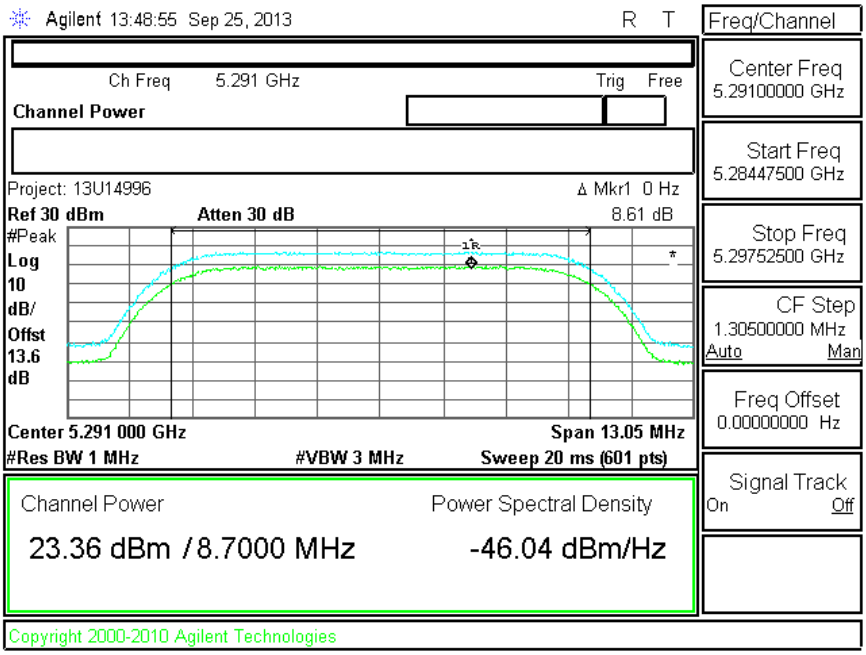


QAM 256

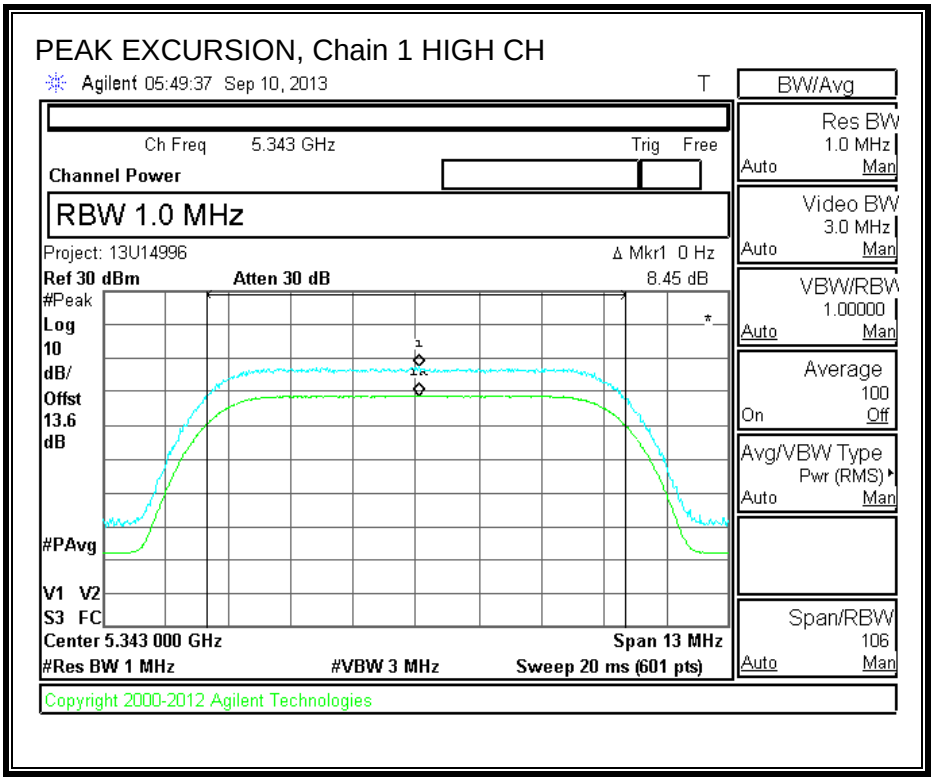
PEAK EXCURSION, Chain 1



PEAK EXCURSION, Chain 1 MID CH



PEAK EXCURSION, Chain 1 HIGH CH



9 RADIATED TEST RESULTS

9.1 LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 1 MHz for peak measurements and as applicable for average measurements.

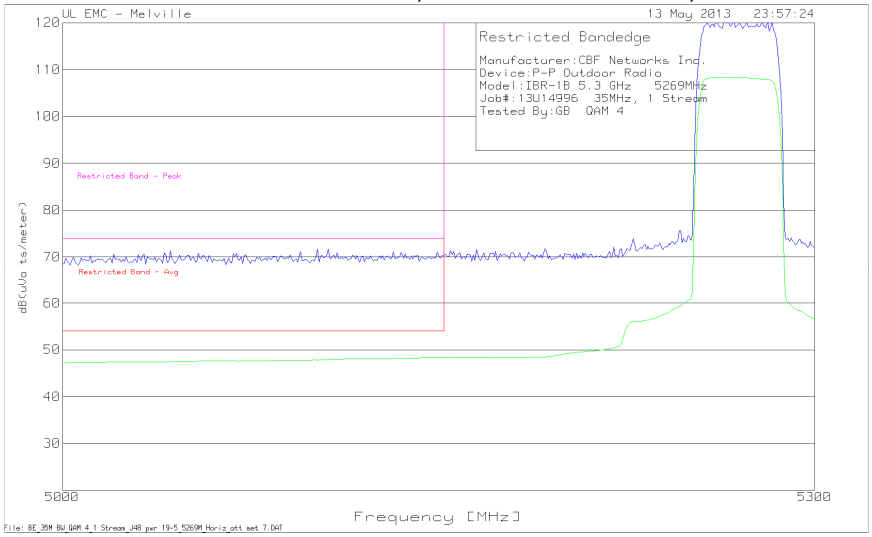
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Note: Radiated Emissions for 9 and 18MHz only QAM 4 Spurious were evaluated based on worst case.

9.2 TX ABOVE 1 GHz 802.11a (SISO) MODE IN THE 5.3 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL) 35MHz QAM 4 (SISO)

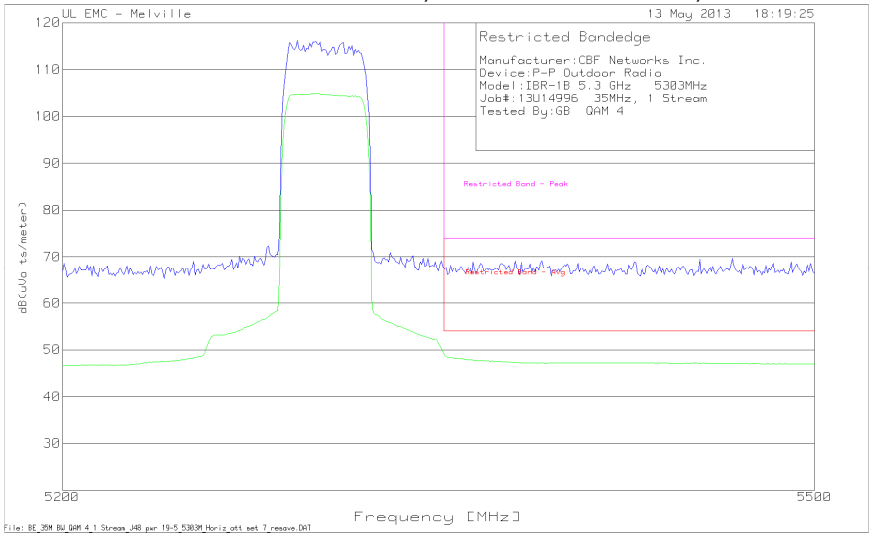
LOW CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



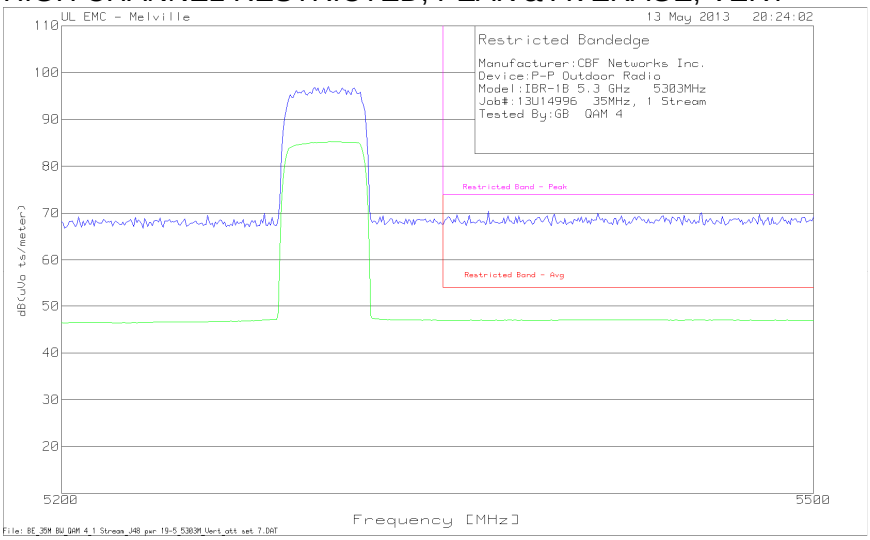
LOW CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

RESTRICTED BANDEDGE (HIGH CHANNEL) 35MHz QAM 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

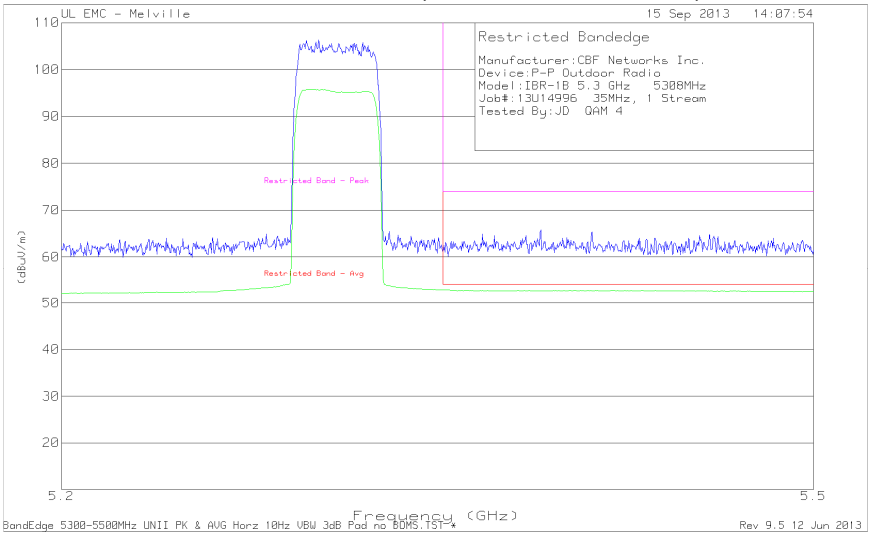


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

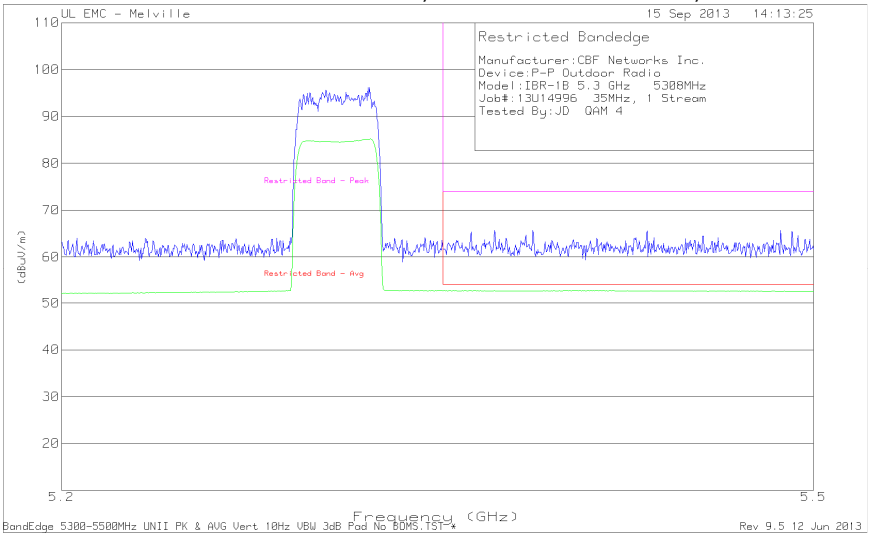


RESTRICTED BANDEDGE (HIGH CHANNEL) 35MHz QAM 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



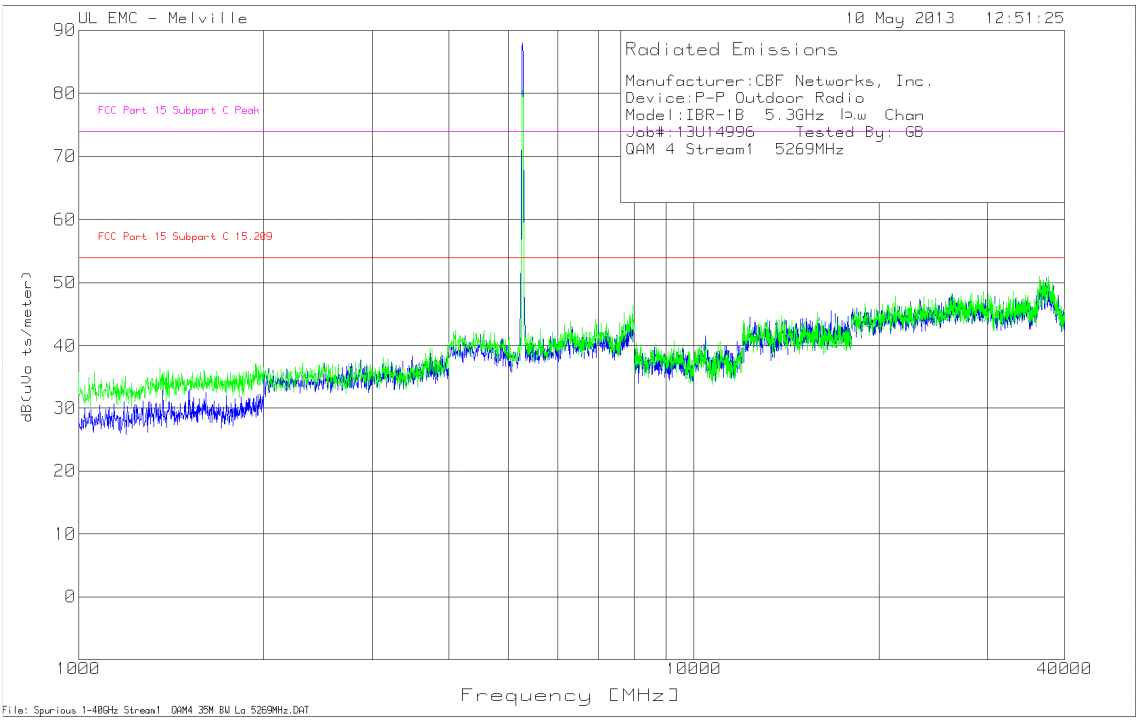
RESTRICTED BANDEDGE (HIGH CHANNEL) 35MHz QAM 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

HARMONICS AND SPURIOUS EMISSIONS

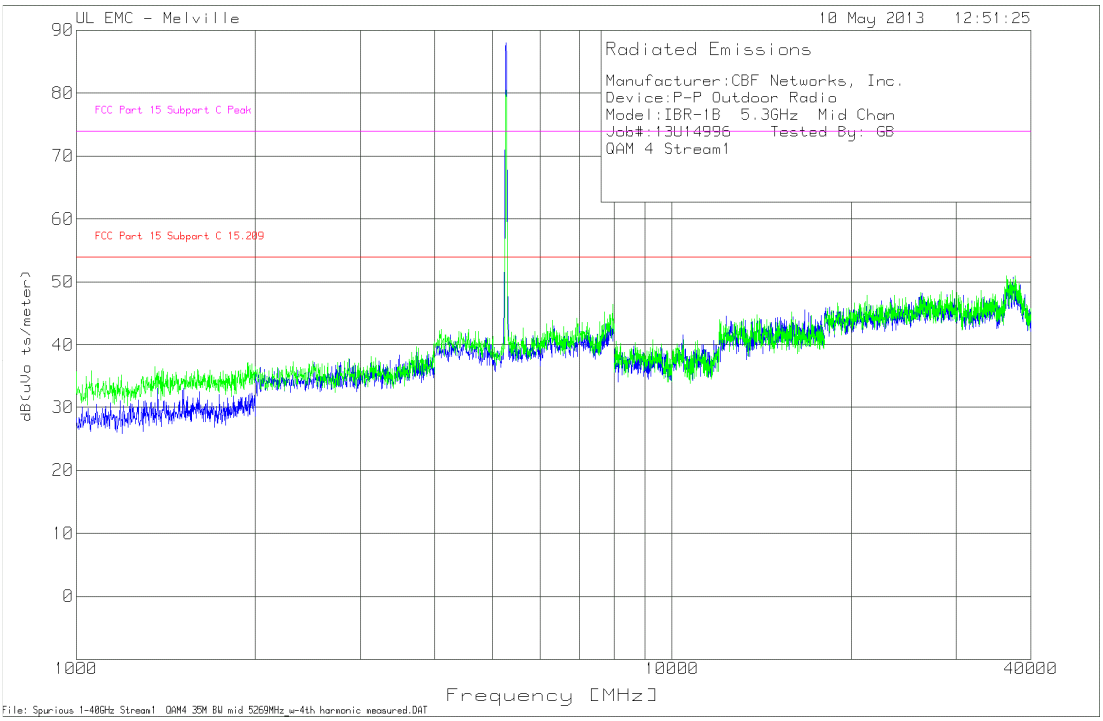
Low channel



No Spurious emissions were observed above 1GHz.

HARMONICS AND SPURIOUS EMISSIONS

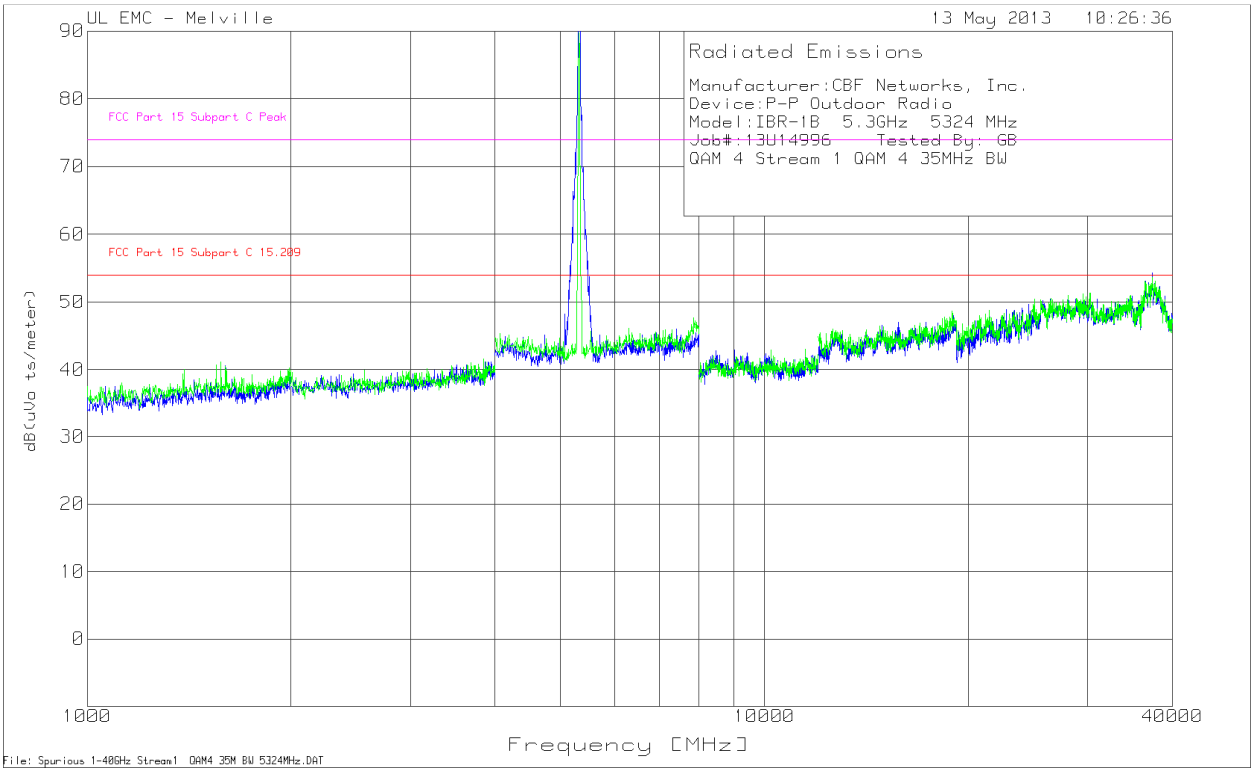
Mid channel



No Spurious emissions were observed above 1GHz

HARMONICS AND SPURIOUS EMISSIONS

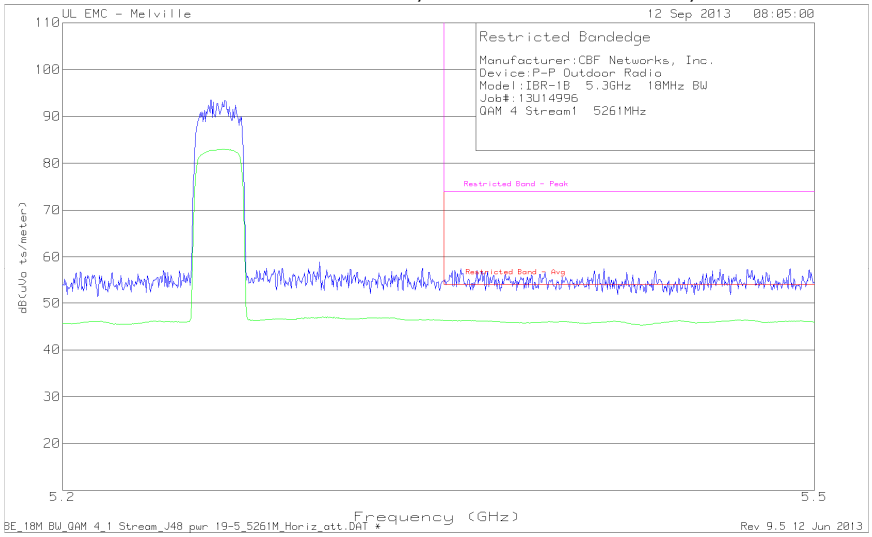
High Channel



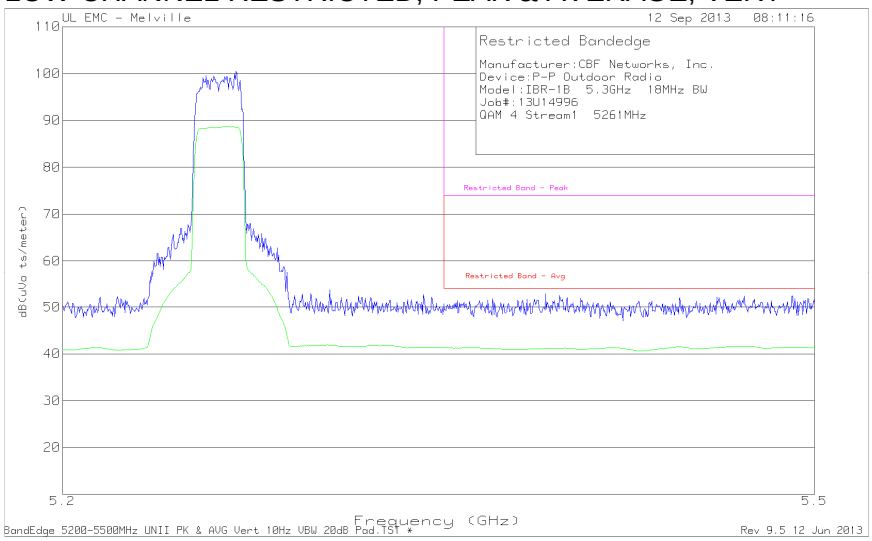
No Spurious emissions were observed above 1 GHz

RESTRICTED BANDEDGE (LOW CHANNEL) 18MHz QAM 4

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

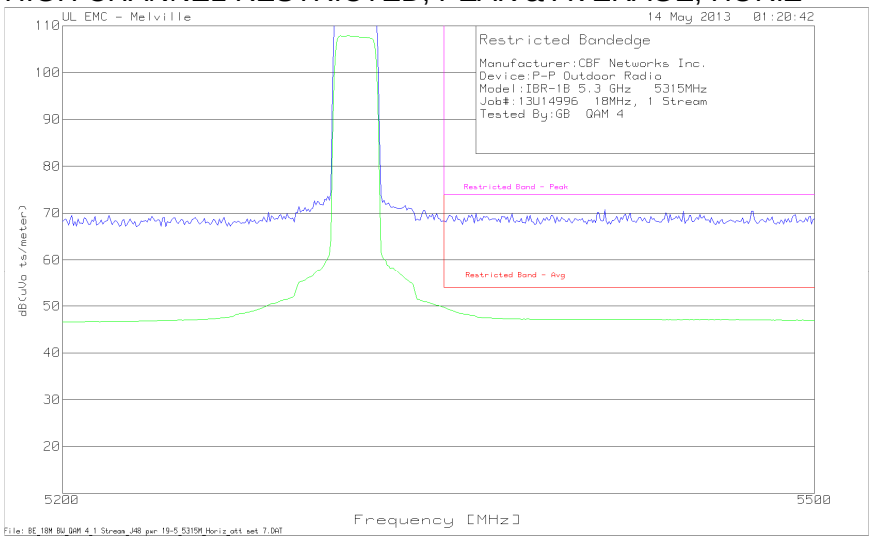


LOW CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

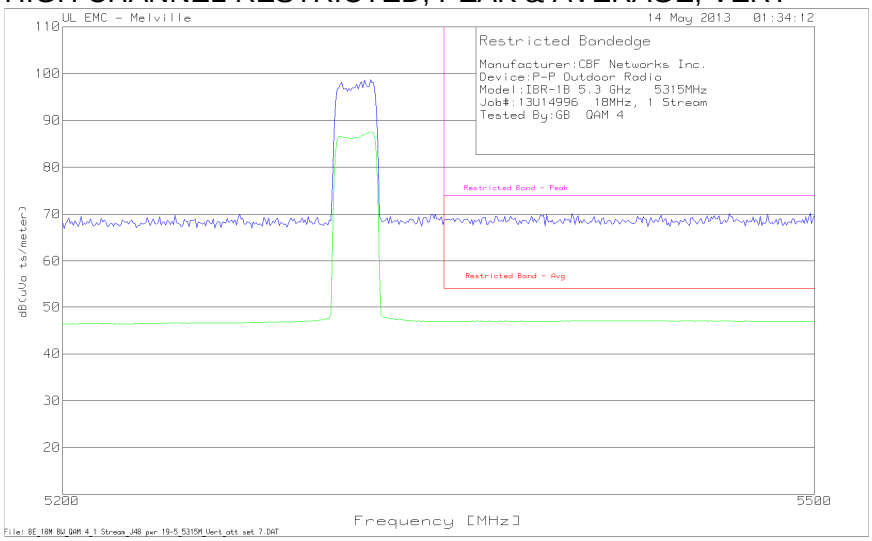


RESTRICTED BANDEDGE (HIGH CHANNEL) 18MHz QAM 4

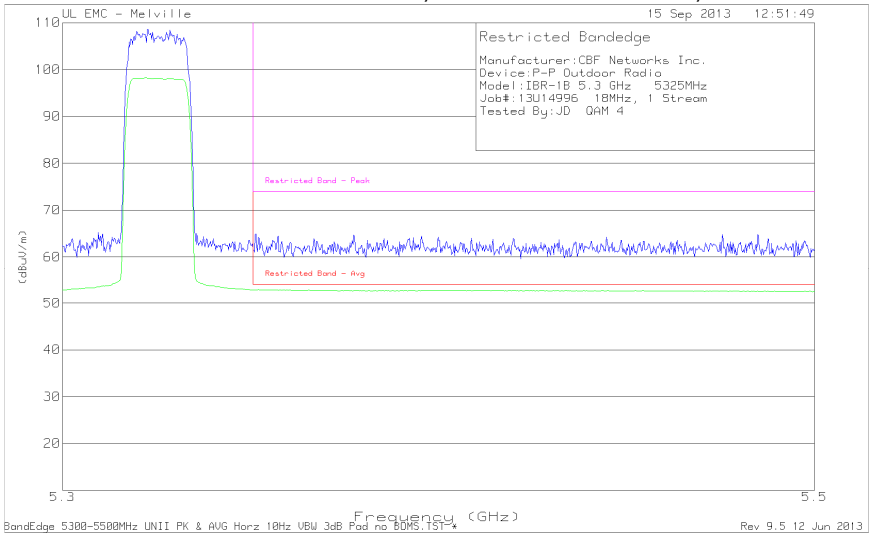
HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



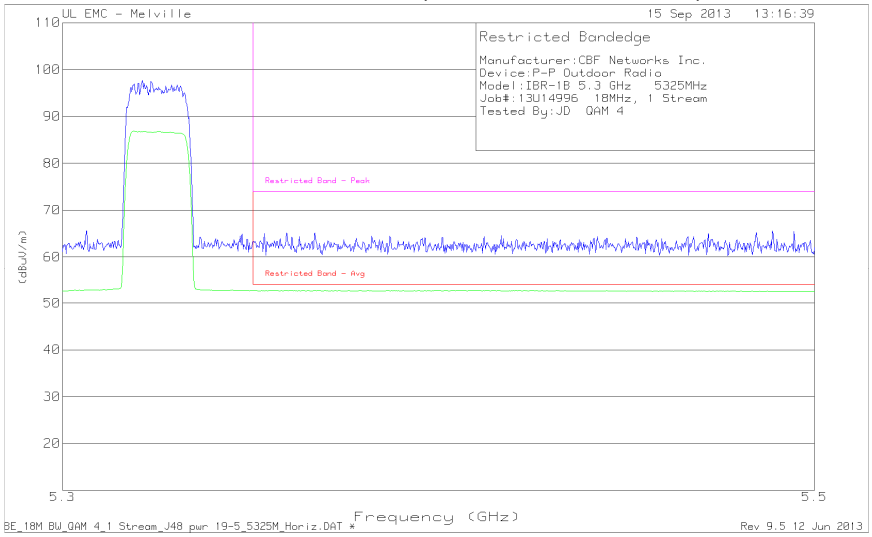
HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



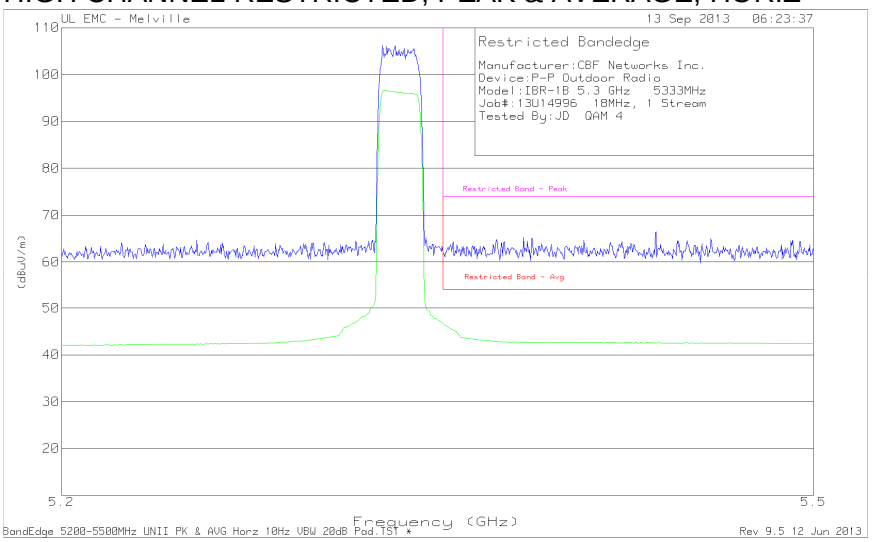
HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



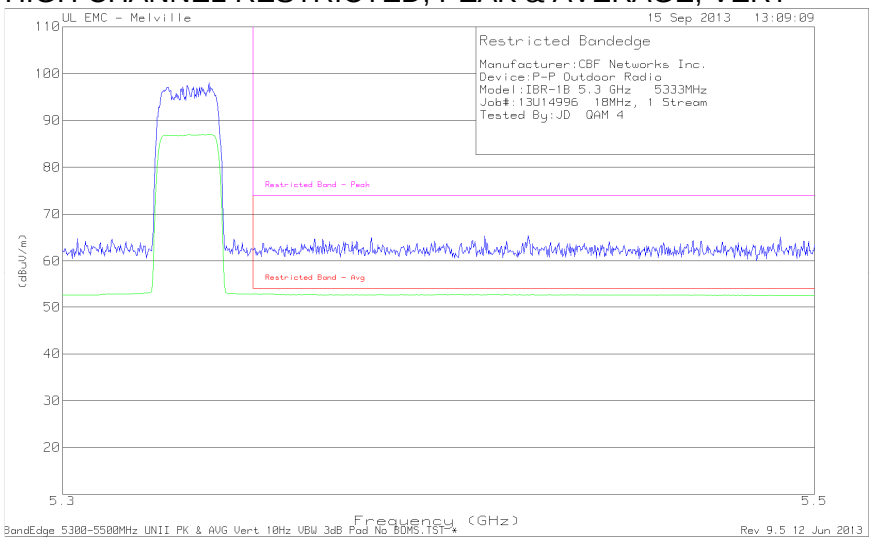
HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

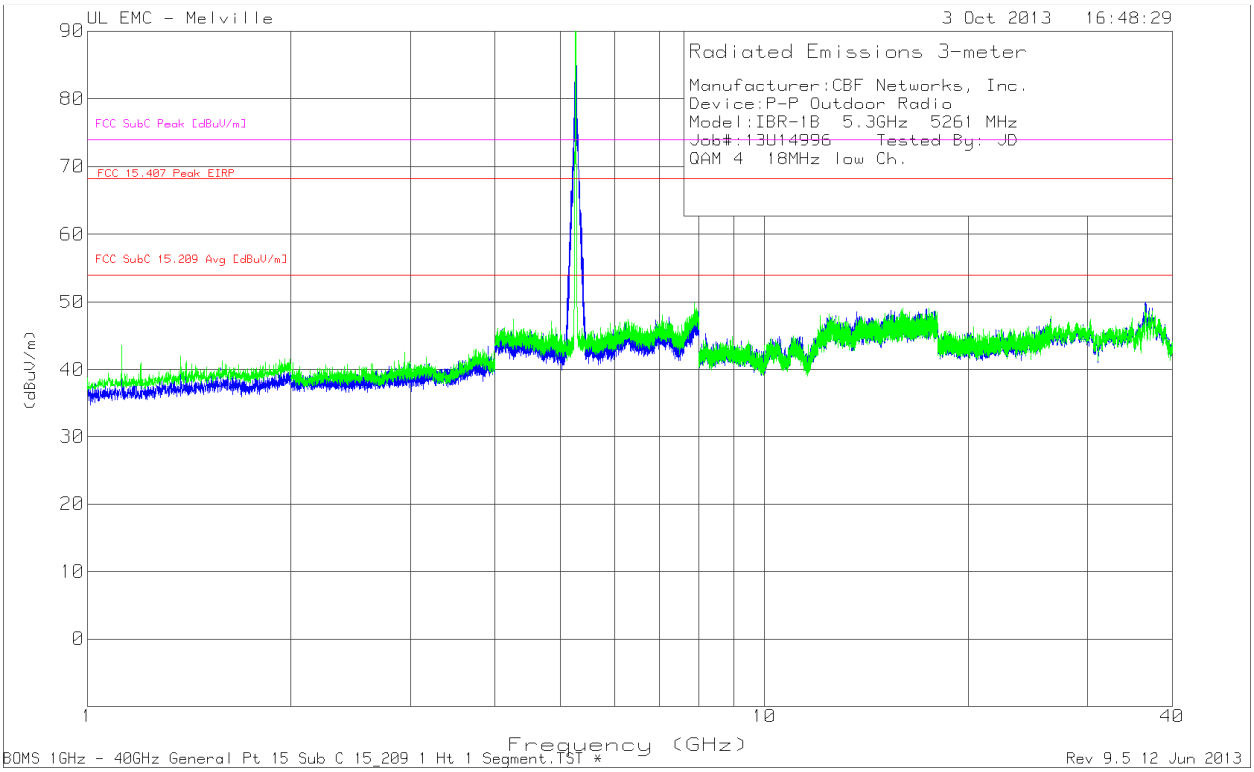


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



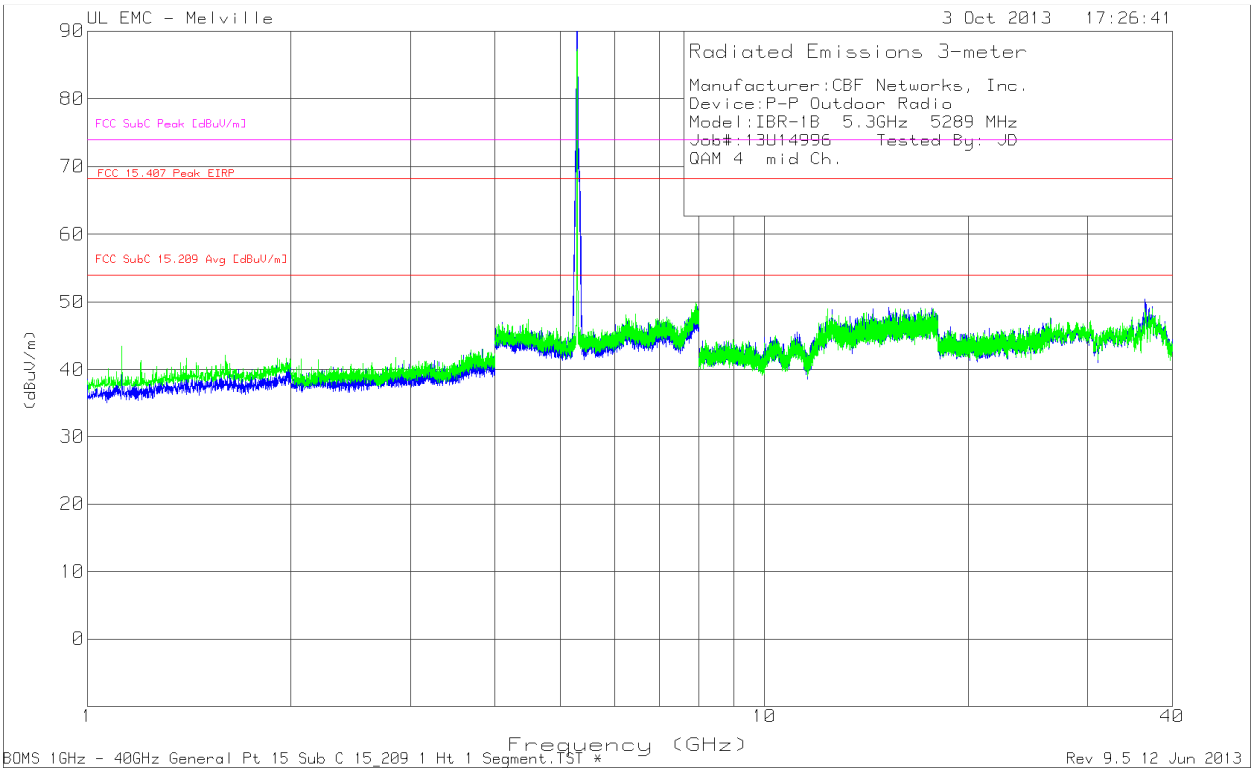
HARMONICS AND SPURIOUS EMISSIONS

Low channel



HARMONICS AND SPURIOUS EMISSIONS

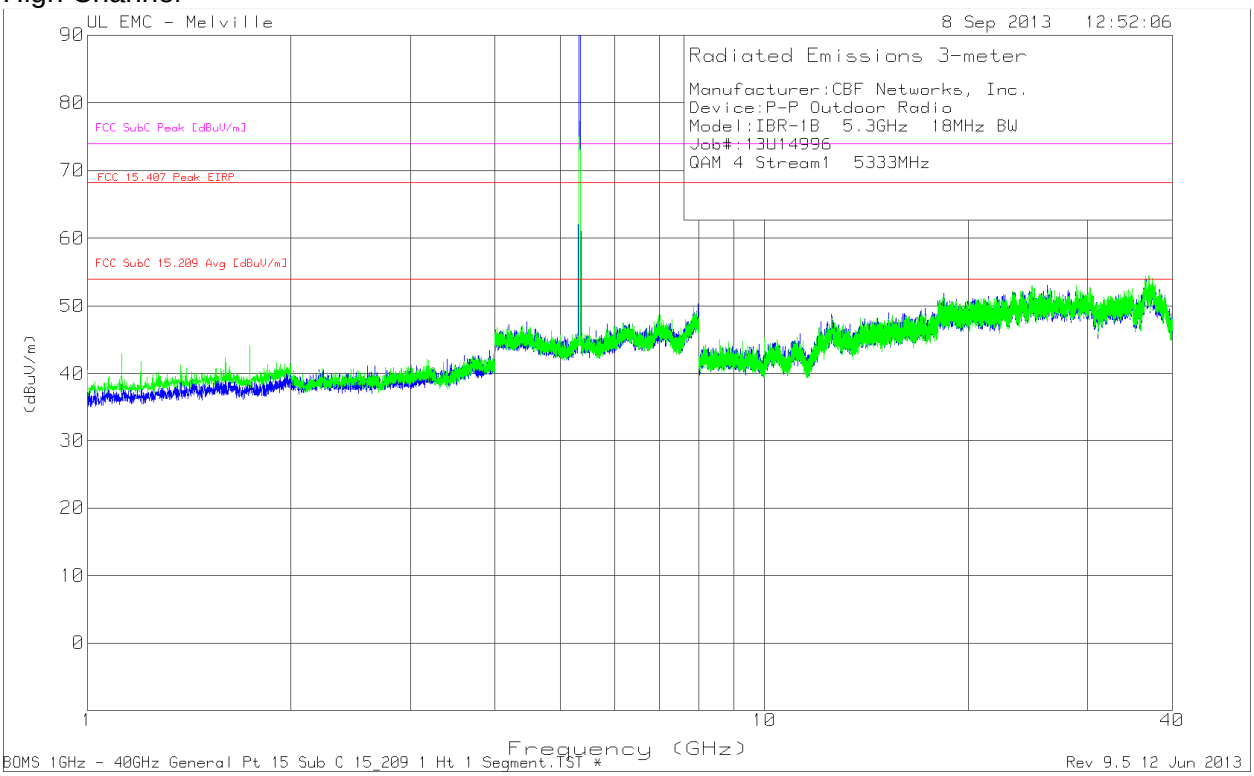
Mid channel



No spurious emissions were observed above 1GHz

HARMONICS AND SPURIOUS EMISSIONS

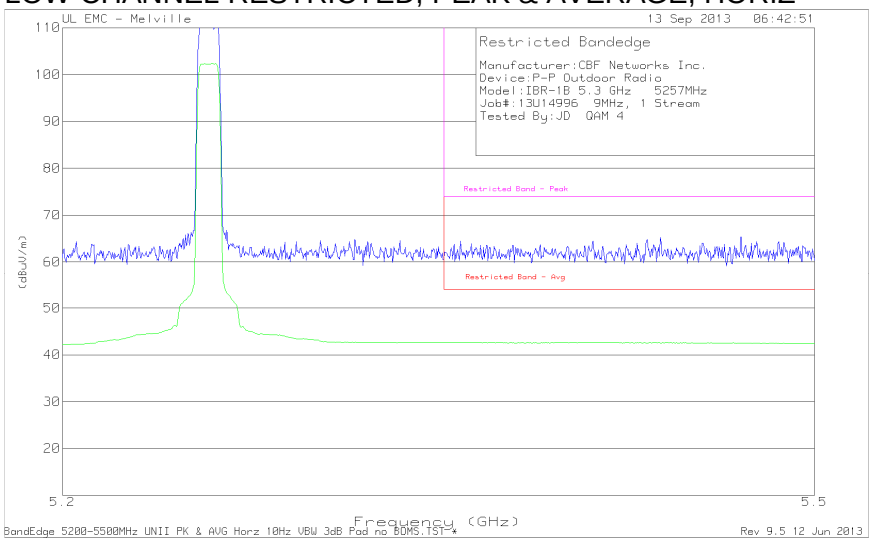
High Channel



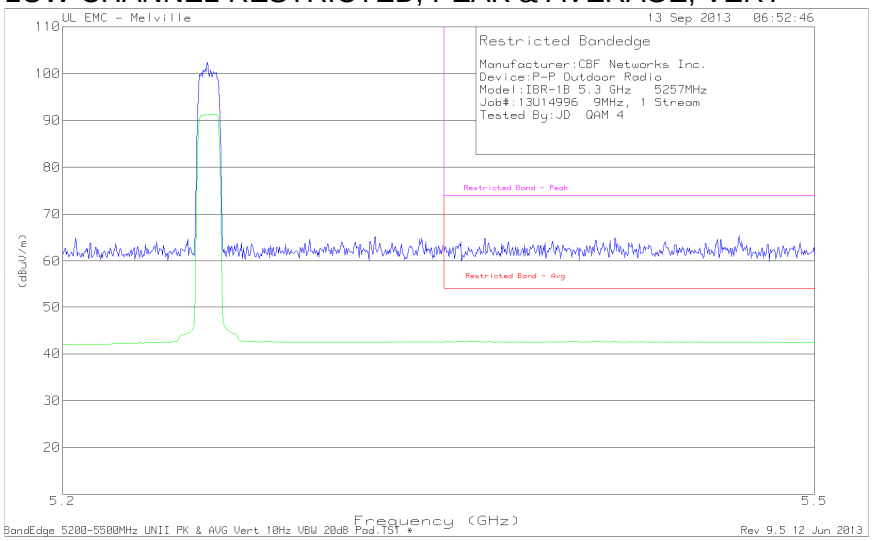
No spurious emissions were observed above 1GHz

RESTRICTED BANDEDGE (LOW CHANNEL) 9MHz QAM 4

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

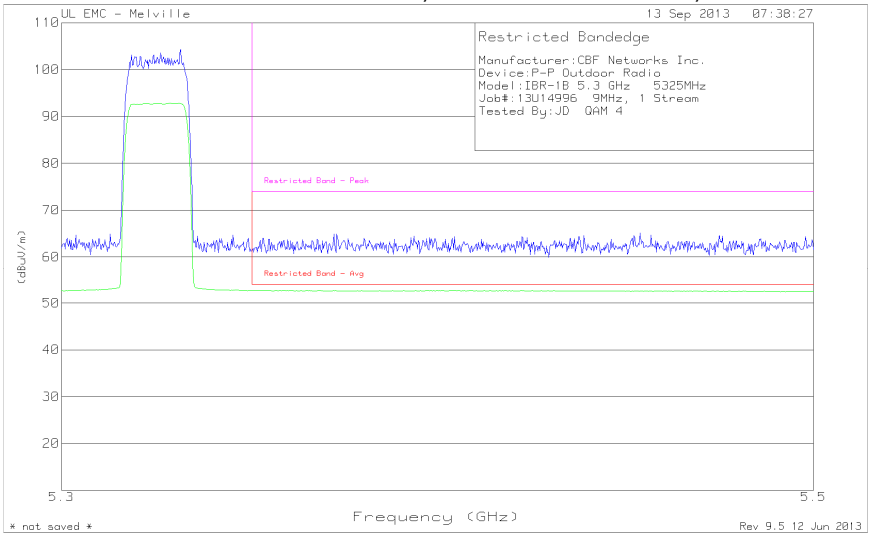


LOW CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



RESTRICTED BANDEDGE (HIGH CHANNEL) 9MHz QAM 4

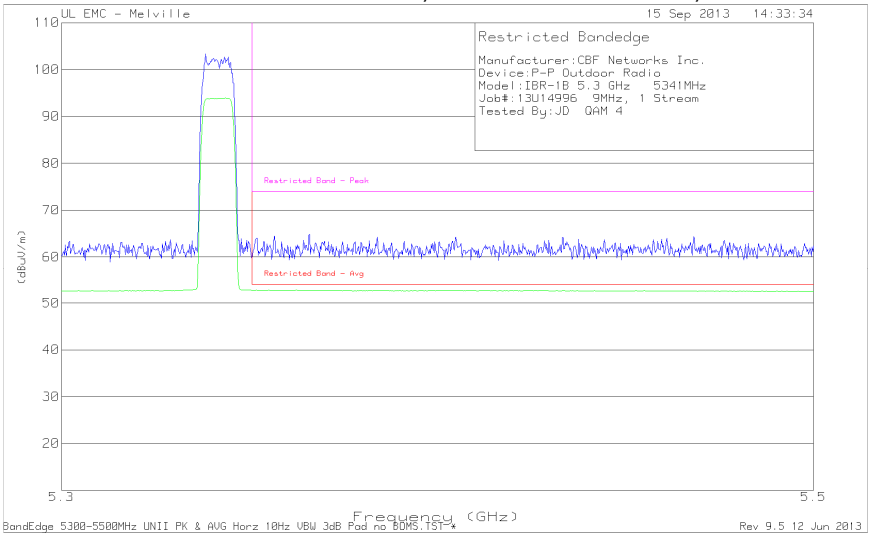
HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

RESTRICTED BANDEDGE (HIGH CHANNEL) 9MHz QAM 4

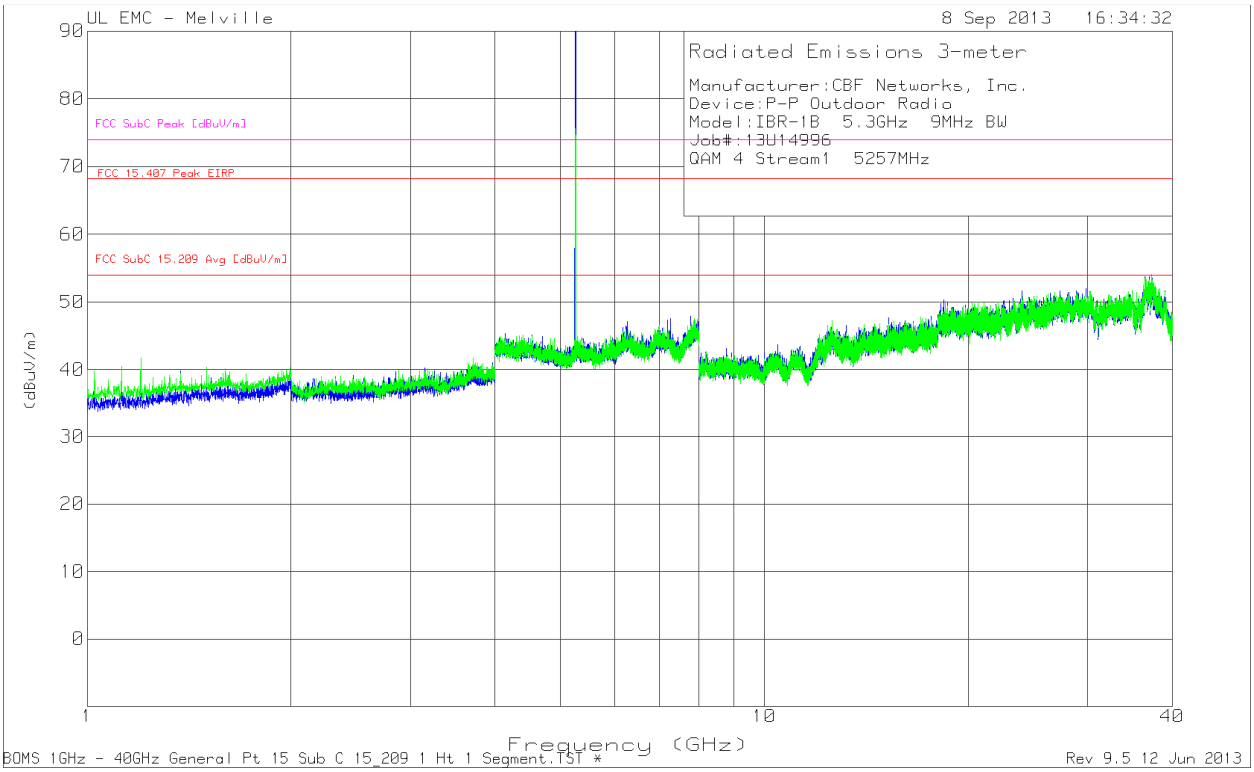
HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

HARMONICS AND SPURIOUS EMISSIONS

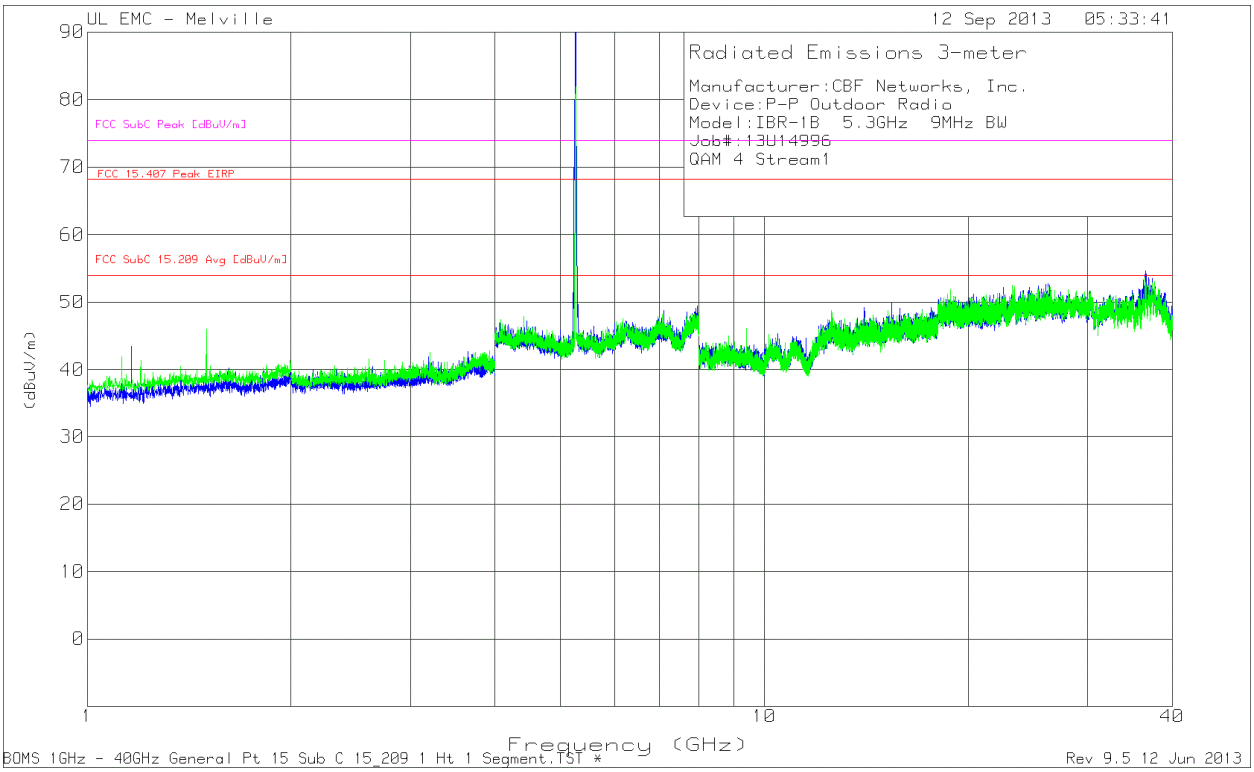
Low channel



No spurious emissions were observed above 1GHz

HARMONICS AND SPURIOUS EMISSIONS

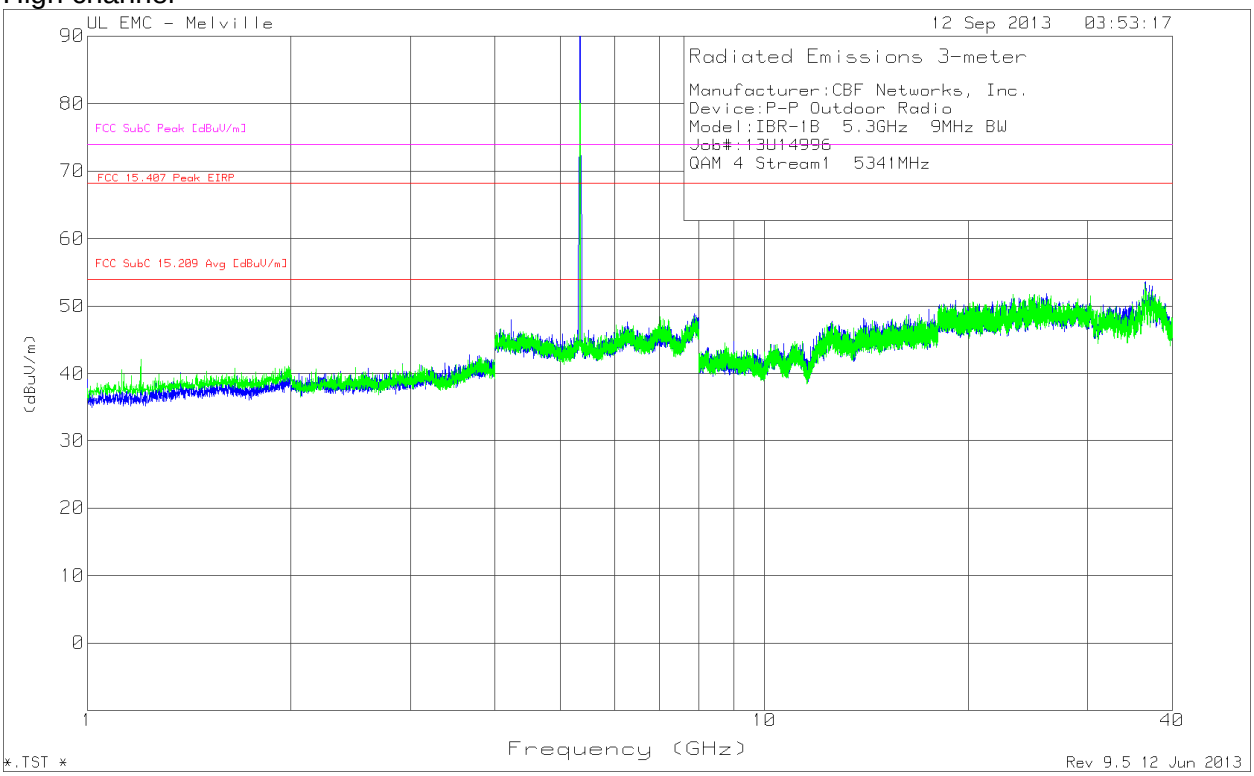
Mid channel



No spurious emissions were observed above 1GHz

HARMONICS AND SPURIOUS EMISSIONS

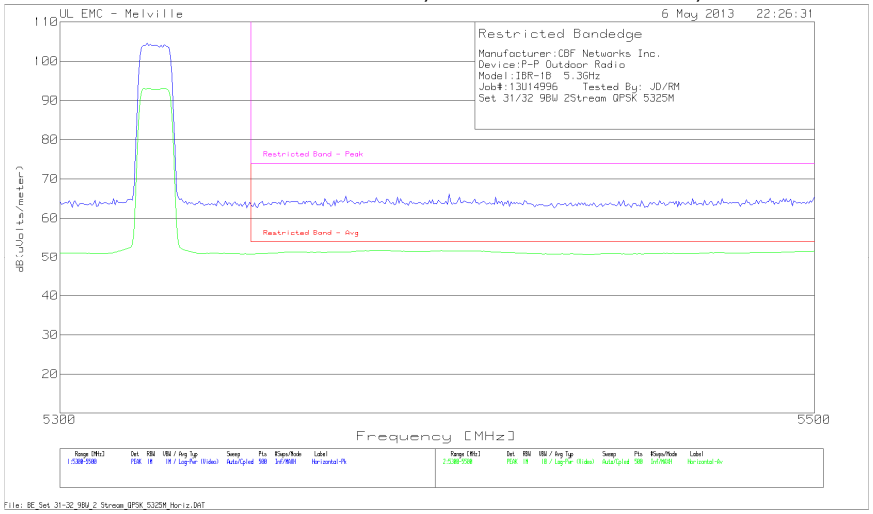
High channel



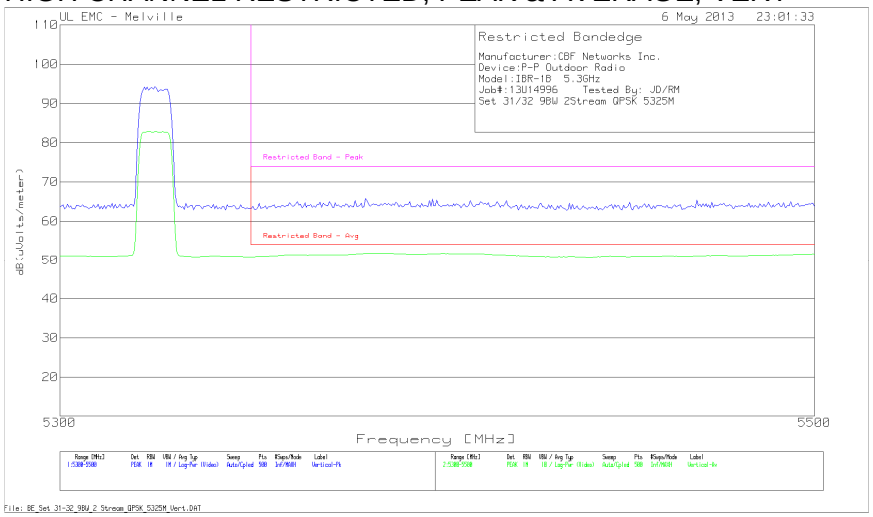
No spurious emissions were observed above 1GHz

RESTRICTED BANDEDGE (HIGH CHANNEL) 9MHz QAM 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

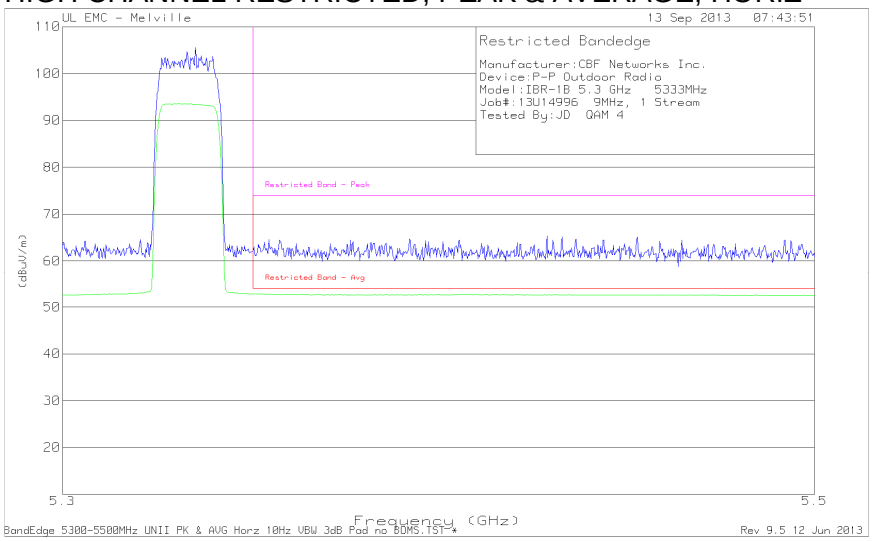


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

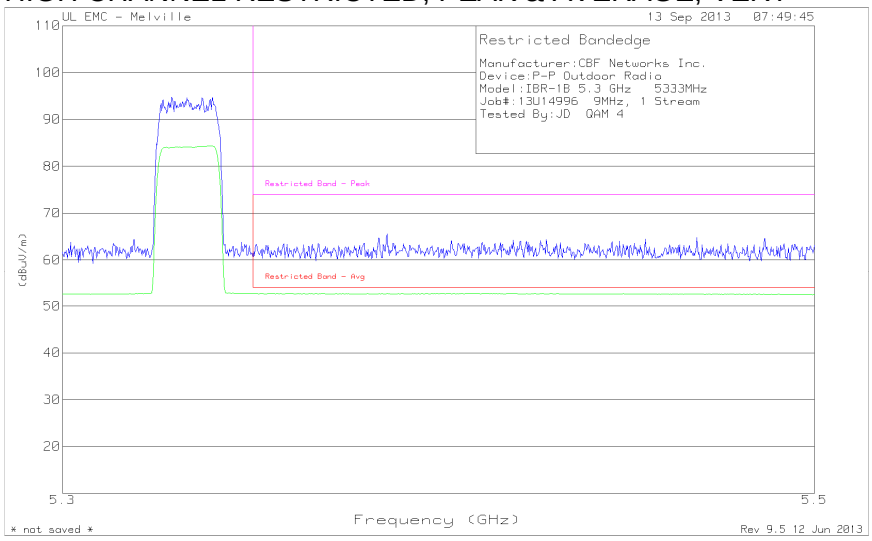


RESTRICTED BANDEDGE (HIGH CHANNEL) 9MHz QAM 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

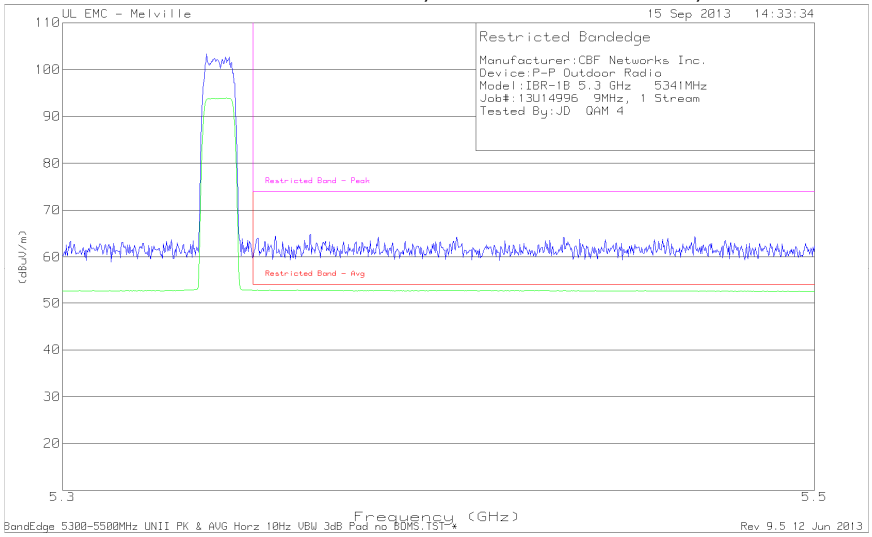


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

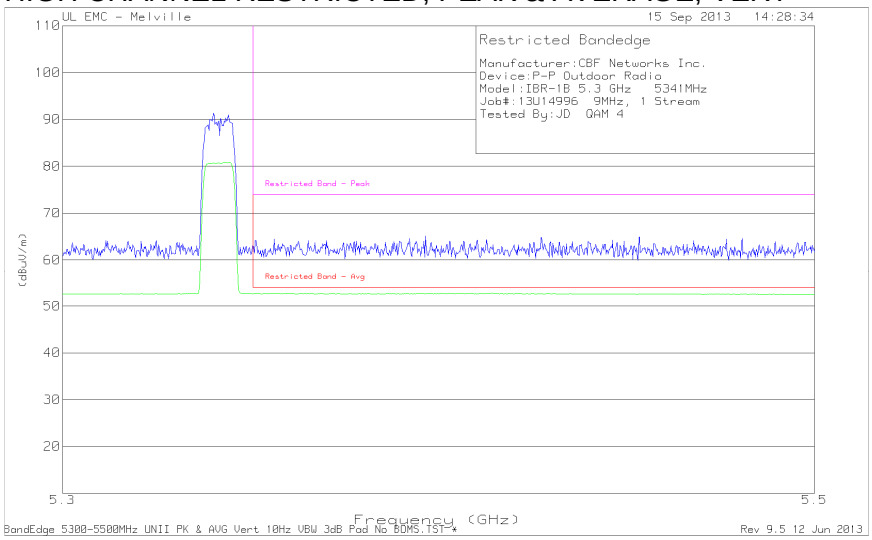


RESTRICTED BANDEDGE (HIGH CHANNEL) 9MHz QAM 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

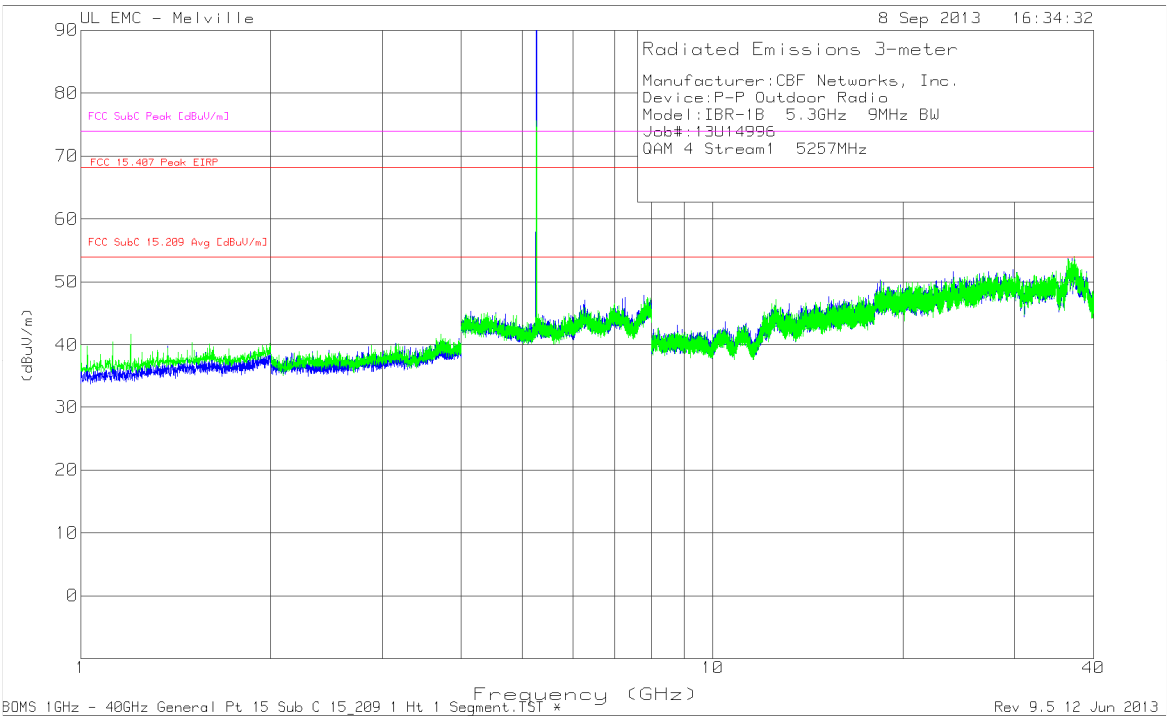


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

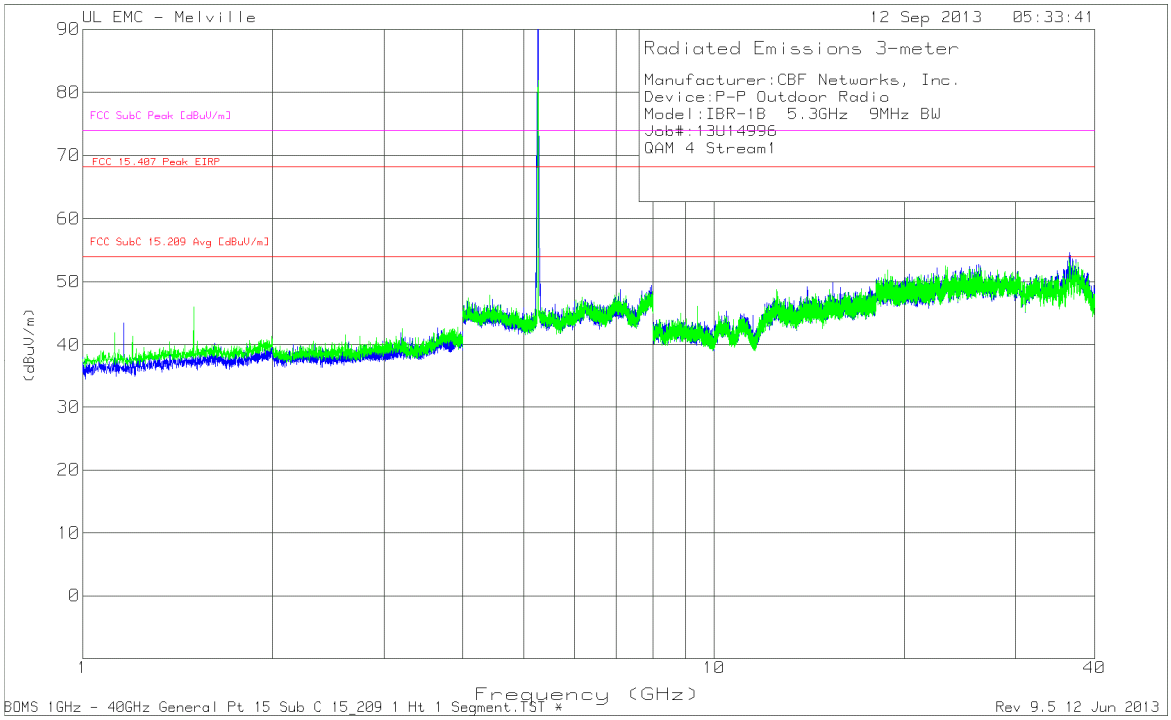
Low Channel



No Spurious emissions were observed above 1GHz

HARMONICS AND SPURIOUS EMISSIONS

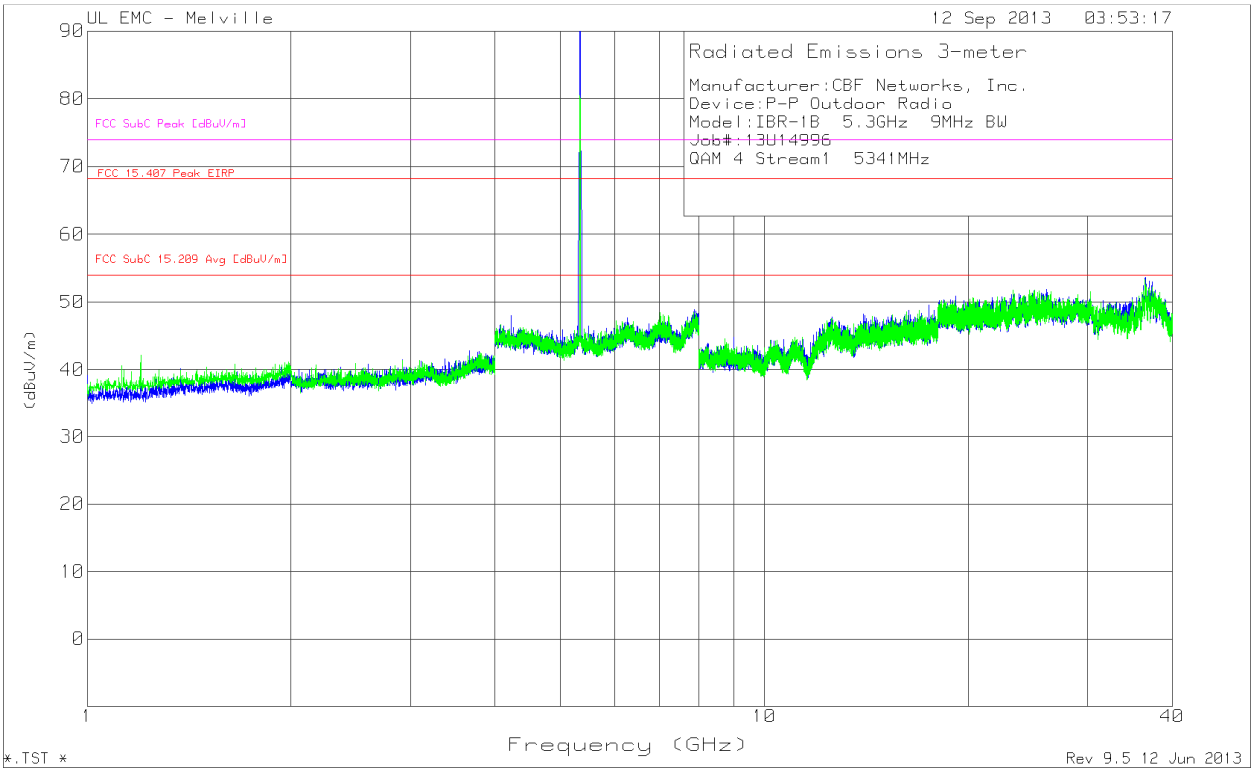
Mid Channel



No Spurious emissions were observed above 1GHz

HARMONICS AND SPURIOUS EMISSIONS

High Channel

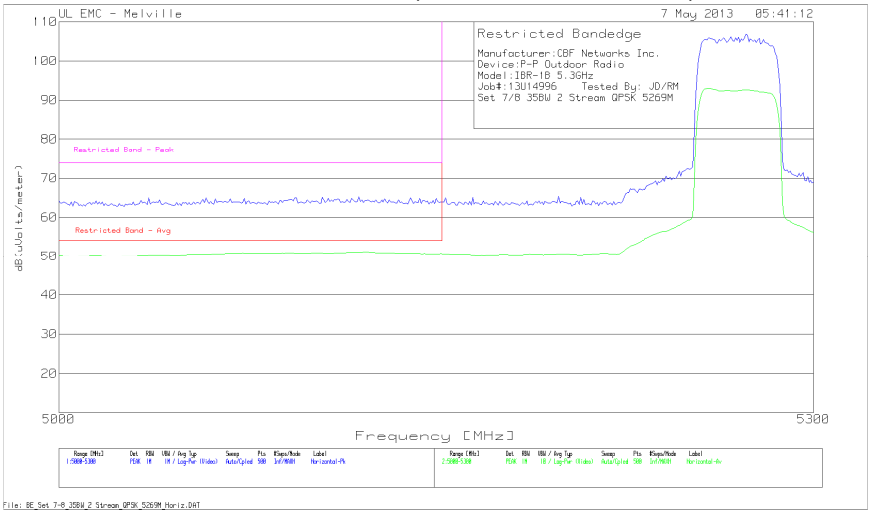


No spurious emissions were observed above 1GHz

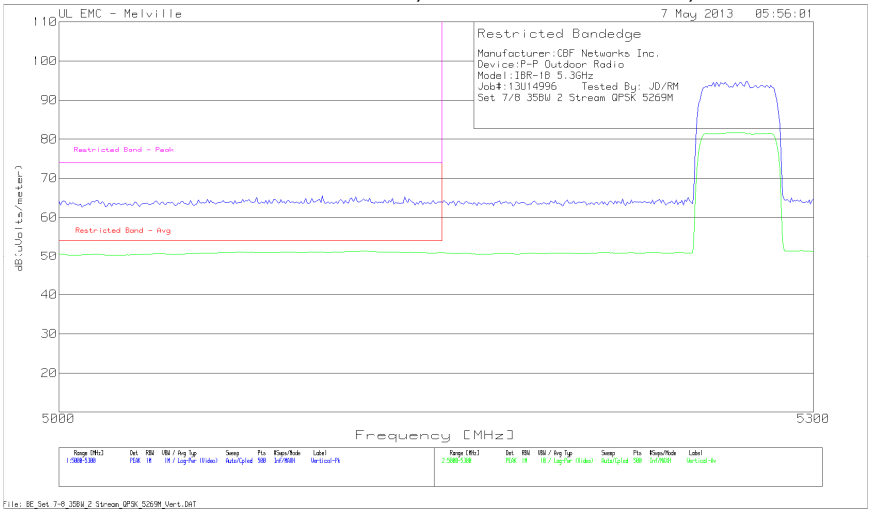
9.3 TX ABOVE 1 GHz 802.11a (SISO) MODE IN THE 5.3 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL) 35MHz QAM 4 (MIMO)

RESTRICTED BANDEDGE (LOW CHANNEL) 35MHz QAM 4

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

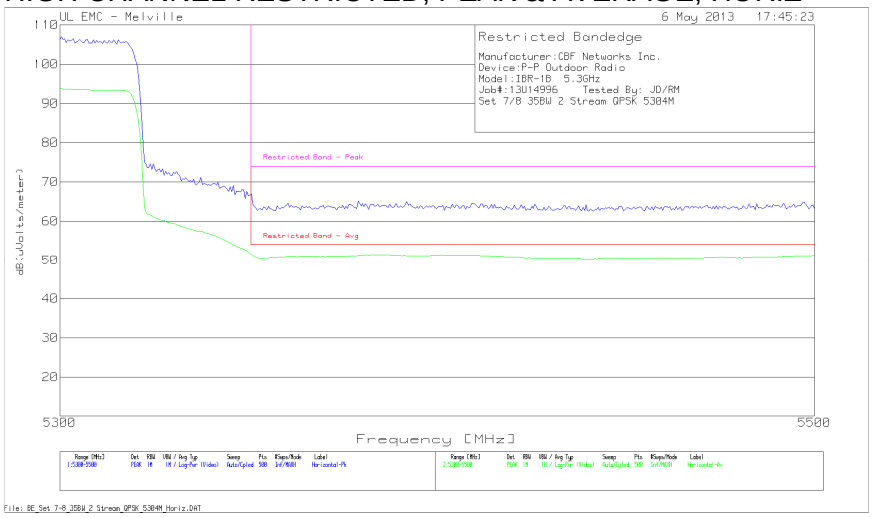


LOW CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

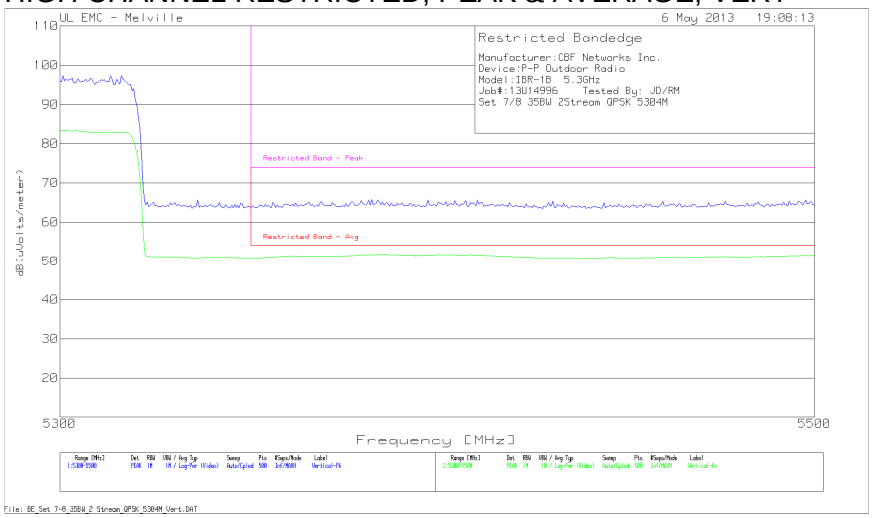


RESTRICTED BANDEDGE (HIGH CHANNEL) 35MHz QAM 4 (MIMO)

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

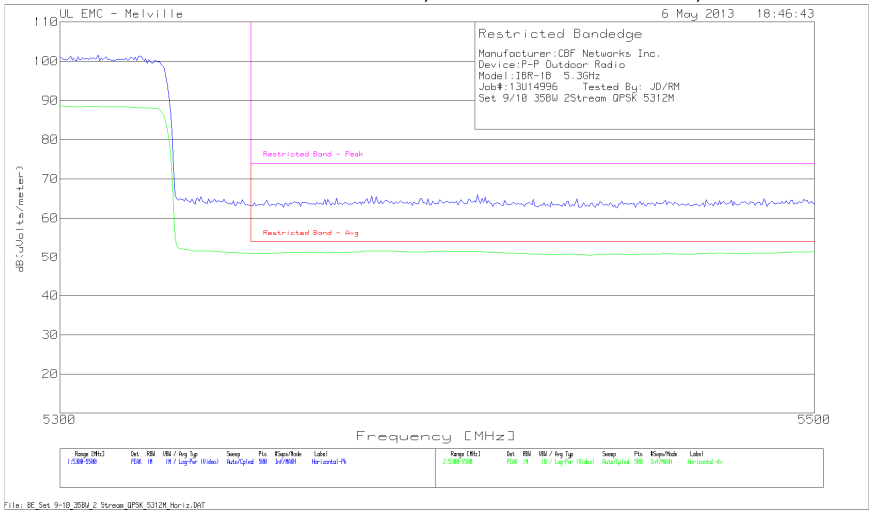


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

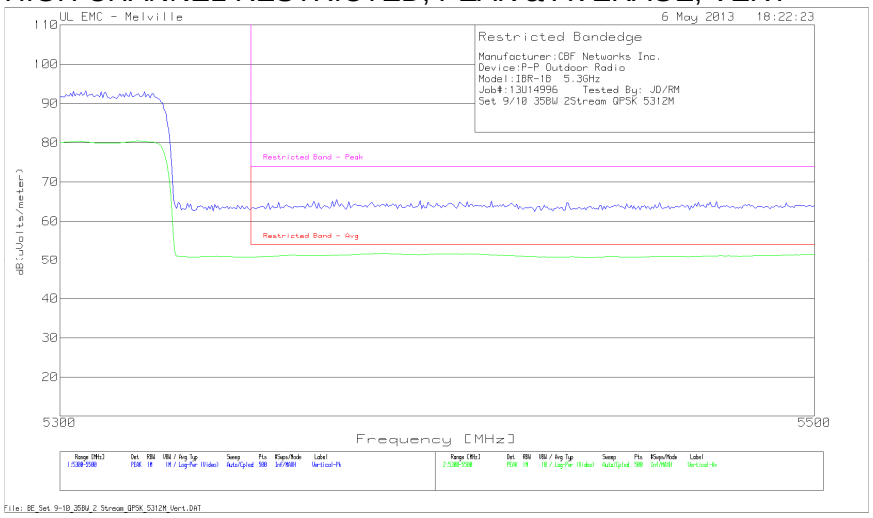


RESTRICTED BANDEDGE (HIGH CHANNEL) 35MHz QAM 4 (MIMO)

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

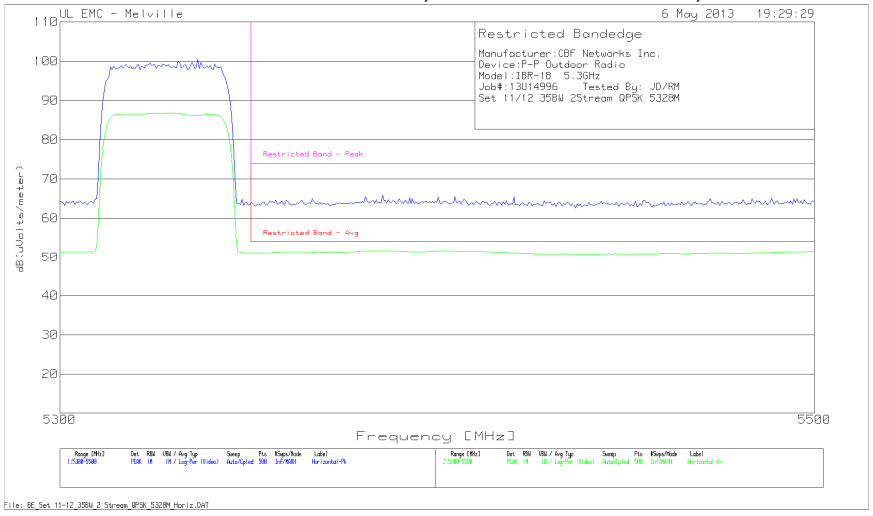


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



RESTRICTED BANDEDGE (HIGH CHANNEL) 35MHz QAM 4 (MIMO)

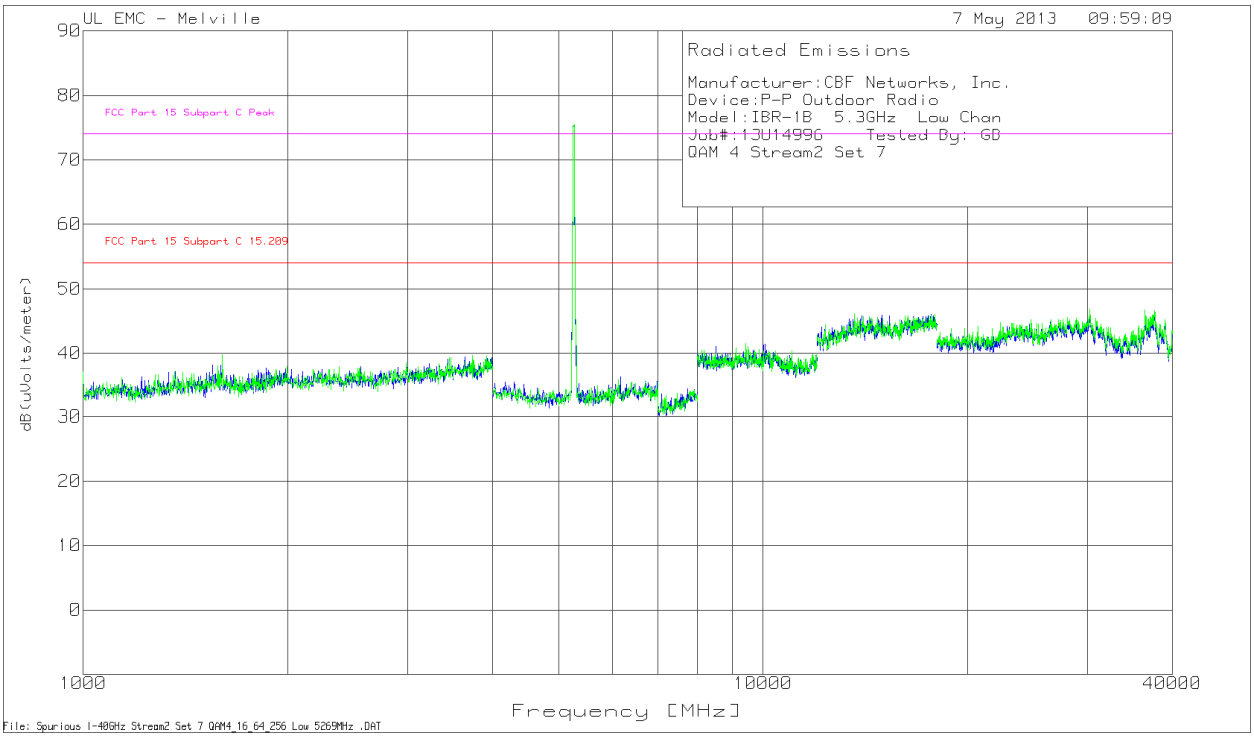
HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

HARMONICS AND SPURIOUS EMISSIONS 35MHz QAM 4 (MIMO)

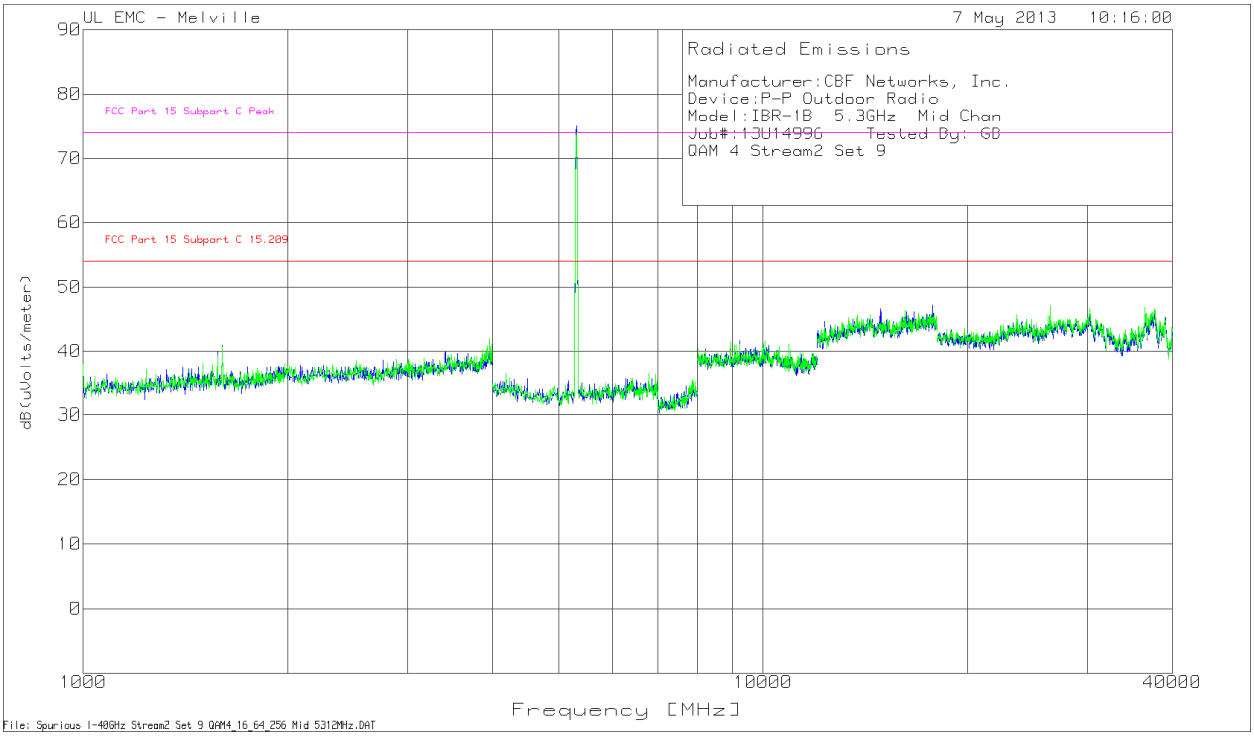
Low channel



No spurious emissions were observed above 1GHz

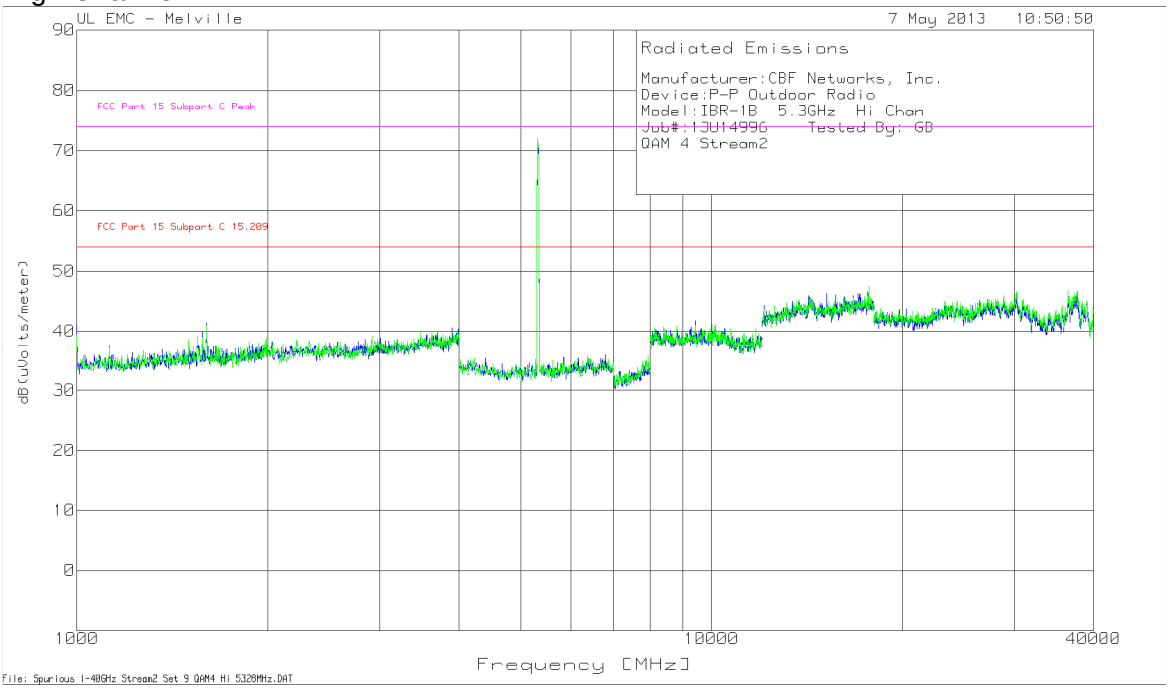
HARMONICS AND SPURIOUS EMISSIONS 35MHz QAM 4 (MIMO)

Mid channel



HARMONICS AND SPURIOUS EMISSIONS 35MHz QAM 4 (MIMO)

High Channel



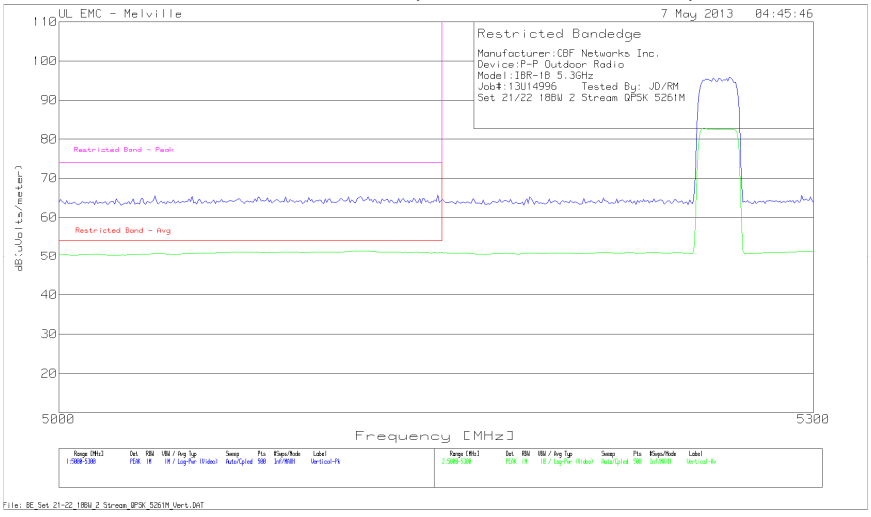
No Spurious emissions were observed above 1GHz

9.4 TX ABOVE 1 GHz 802.11a MODE IN THE 5.3 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL) 18MHz QAM 4 (MIMO)

RESTRICTED BANDEDGE (LOW CHANNEL) 18MHz QAM 4

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



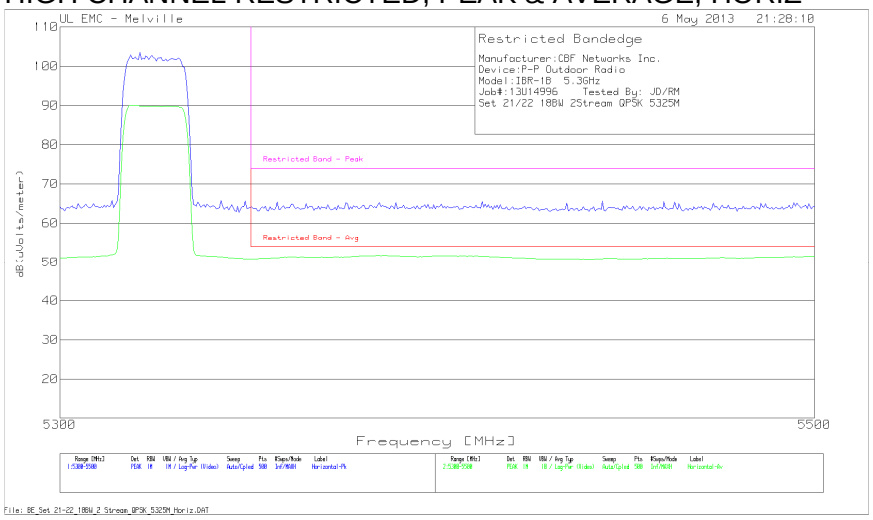
RESTRICTED BANDEDGE (HIGH CHANNEL) 18MHz QAM 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

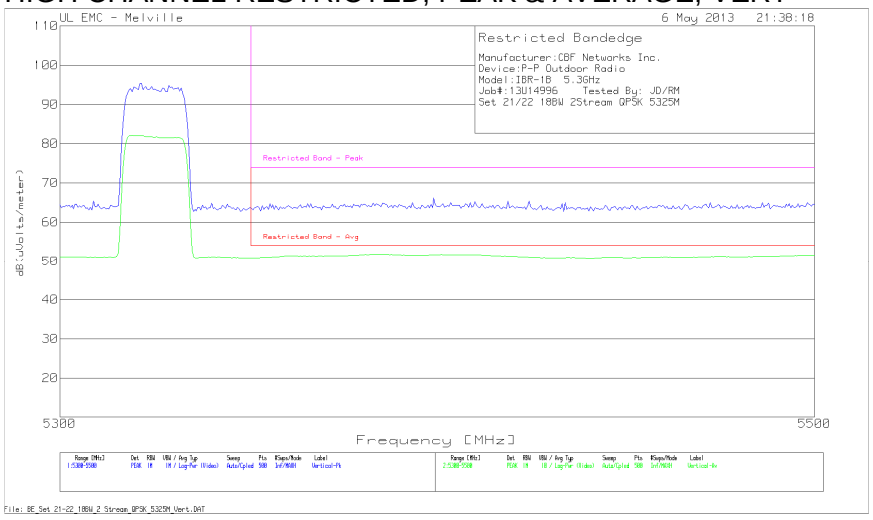
HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

RESTRICTED BANDEDGE (HIGH CHANNEL) 18MHz QAM 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

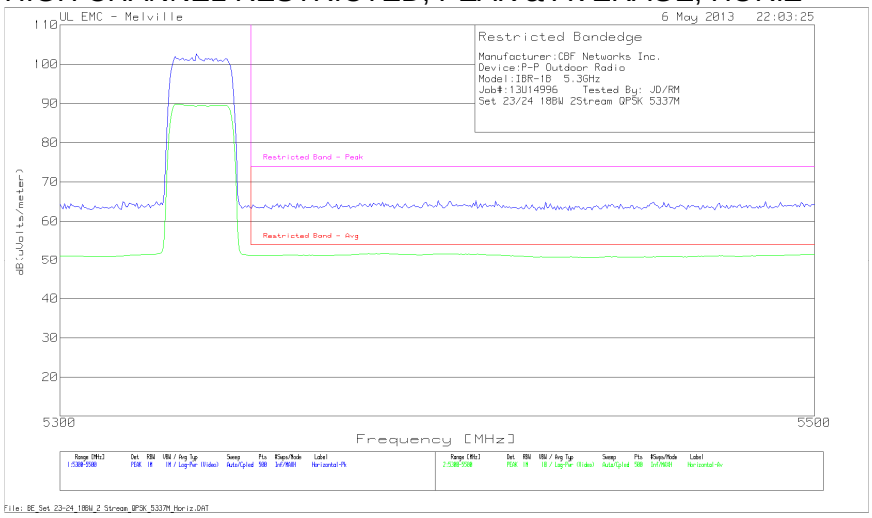


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

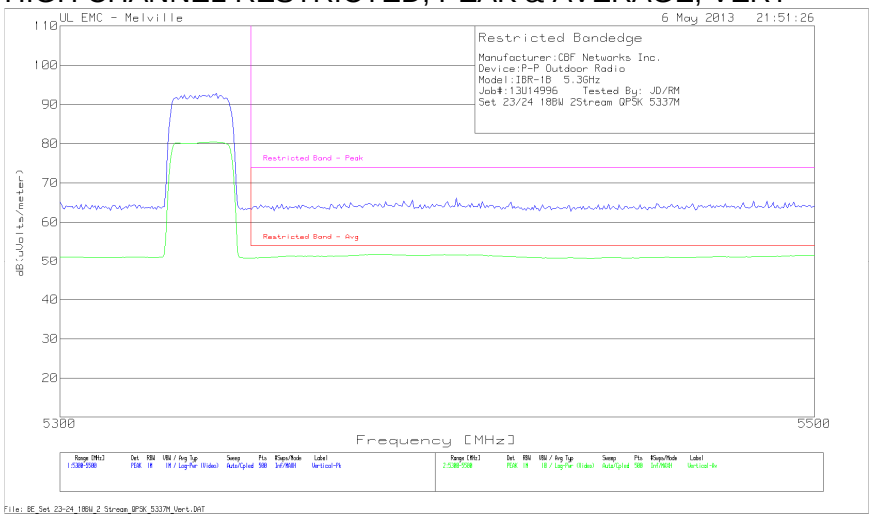


RESTRICTED BANDEDGE (HIGH CHANNEL) 18MHz QAM 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

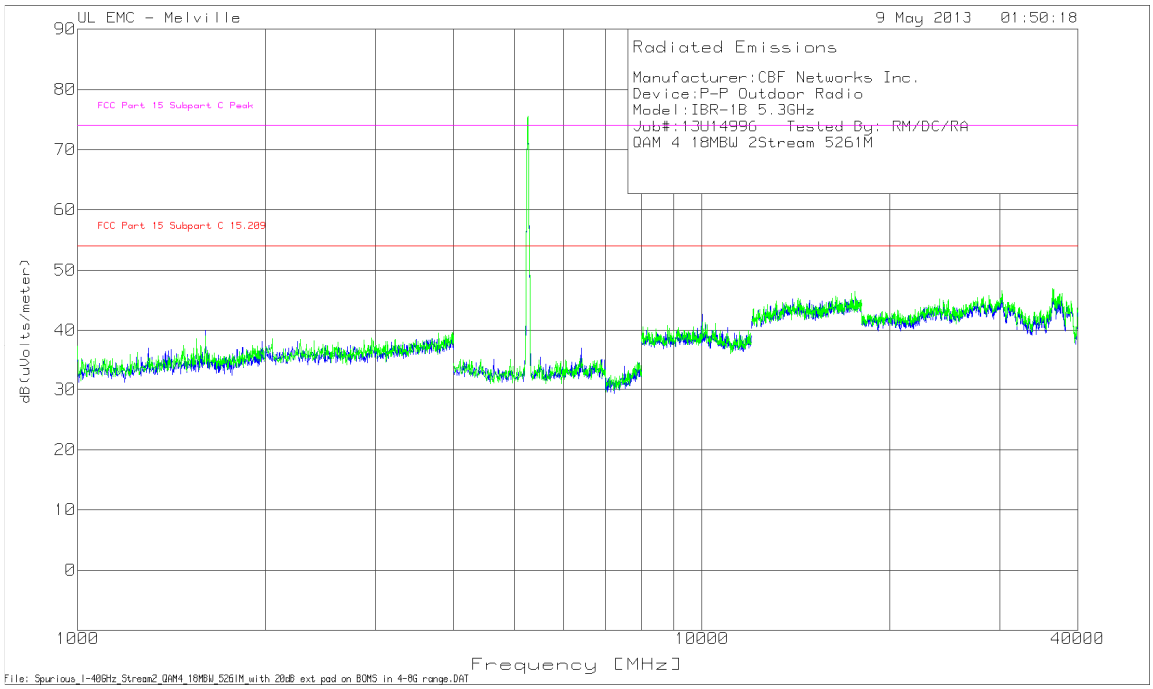


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

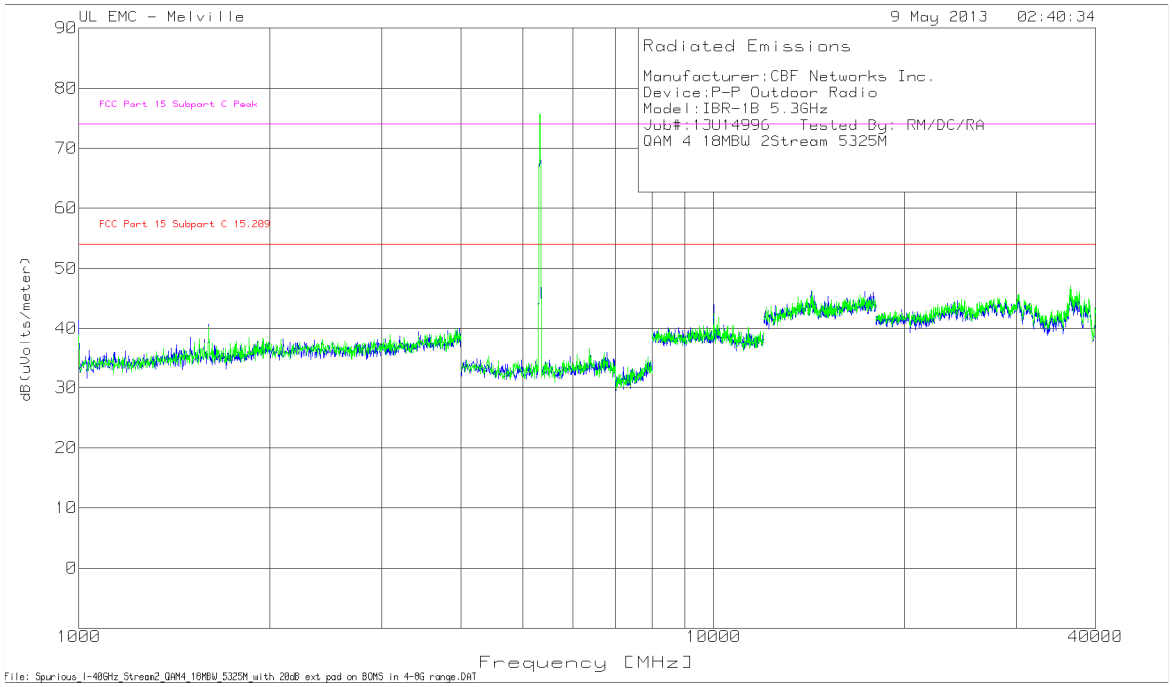
Low Channel



No Spurious emissions were observed above 1GHz

HARMONICS AND SPURIOUS EMISSIONS

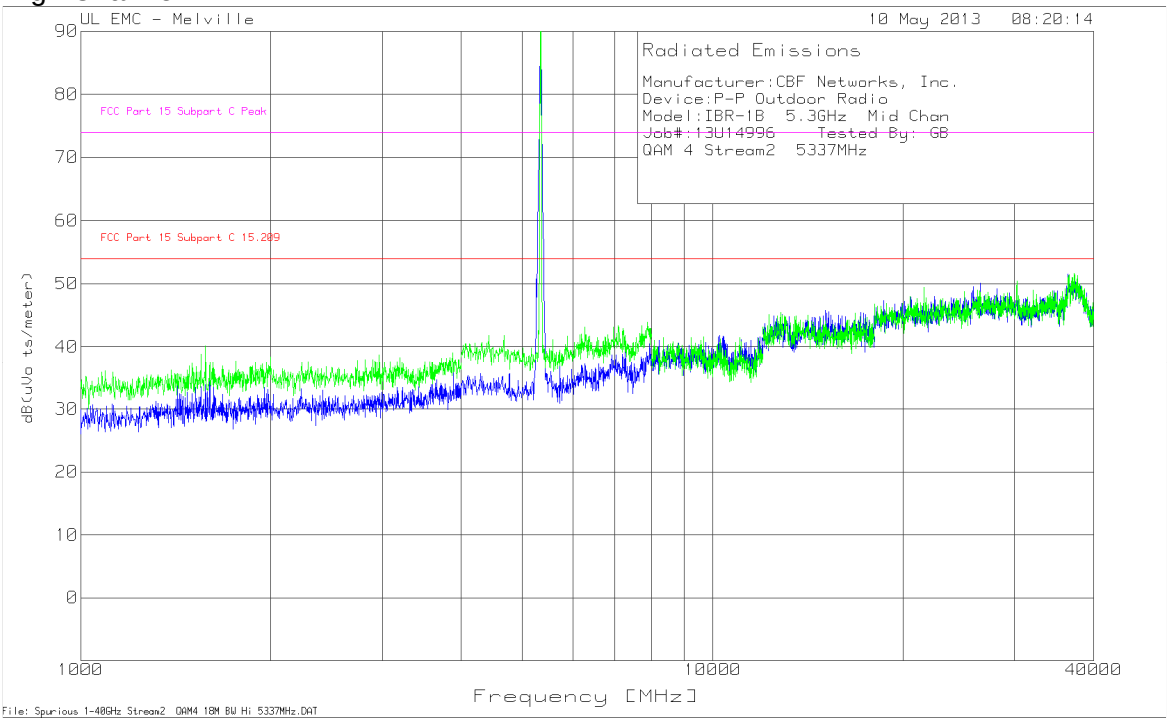
Mid Channel



No Spurious emissions were observed above 1GHz

HARMONICS AND SPURIOUS EMISSIONS

High Channel

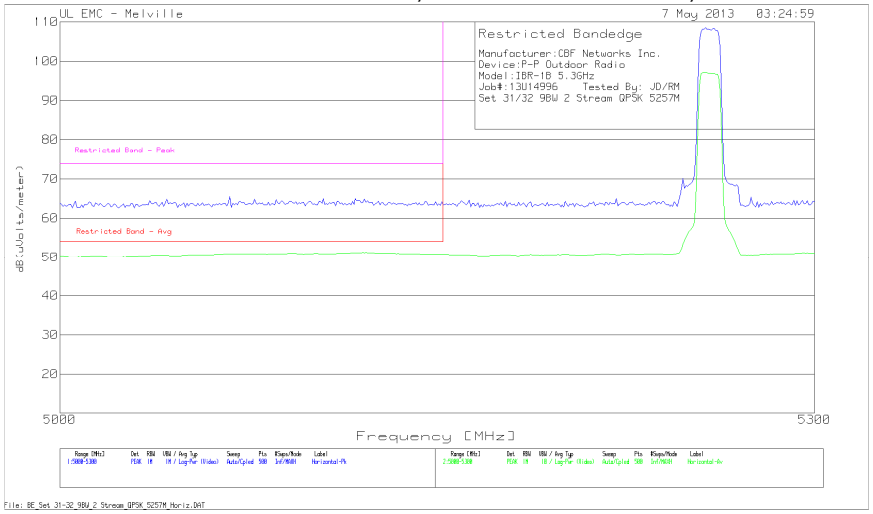


No Spurious emissions were observed above 1GHz

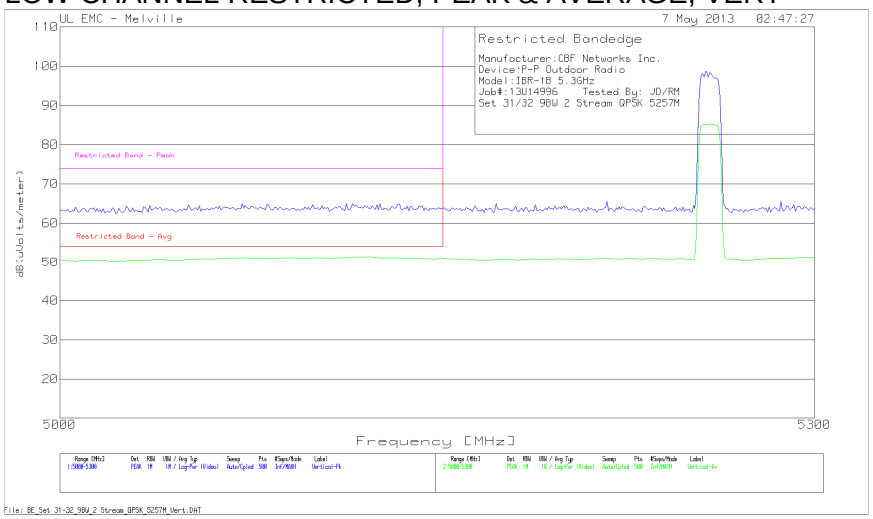
9.5 TX ABOVE 1 GHz 802.11a (SISO) MODE IN THE 5.3 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL) 9MHz QAM 4 (MIMO)

RESTRICTED BANDEDGE (LOW CHANNEL) 9MHz QAM 4

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



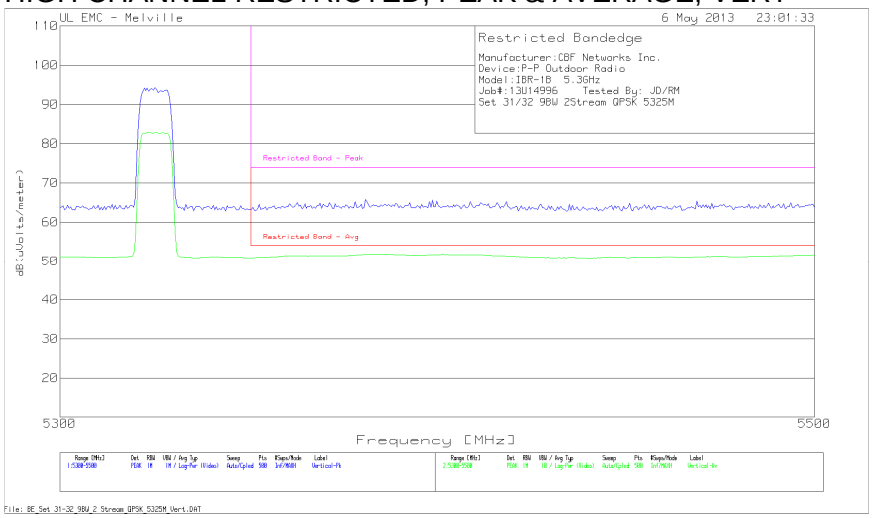
LOW CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



RESTRICTED BANDEDGE (HIGH CHANNEL) 9MHz QAM 4

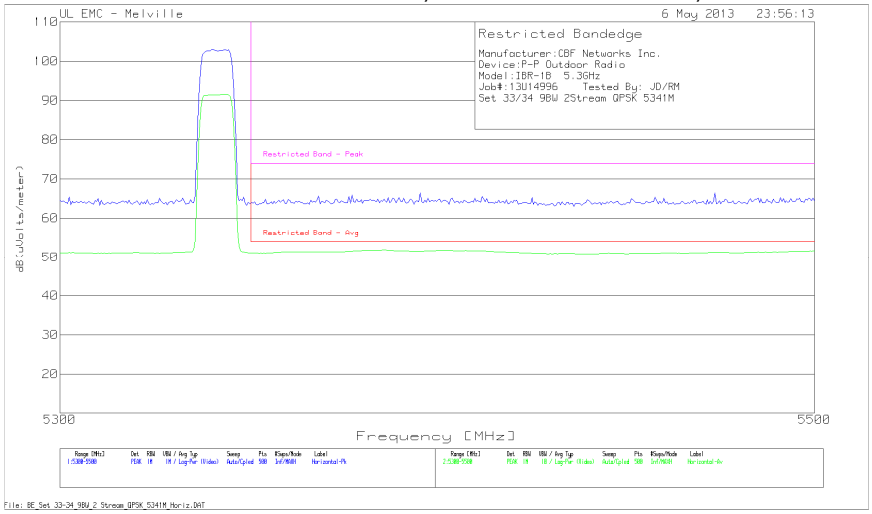
HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

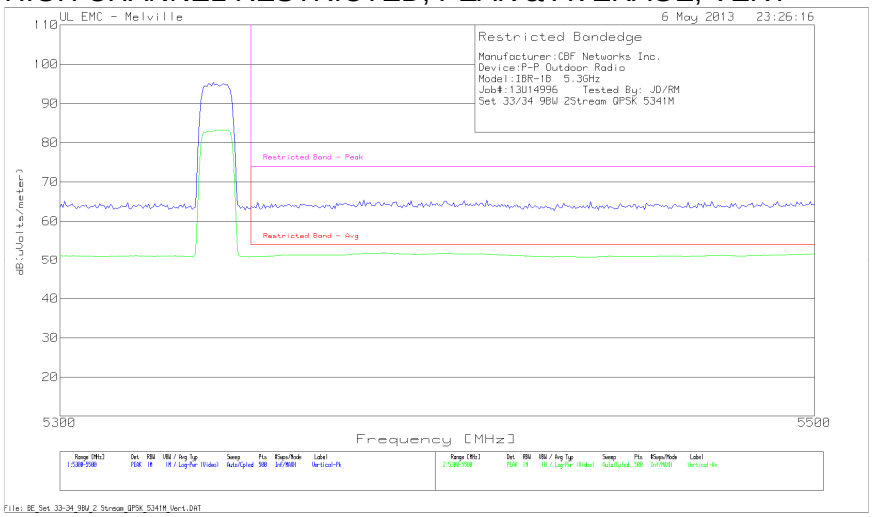


RESTRICTED BANDEDGE (HIGH CHANNEL) 9MHz QAM 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

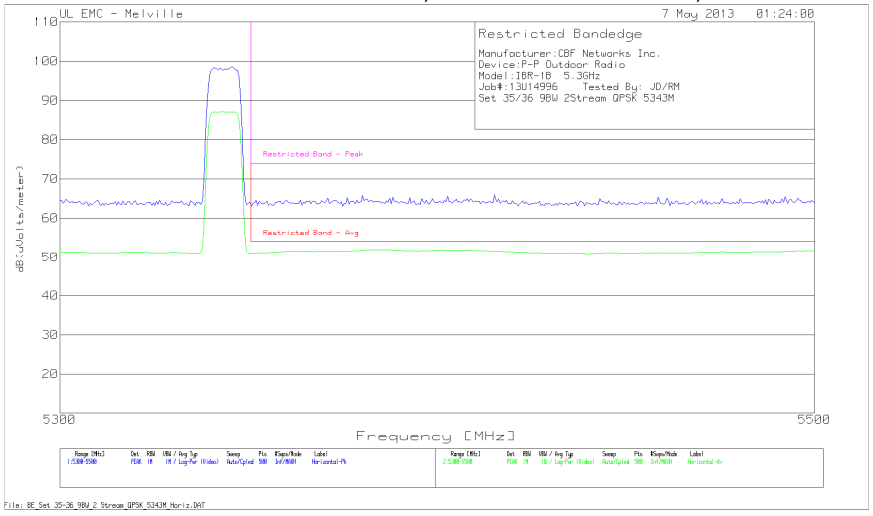


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT

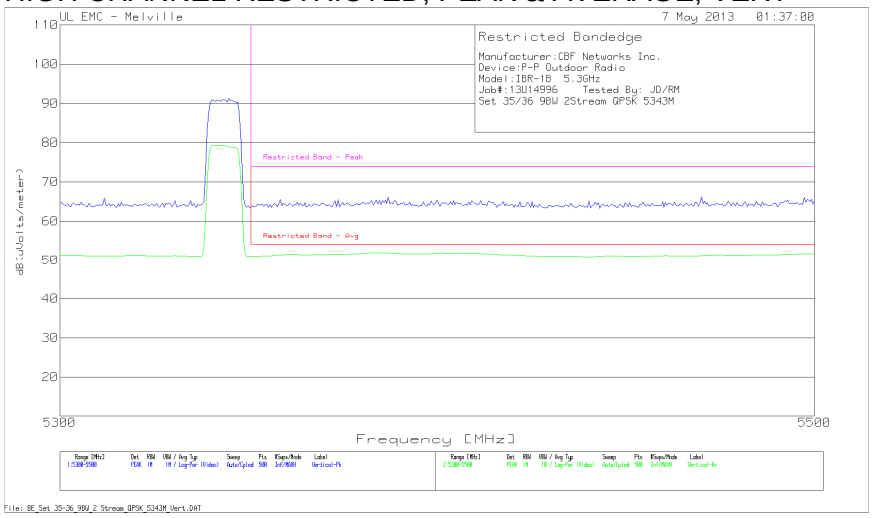


RESTRICTED BANDEDGE (HIGH CHANNEL) 9MHz 4

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

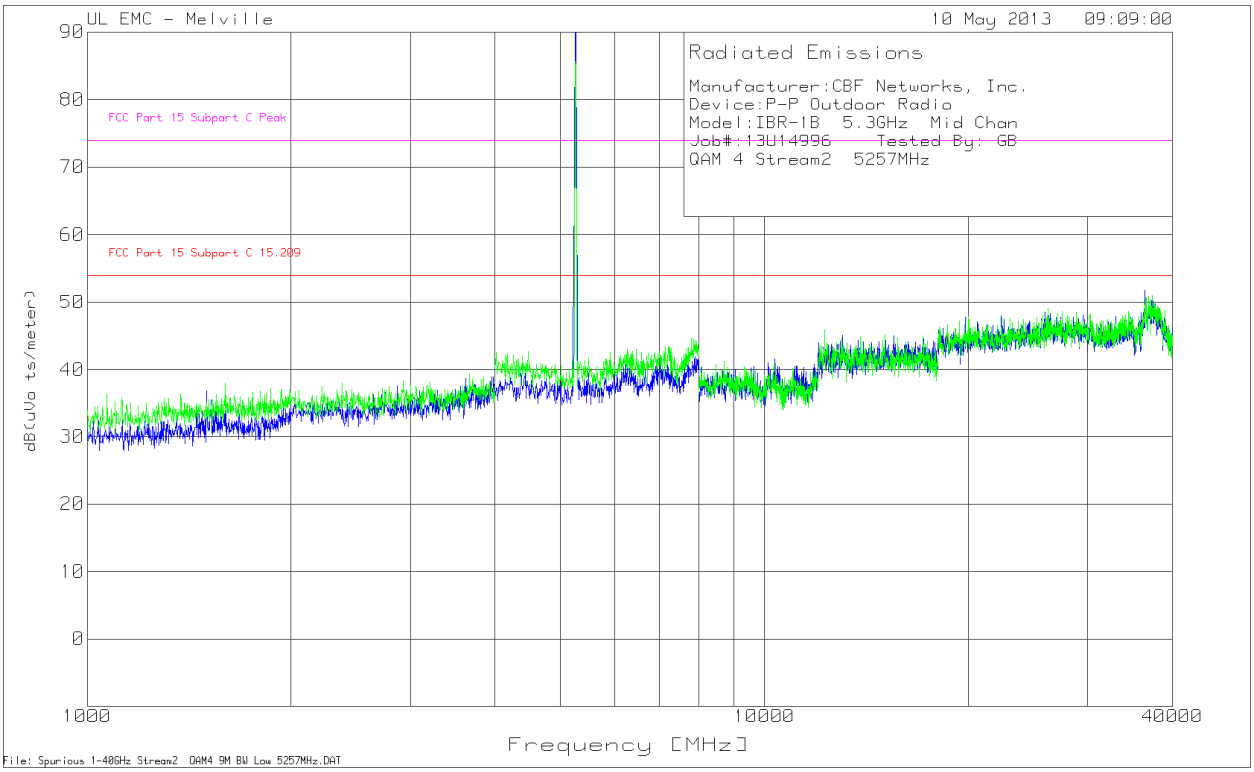


HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



HARMONICS AND SPURIOUS EMISSIONS

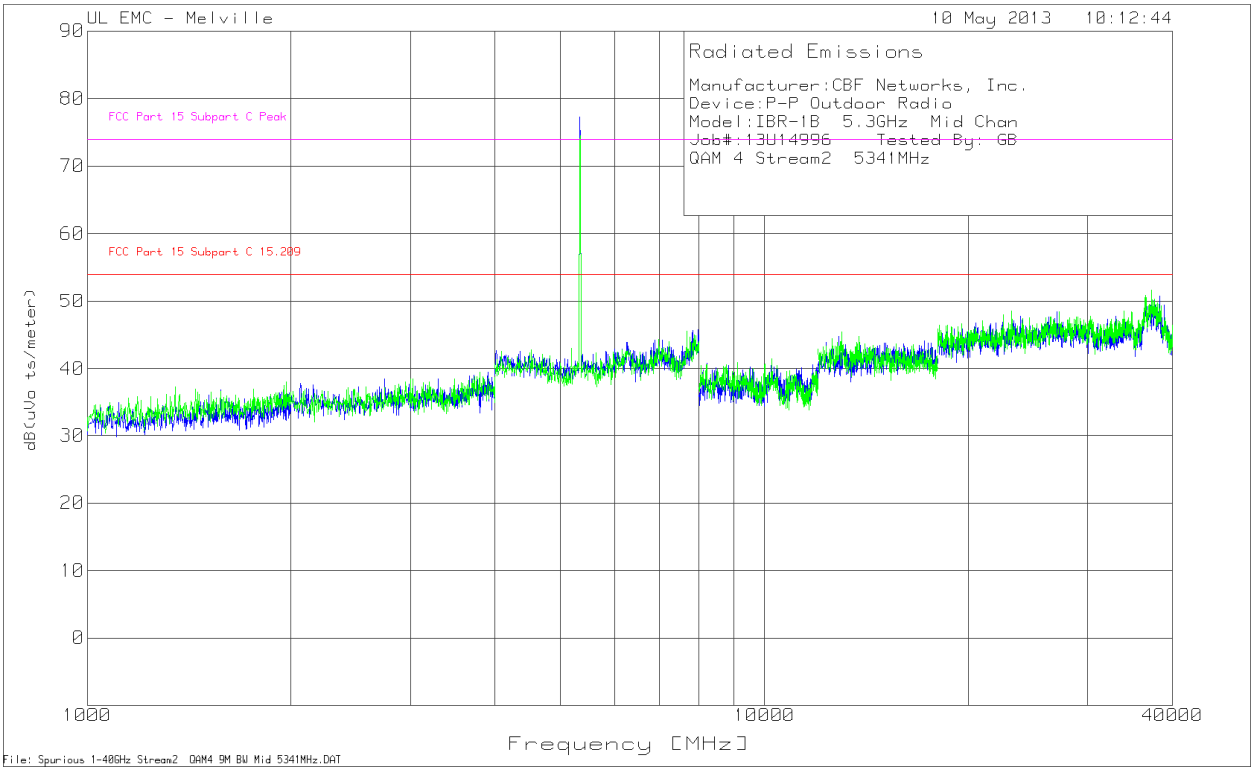
Low channel



No spurious emissions were observed above 1 GHz

HARMONICS AND SPURIOUS EMISSIONS

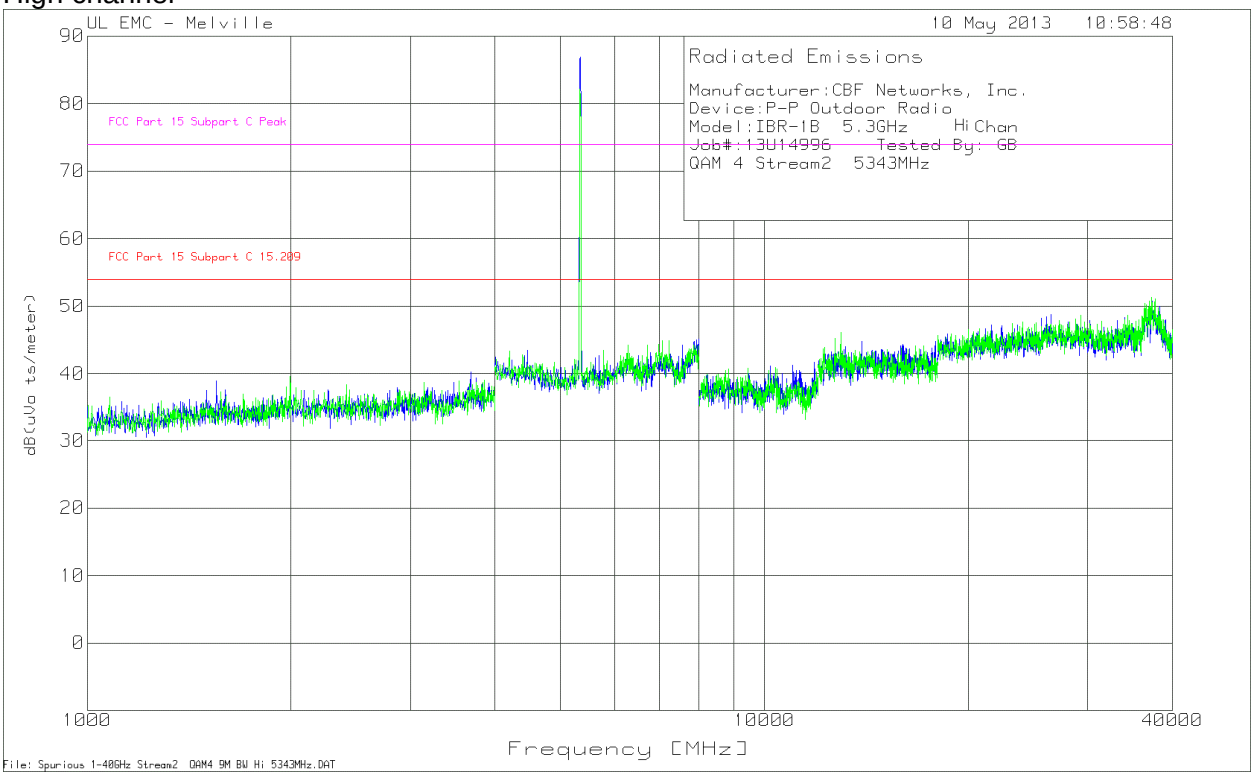
Mid Channel



No spurious emissions were observed above 1 GHz

HARMONICS AND SPURIOUS EMISSIONS

High channel

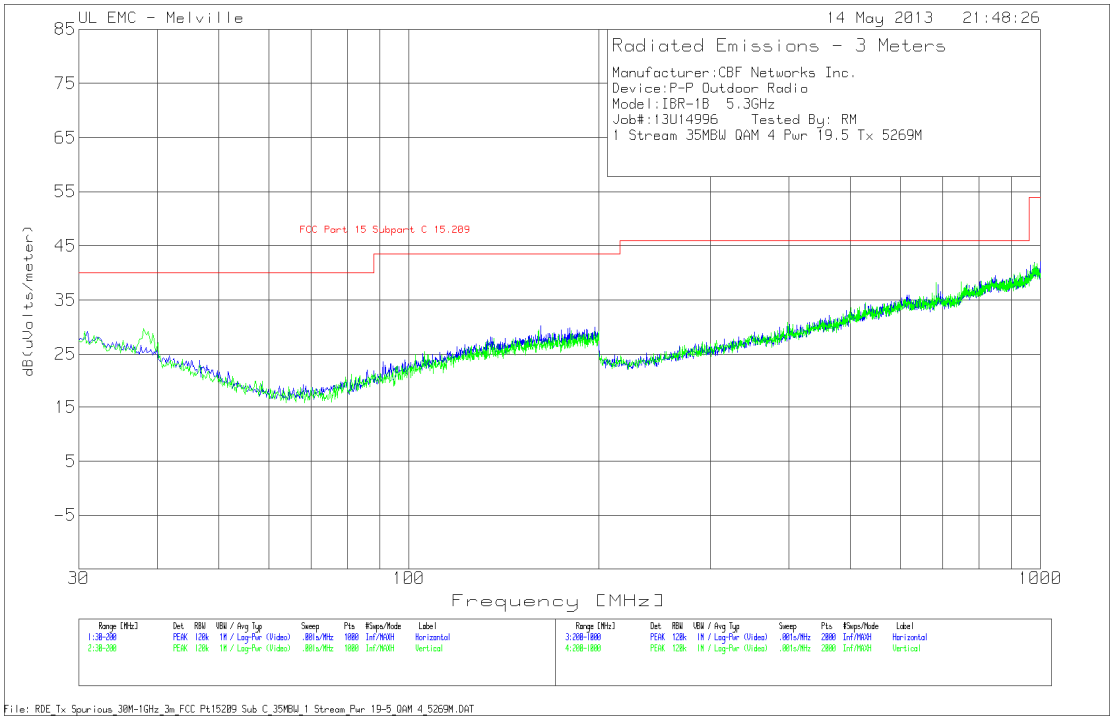


No spurious emissions were observed above 1 GHz

9.6 WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL AND VERTICAL) 35MHz

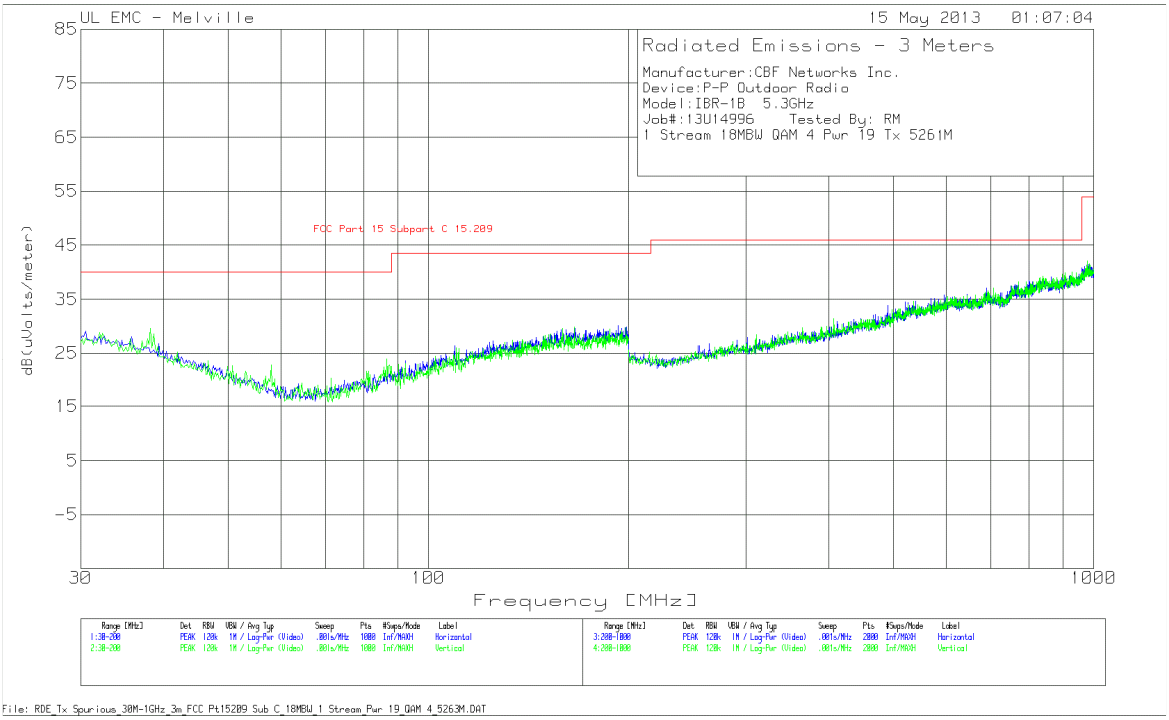
HORIZONTAL & VERTICAL PLOT



No Spurious emissions were observed above the system noise floor.

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL AND VERTICAL) 18MHz

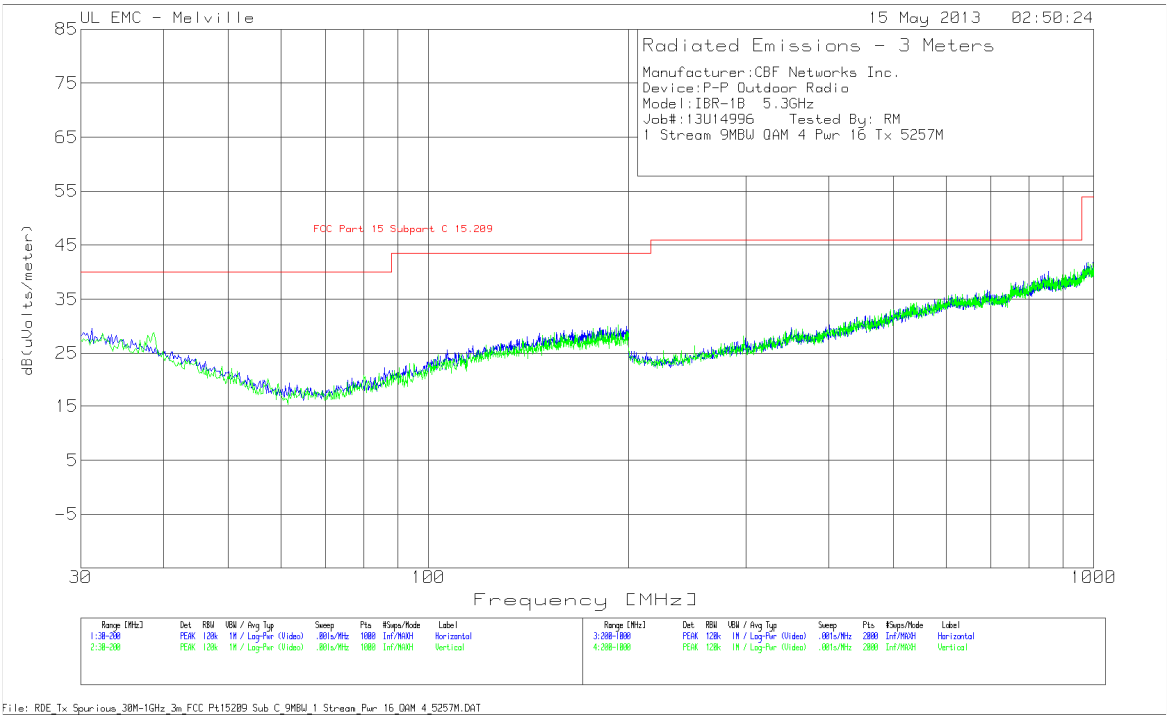
HORIZONTAL & VERTICAL PLOT



No Spurious emissions were observed above the system noise floor.

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL) 9MHz

HORIZONTAL & VERTICAL PLOT



No Spurious emissions were observed above the system noise floor

10 AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

6 WORST EMISSIONS

Manufacturer: CBF Networks, Inc.
Device: P-P outdoor Radio
Model: IBR-1A UNII 5,3GHz
Job: 13U14996 Constant Packet
Tested by: DC/JD

Test Frequency [MHz]	Meter Reading (dBuV)	Transducer Factor [dB]	Gain/Loss Factor [dB]	Level (dB(uVolts))	Limit:1 2
Line - L1 .15 - 30MHz					
.1545	16.11 Av	0	10	26.11	65.8
			Margin [dB]		-39.69
.2085	10.83 Av	0	10	20.83	63.3
			Margin [dB]		-42.47
.294	27.22 Av	0	10	37.22	60.4
			Margin [dB]		-23.18
3.444	18.65 Av	0	10.1	28.75	56
			Margin [dB]		-27.25
6.45	23.25 Av	0	10.3	33.55	60
			Margin [dB]		-26.45
14.694	29.92 Av	0	11	40.92	60
			Margin [dB]		-19.08
Neutral .15 - 30MHz					
.15	15.82 Av	0	10.1	25.92	66
			Margin [dB]		-40.08
.294	27.22 Av	0	10	37.22	60.4
			Margin [dB]		-23.18
.411	21.82 Av	0	10	31.82	57.6
			Margin [dB]		-25.78
3.4125	20.25 Av	0	10.2	30.45	56
			Margin [dB]		-25.55
6.9	18.61 Av	0	10.3	28.91	60
			Margin [dB]		-31.09
15.189	32.53 Av	0	11.1	43.63	60
			Margin [dB]		-16.37

LIMIT 1: FCC Part 15 Subpart C Avg.

QP - Quasi-Peak detector
Av - average detection

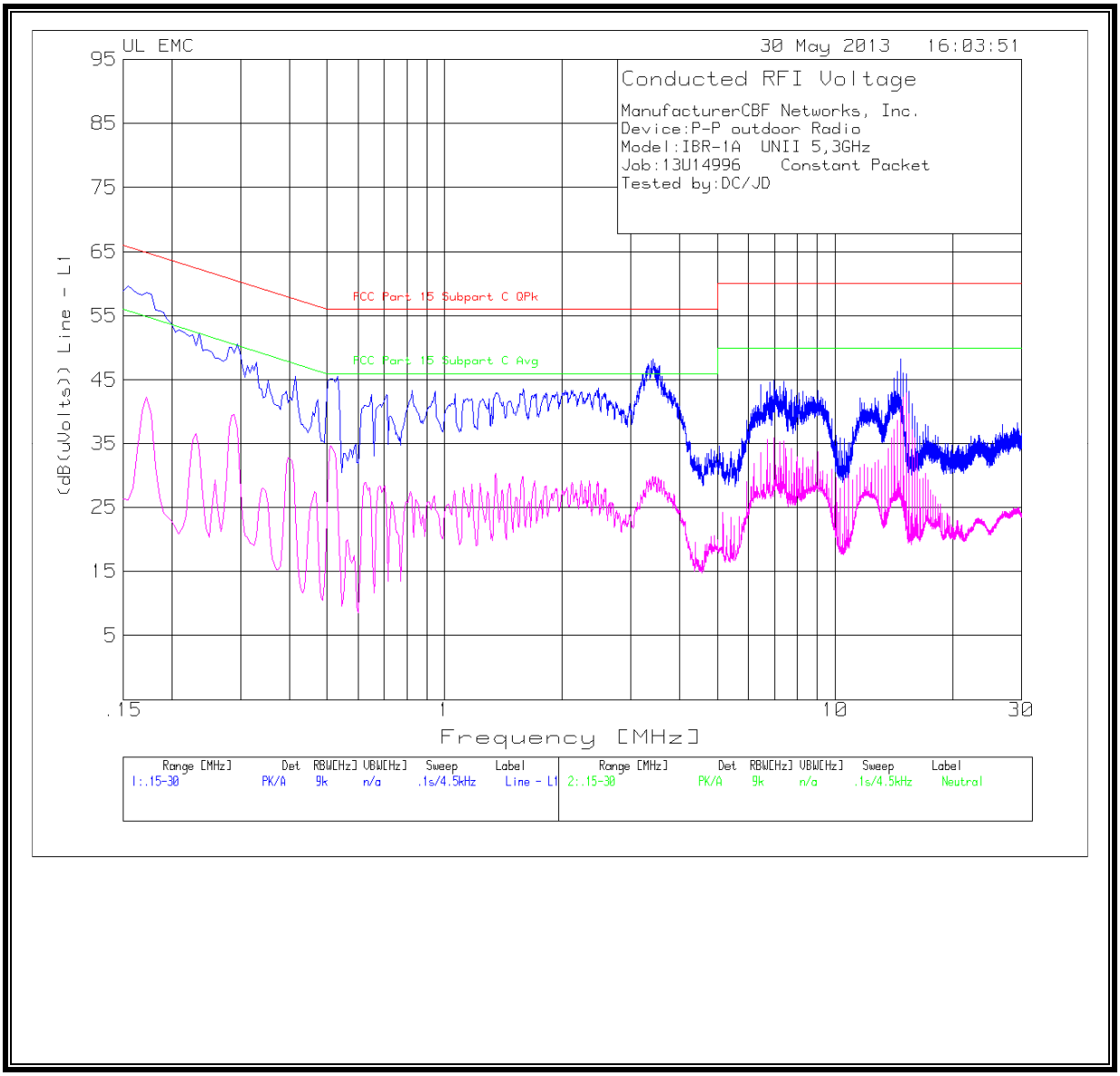
Manufacturer: CBF Networks, Inc.
Device: P-P outdoor Radio
Model: IBR-1A UNII 5,3GHz
Job: 13U14996 Constant Packet
Tested by: DC/JD

Test Frequency [MHz]	Meter Reading (dBuV)	Transducer	Factor	Gain/Loss Factor [dB]	Level (dB(uVolts))	Limit:1	2	3	4	5	6
Line - L1 .15 - 30MHz											
.15	39.37 QP	0		10	49.37	66	56	-	-	-	-
				Margin [dB]:		-16.63	-6.63	-	-	-	-
.2067	33.33 QP	0		10	43.33	63.34	53.34	-	-	-	-
				Margin [dB]:		-20.01	-10.01	-	-	-	-
.2976	38.82 QP	0		10	48.82	60.31	50.31	-	-	-	-
				Margin [dB]:		-11.49	-1.49	-	-	-	-
3.4449	33.61 QP	0		10.1	43.71	56	46	-	-	-	-
				Margin [dB]:		-12.29	-2.29	-	-	-	-
6.4464	27.97 QP	0		10.3	38.27	60	50	-	-	-	-
				Margin [dB]:		-21.73	-11.73	-	-	-	-
14.6976	32.5 QP	0		11	43.5	60	50	-	-	-	-
				Margin [dB]:		-16.5	-6.5	-	-	-	-
3.2955	35.1 QP	0		10.1	45.2	56	46	-	-	-	-
				Margin [dB]:		-10.8	-.8	-	-	-	-
6.7875	31.05 QP	0		10.3	41.35	60	50	-	-	-	-
				Margin [dB]:		-18.65	-8.65	-	-	-	-
14.5302	27.71 QP	0		10.9	38.61	60	50	-	-	-	-
				Margin [dB]:		-21.39	-11.39	-	-	-	-
Neutral .15 - 30MHz											
.1518	40.67 QP	0		10.1	50.77	65.9	55.9	-	-	-	-
				Margin [dB]:		-15.13	-5.13	-	-	-	-
.1563	39.85 QP	0		10.1	49.95	65.66	55.66	-	-	-	-
				Margin [dB]:		-15.71	-5.71	-	-	-	-
.2967	38.71 QP	0		10	48.71	60.33	50.33	-	-	-	-
				Margin [dB]:		-11.62	-1.62	-	-	-	-
.4146	34.11 QP	0		10	44.11	57.56	47.56	-	-	-	-
				Margin [dB]:		-13.45	-3.45	-	-	-	-
3.408	34.51 QP	0		10.2	44.71	56	46	-	-	-	-
				Margin [dB]:		-11.29	-1.29	-	-	-	-
6.8982	23.62 QP	0		10.3	33.92	60	50	-	-	-	-
				Margin [dB]:		-26.08	-16.08	-	-	-	-
15.1926	22.22 QP	0		11.1	33.32	60	50	-	-	-	-
				Margin [dB]:		-26.68	-16.68	-	-	-	-
.1833	40.34 QP	0		10	50.34	64.33	54.33	-	-	-	-
				Margin [dB]:		-13.99	-3.99	-	-	-	-
.303	39.65 QP	0		10	49.65	60.16	50.16	-	-	-	-
				Margin [dB]:		-10.51	-.51	-	-	-	-
.52395	38.36 QP	0		10.1	48.46	56	46	-	-	-	-
				Margin [dB]:		-7.54	2.46	-	-	-	-
.7287	36.26 QP	0		10.1	46.36	56	46	-	-	-	-
				Margin [dB]:		-9.64	.36	-	-	-	-
1.2705	35.75 QP	0		10.1	45.85	56	46	-	-	-	-
				Margin [dB]:		-10.15	-.15	-	-	-	-
1.6161	35.22 QP	0		10.1	45.32	56	46	-	-	-	-
				Margin [dB]:		-10.68	-.68	-	-	-	-
3.2865	35.78 QP	0		10.2	45.98	56	46	-	-	-	-
				Margin [dB]:		-10.02	-.02	-	-	-	-
7.7622	23.06 QP	0		10.4	33.46	60	50	-	-	-	-
				Margin [dB]:		-26.54	-16.54	-	-	-	-
14.7714	25.06 QP	0		11	36.06	60	50	-	-	-	-
				Margin [dB]:		-23.94	-13.94	-	-	-	-

QP - Quasi-Peak detector
Av - average detection

LIMIT 1: FCC Part 15 Subpart C QPk
LIMIT 2: FCC Part 15 Subpart C Avg

LINE 1 RESULTS



LINE 2 RESULTS