FCC 47 CFR PART 15 SUBPART C
INDUSTRY (ISED) CANADA RSS-247 ISSUE 1

CERTIFICATION TEST REPORT

FOR

WIRELESS ACCESS POINT

MODEL NUMBER: ACWAP0727

FCC ID: WPX-ACWAP
IC: 8014A-ACWAP

REPORT NUMBER: 11387322-E1

ISSUE DATE: 2016-10-25

Prepared for
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Revision History

Ver.	Issue Date	Revisions	Revised By
1	2016-10-03	Initial Issue	Rick Jankovics
2	2016-10-04	Added statements regarding Line Conducted Emissions in Section 5.5 and add Line Conducted Module (Section 10).	Jeff Moser
3	2016-10-06	Revised model number.	Jeff Moser
4	2016-10-11	Revised the directional antenna gain calculation for legacy modes (802.11 b/g).	Jeff Moser
5	2016-10-25	Added MCS0 data for 802.11nHT20 and nHT40. Revised model number.	Jeff Moser

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: GOGO LLC
111 N. CANAL ST.
CHICAGO, ILLINOIS 60606 USA

EUT DESCRIPTION: Wireless Access Point

MODEL: ACWAP0727, p/n P33206

SERIAL NUMBER: ENG001

DATE TESTED: 2016-06-20,
2016-08-20 to 2016-10-24

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
Industry Canada (ISED CANADA) RSS-247 Issue 1	Pass
Industry Canada (ISED CANADA) RSS-GEN Issue 4	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 LLC By:

Jeff Moser
EMC Program Manager
UL – Consumer Technology Division

Prepared By:

Richard Jankovics
WiSE Engineer
UL – Consumer Technology Division

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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 KDB 558074, ANSI C63.10:2013, RSS-GEN Issue 4, and RSS-247 Issue 1.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA and 2800 Suite B, Perimeter Park Drive, Morrisville, NC 27560.

12 Laboratory Dr., RTP, NC 27709
☐ Chamber A
☐ Chamber C

2800 Suite B Perimeter Park Dr., Morrisville, NC 27560
☒ Chamber NORTH
☒ Chamber SOUTH

The onsite chambers are covered under Industry (ISED) Canada company address code 2180C with site numbers 2180C -1 through 2180C-4, respectively.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at http://www.nist.gov/nvlap/.

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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:

PARAMETER	UNCERTAINTY
Total RF power, conducted	± 0.45 dB
RF power density, conducted	± 1.5 dB
Spurious emissions, conducted	± 2.94 dB
All emissions, radiated up to 40 GHz	± 5.36 dB
Temperature	± 0.07°C
Humidity	± 2.26% RH
DC and low frequency voltages	± 1.27%
Conducted Emissions (0.150-30MHz)	± 3.65dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g/n/ac 3x3 SDM Wireless Access Point for Commercial Aircraft.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2472	802.11b	20.90	123.03
2412 - 2472	802.11g	18.80	75.86
2412 - 2472	802.11n HT20 (CDD)	20.03	100.69
2412 - 2472	802.11n HT20 (SDM)	19.71	93.54
2422 - 2462	802.11n HT40 (CDD)	16.44	44.06
2422 - 2462	802.11n HT40 (SDM)	18.92	77.98

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes 3 omni-directional dome antennas connected via coaxial cable, each with a maximum gain of:

Frequency Range (MHz)	Antenna Gain (dBi)
2400 - 2700	+6
4900 - 5935	+8

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was ArubaOS version 6.4.2.0.

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5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission was performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. Line Conducted Emissions was not performed since the EUT is intended for installation on an aircraft.

The fundamental of the EUT chassis with terminated antenna ports was investigated in three orthogonal orientations X,Y,Z, it was determined that X (flat) orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Additionally, the fundamental of the EUT antenna was investigated in two orthogonal orientations Horizontal and Vertical, it was determined that the horizontal orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT antenna in horizontal orientation.

Note – The antennas are omni-directional, therefore only horizontal and vertical orientations were investigated.

Based on the baseline scan, the worst-case data rates were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20 CDD: MCS0
802.11n HT20 SDM: MCS16
802.11n HT40 CDD: MCS0
802.11n HT40 SDM: MCS16

Note – 802.11n Power, Radiated Band Edge and Radiated Spurious were performed at both CDD (MCS0) and SDM (MCS16) modes. All other tests were performed at SDM (MCS16).

Power will be limited as follows:

Nss < Nant: max power per chain constrained by CDD 3x3 MIMO, Nss = 1 power per chain.
Nss = Nant: max power per chain constrained by SDM 3x3 MIMO power per chain.

Radiated emissions for EUT with antenna was performed and passed; therefore, restricted band antenna port spurious was not performed.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	T440	NA	NA
Power Brick	Lenovo	ADLX65NLC2A	NA	NA

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Power	1	Proprietary	Proprietary	1.5	
2	Antenna	3	RF	Coaxial	1	
3	USB	1	USB	USB	1	Not permanently connected in the field
4	Ethernet	1	Quadrax	Shielded	35	Connected to laptop outside of chamber

TEST SETUP

The EUT connected to a laptop to execute software to exercise the radio card.

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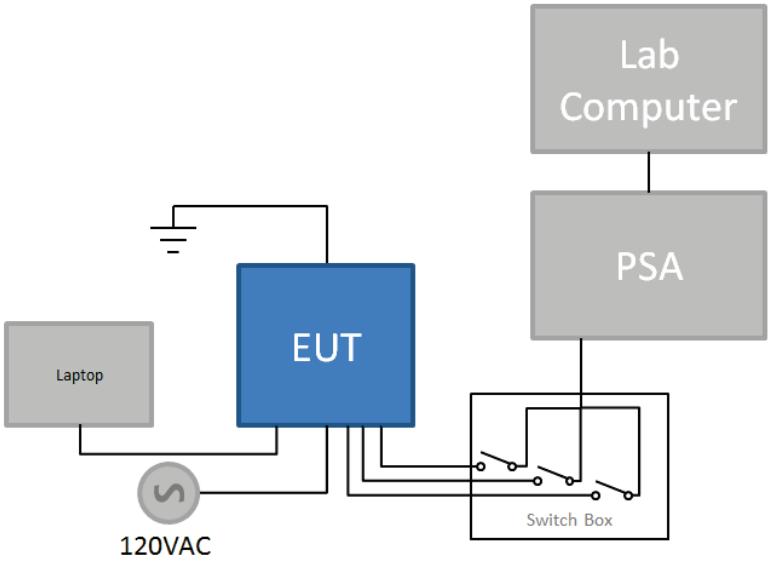
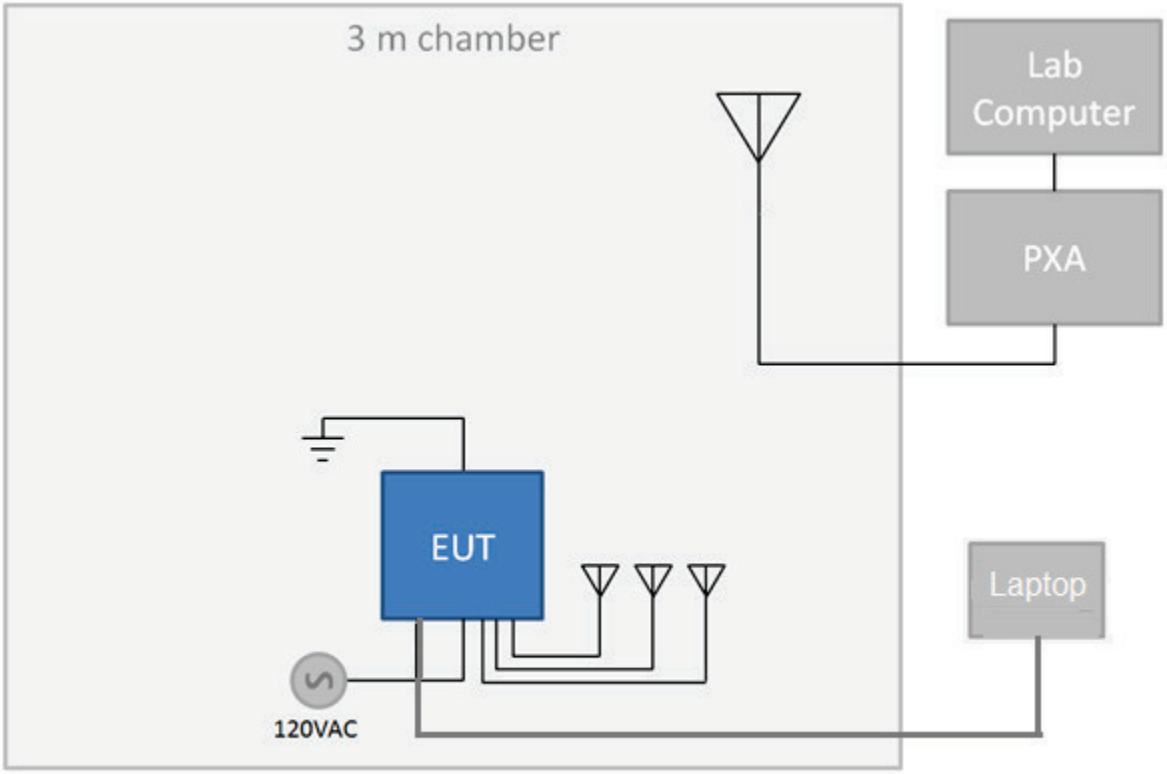
SETUP DIAGRAM FOR TESTS

Conducted Measurements



Radiated Measurements



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6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz	**(Loop Ant.)**			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2015-12-08	2016-12-31
	30-1000 MHz				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2016-06-07	2017-06-30
	1-18 GHz				
AT0069	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2016-03-07	2017-03-31
	18-40 GHz				
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2016-09-06	2017-09-30
	Gain-Loss Chains				
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2015-10-07	2016-10-31
S-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2016-06-26	2017-06-30
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2015-08-22, 2016-08-28	2015-08-31, 2017-08-28
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2016-08-28	2017-08-28
	Receiver & Software				
SA0025	Spectrum Analyzer	Agilent	N9030A	2016-03-17	2017-03-31
SA0026 (18-40GHz RSE)	Spectrum Analyzer	Agilent	N9030A	2016-02-24	2017-02-28
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
HI0078	Temp/Humid/Pressure Meter	Springfield Precision	PreciseTemp	2016-06-13	2017-06-13

Note – This test area was used from 2016-08-20 to 2016-09-30.

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Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - North Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz	**(Loop Ant.)**			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2015-12-08	2016-12-31
	30-1000 MHz				
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2016-06-27	2017-06-30
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2016-03-07	2017-03-31
	Gain-Loss Chains				
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2015-10-07	2016-10-31
N-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2016-06-26	2017-06-30
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2015-09-29, 2016-08-28	2016-09-30, 2017-08-28
	Receiver & Software				
SA0027	Spectrum Analyzer	Agilent	N9030A	2016-02-08	2017-02-08
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
139844	Temp/Humid/Pressure Meter	Control Co./Fisher	14-650-118	2016-02-19	2017-02-19

Note – Fundamental checks of the chassis was performed on 2016-06-20. All other testing in this test area was performed from 2016-08-23 to 2016-10-24.

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Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 1				
72822 (SA0019)	Spectrum Analyzer	Agilent Technologies	E4446A	2016-08-25	2017-08-25
PWM002	RF Power Meter	Keysight Technologies	N1911A	2016-06-22	2017-06-22
PWS002	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2016-06-21	2017-06-21
UL139843	Temp/Humid/Pressure Meter	Fisher Scientific	14-650-118	2016-02-19	2017-02-19
	Conducted Room 2				
SA0020	Spectrum Analyzer	Agilent Technologies	E4446A	2016-03-22	2017-03-31
PWM003	RF Power Meter	Keysight Technologies	N1911A	2016-06-21	2017-06-21
PWS004	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2016-06-22	2017-06-30
UL139843	Temp/Humid/Pressure Meter	Fisher Scientific	14-650-118	2016-02-19	2017-02-19

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7. MEASUREMENT METHODS

Duty Cycle: KDB 558074 D01 v03r05 Section 6.0

6 dB BW: KDB 558074 D01 v03r05, Section 8.1.

99% Occupied Bandwidth: ANSI C63.10:2013, Section 6.9.3

Output Power: KDB 558074 D01 v03r05, Section 9.2.3.2.

Power Spectral Density: KDB 558074 D01 v03r05, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r05, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r05, Section 12.1.

General Radiated Emissions: ANSI C63.10:2013 Sections 6.3-6.6

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

Date: 2016-08-31, 2016-09-02, 2016-10-19
Tester: Ron Reichard, Mark Learner

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)
2.4GHz Band						
802.11b 3TX	0.352	0.444	0.793	79.28%	1.01	2.841
802.11g 3TX	0.051	0.151	0.340	34.01%	4.68	19.501
802.11n HT20 3TX - CDD	0.052	0.088	0.591	59.15%	2.28	19.294
802.11n HT20 3TX - SDM	0.051	0.151	0.340	34.01%	4.68	19.501
802.11n HT40 3TX - CDD	0.052	0.067	0.775	77.45%	1.11	19.238
802.11n HT40 3TX - SDM	0.052	0.067	0.772	77.25%	1.12	19.264

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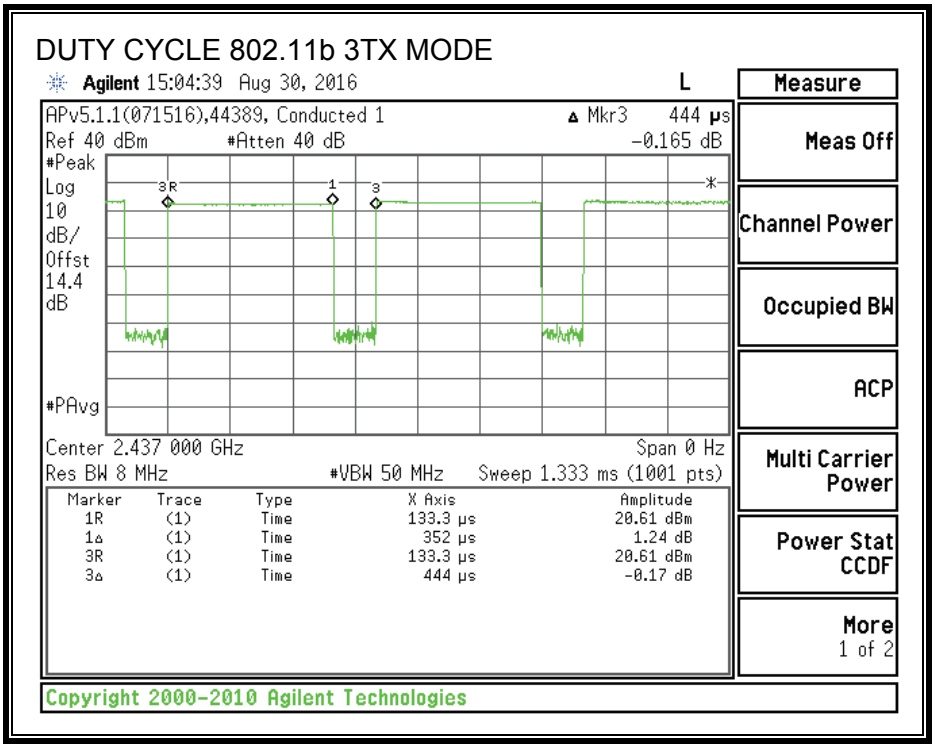
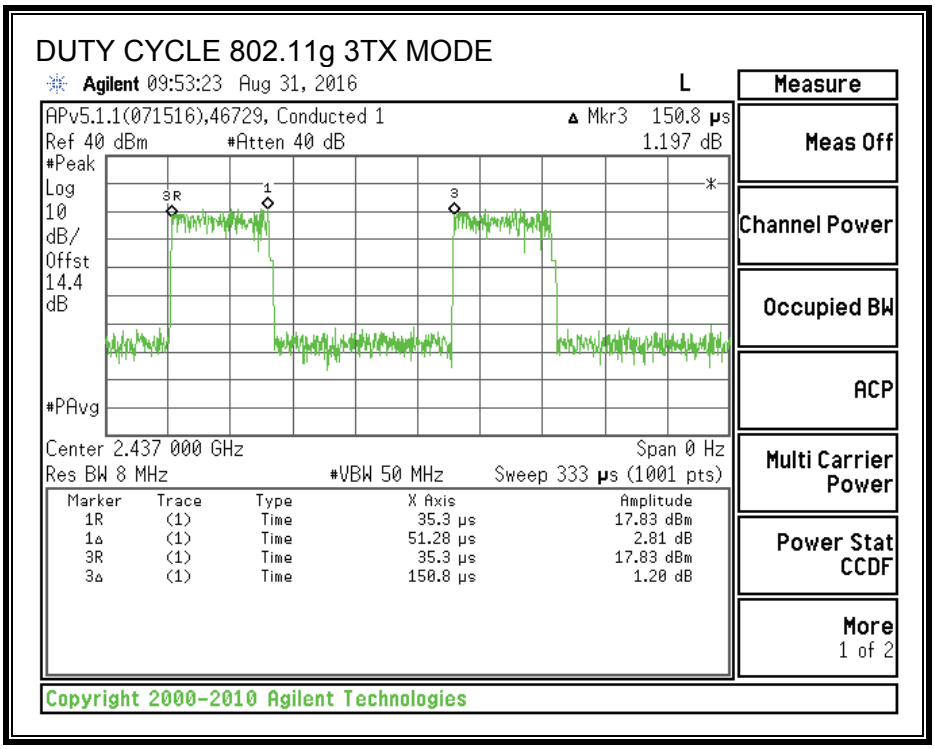
DUTY CYCLE PLOTS

2.4 GHz BAND





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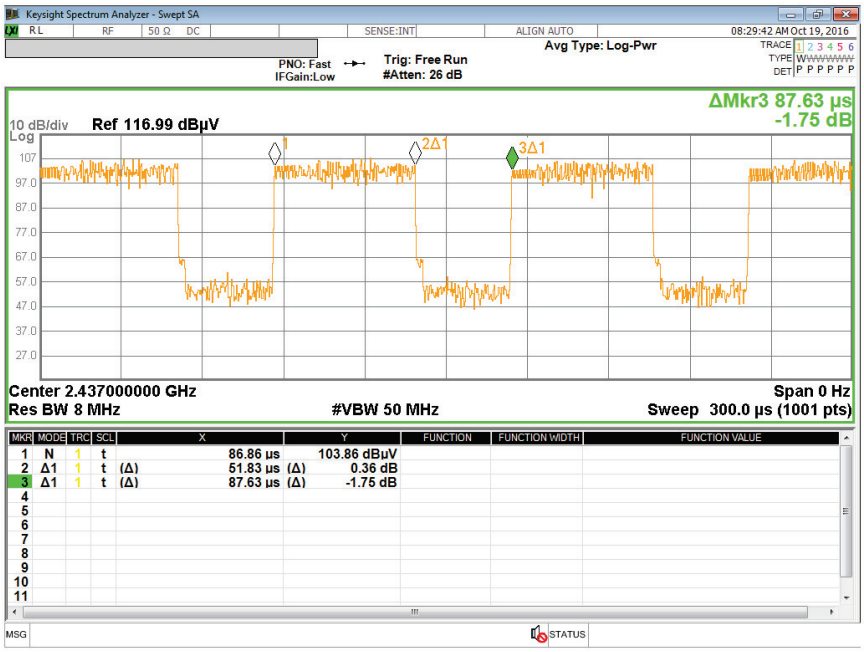
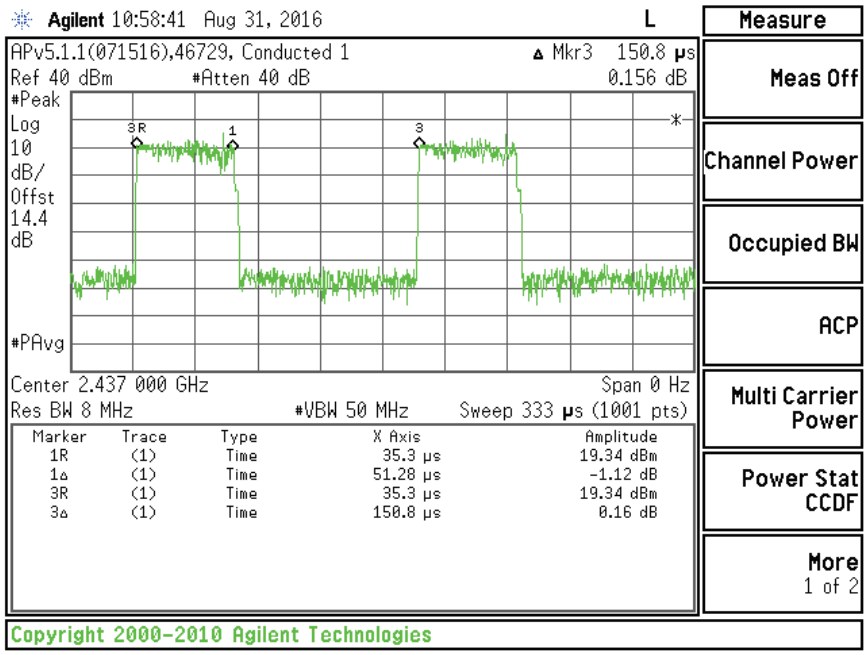
DUTY CYCLE 802.11n HT20 3TX CDD MODE



DUTY CYCLE 802.11n HT20 3TX SDM MODE



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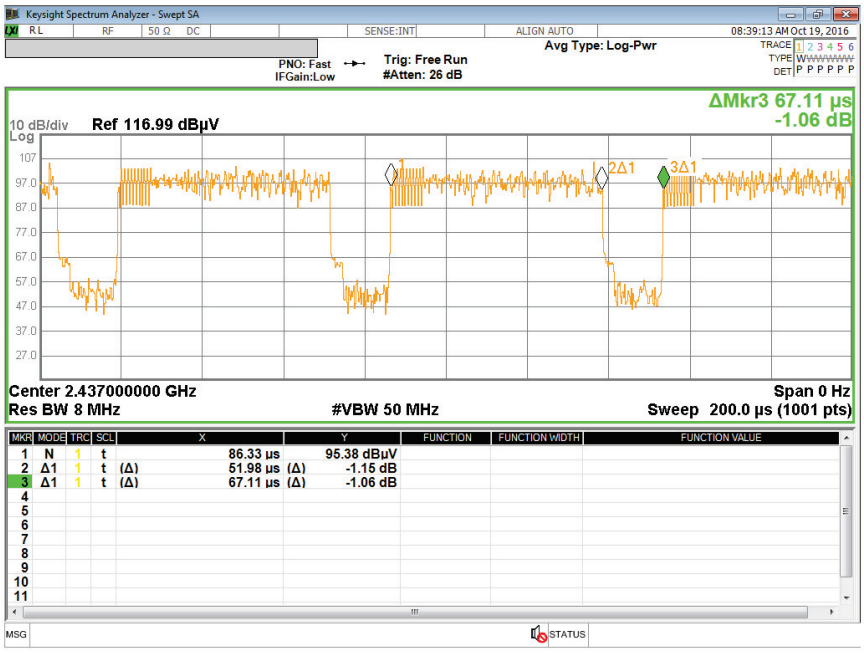
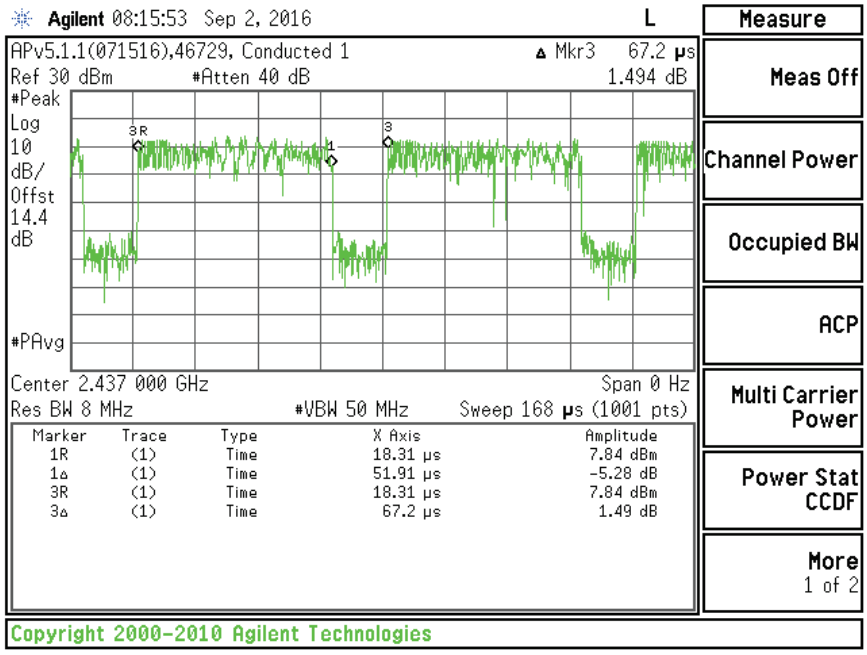
DUTY CYCLE 802.11n HT40 3TX CDD MODE



DUTY CYCLE 802.11n HT40 3TX SDM MODE



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8.2. 802.11b MODE IN THE 2.4 GHz BAND

8.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-247 5.2 (1)

The minimum 6 dB bandwidth shall be at least 500 kHz.

Date: 2016-08-31
Tester: Ron Reichard / Jeff Cabrera

RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	2412	9.072	9.072	8.567	0.5
Mid	2437	8.567	9.030	8.593	0.5
High CH11	2462	9.072	9.044	9.058	0.5
High CH12	2467	9.058	9.044	9.044	0.5
High CH13	2472	9.044	9.016	9.058	0.5

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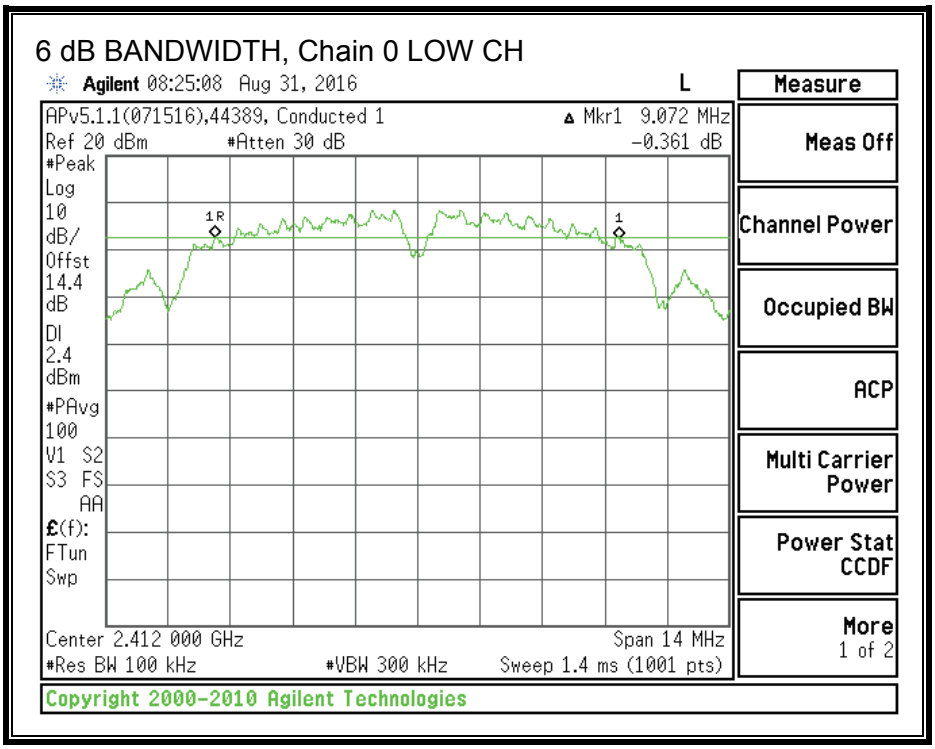
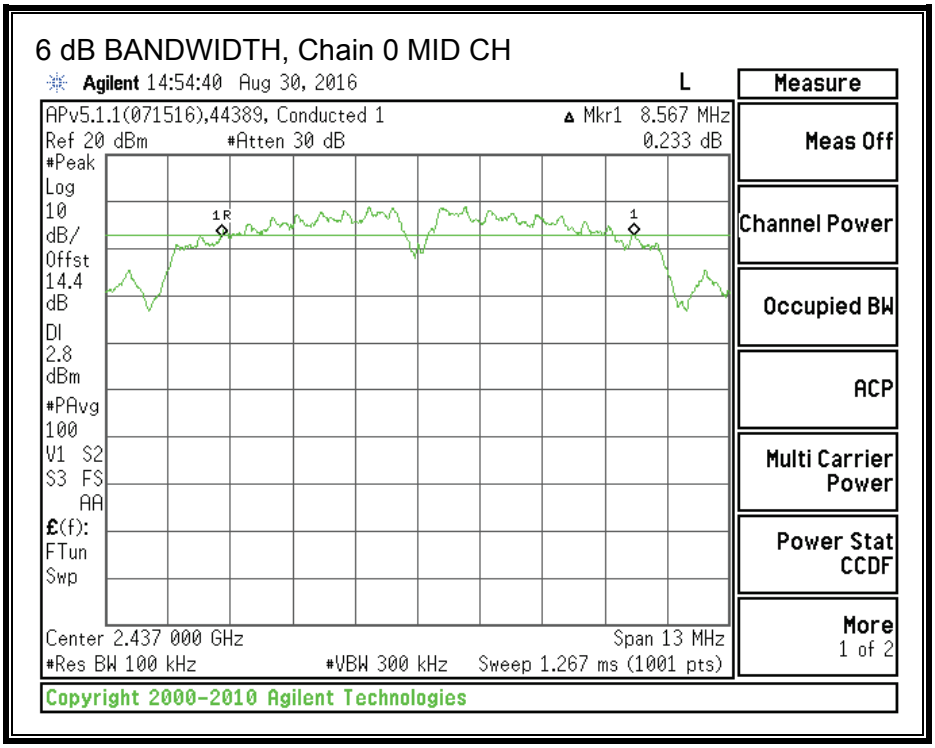
6 dB BANDWIDTH, Chain 0





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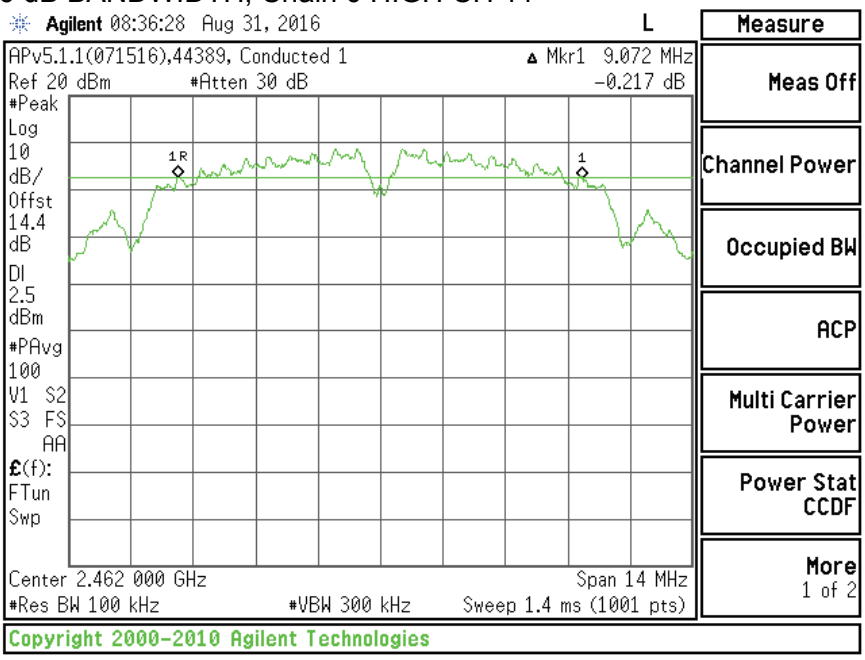
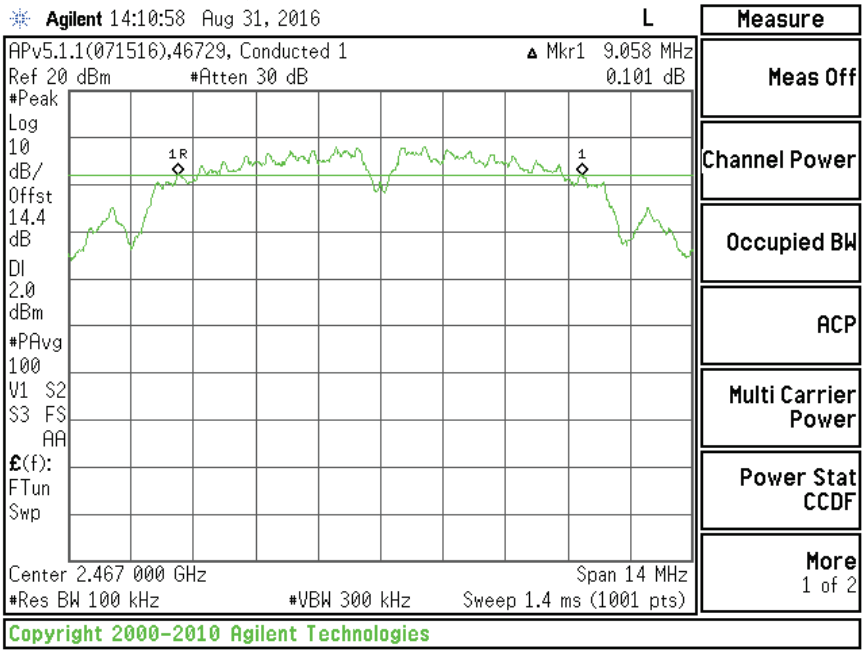
6 dB BANDWIDTH, Chain 0 HIGH CH 11



6 dB BANDWIDTH, Chain 0 HIGH CH 12



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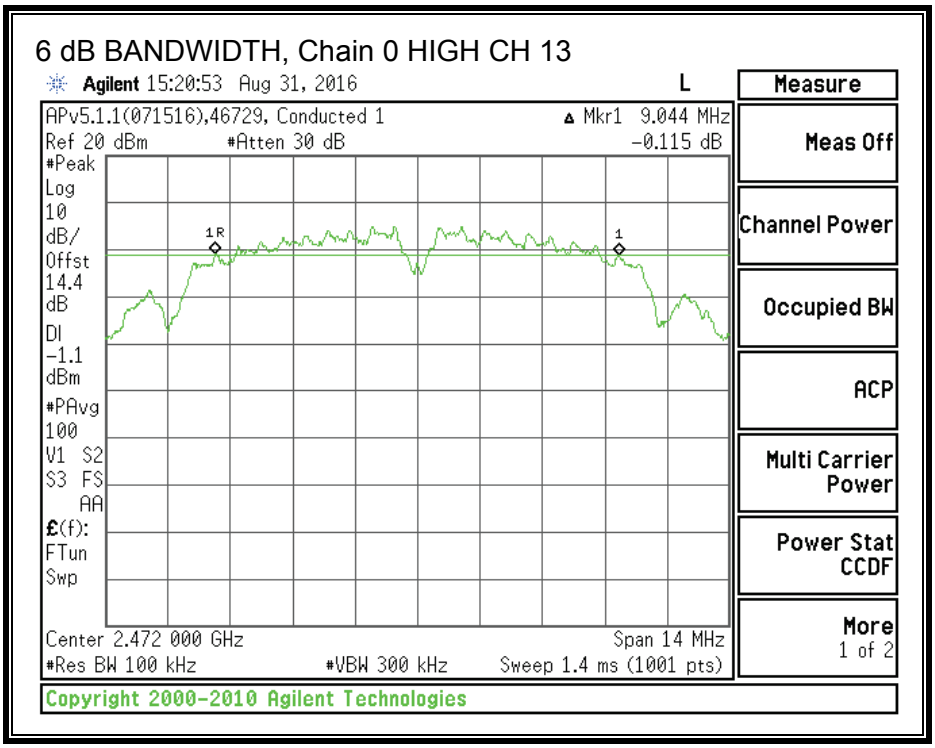
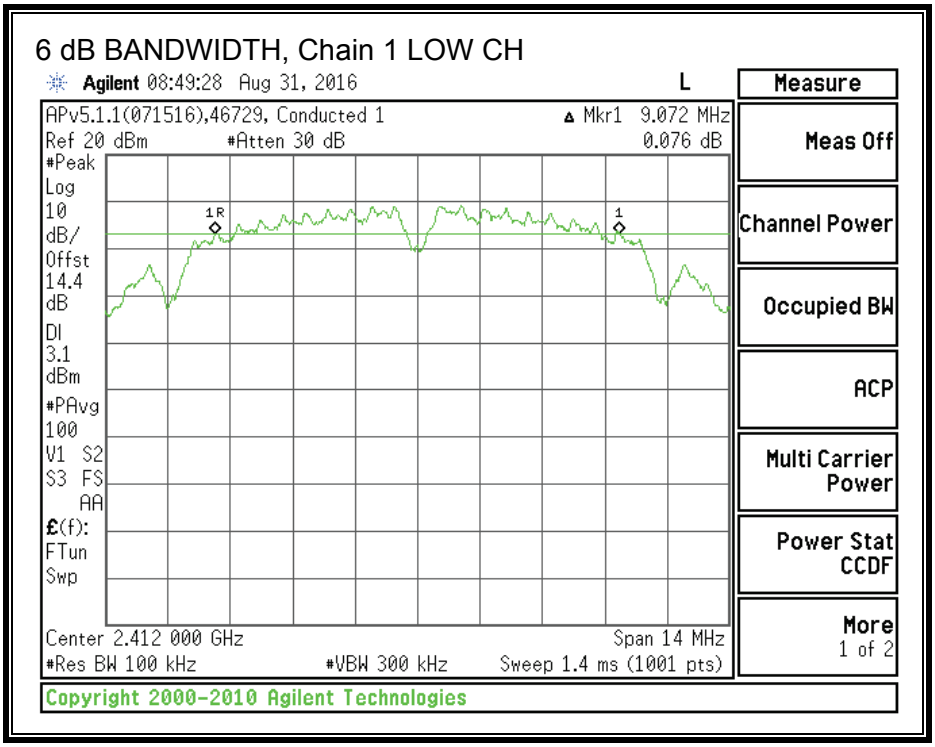


6 dB BANDWIDTH, Chain 1



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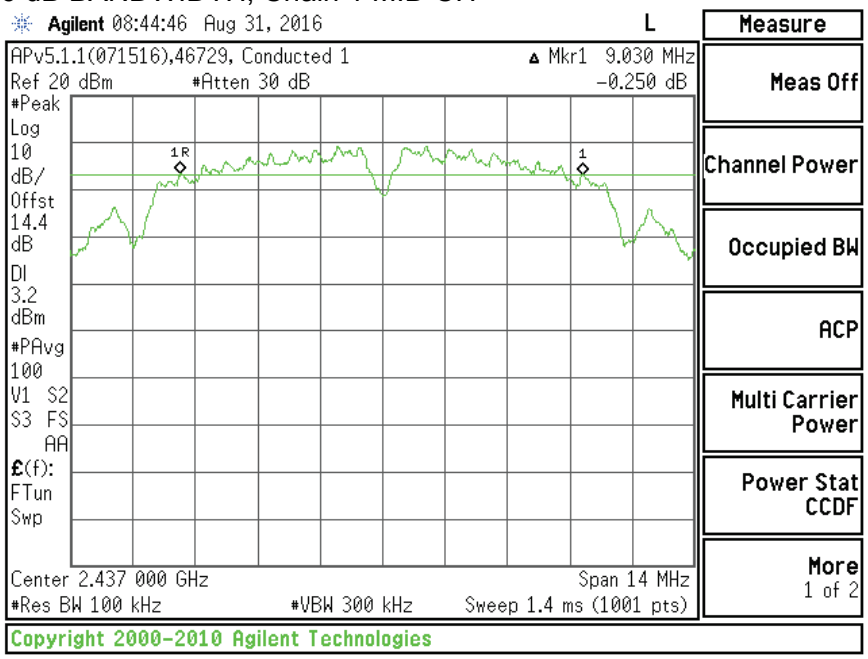
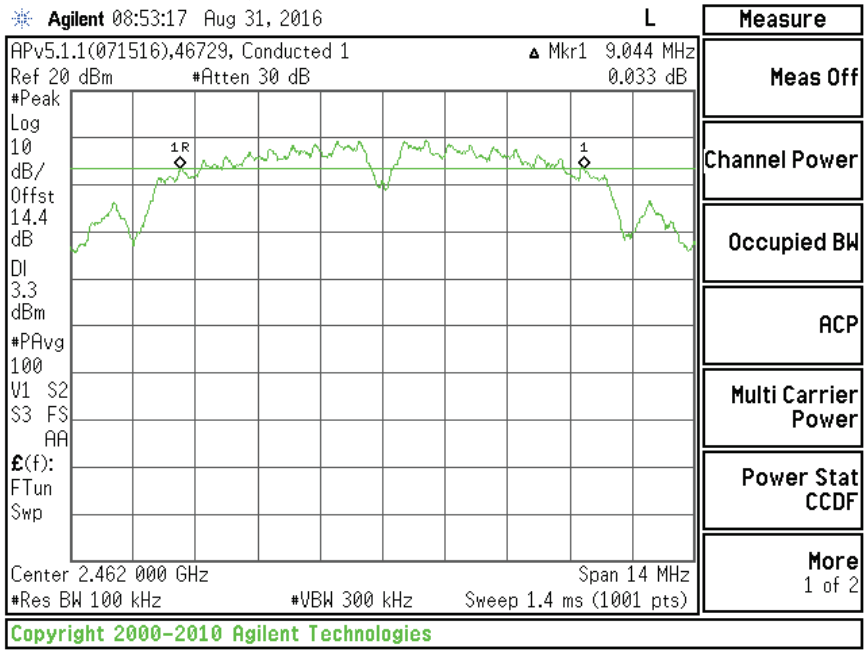
6 dB BANDWIDTH, Chain 1 MID CH



6 dB BANDWIDTH, Chain 1 HIGH CH 11



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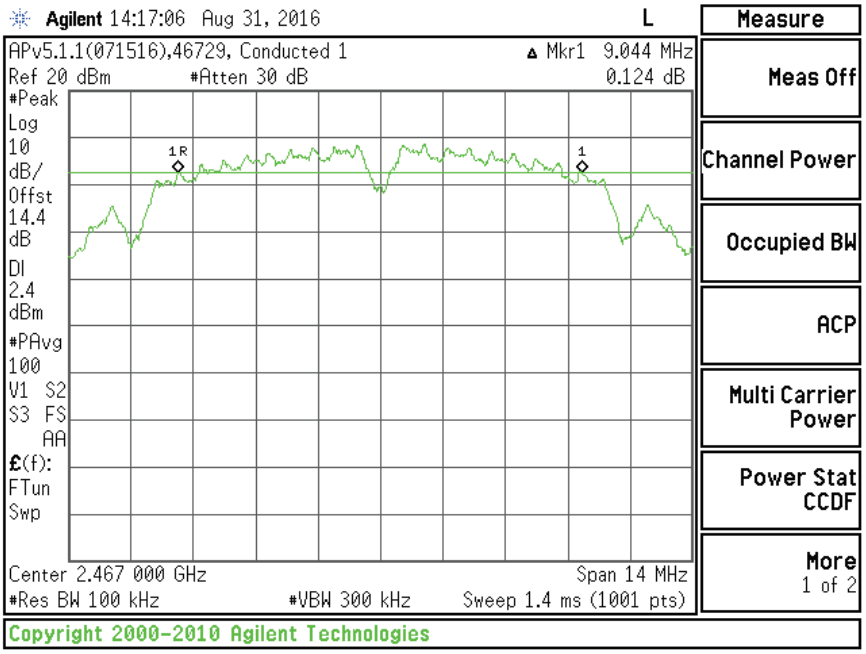
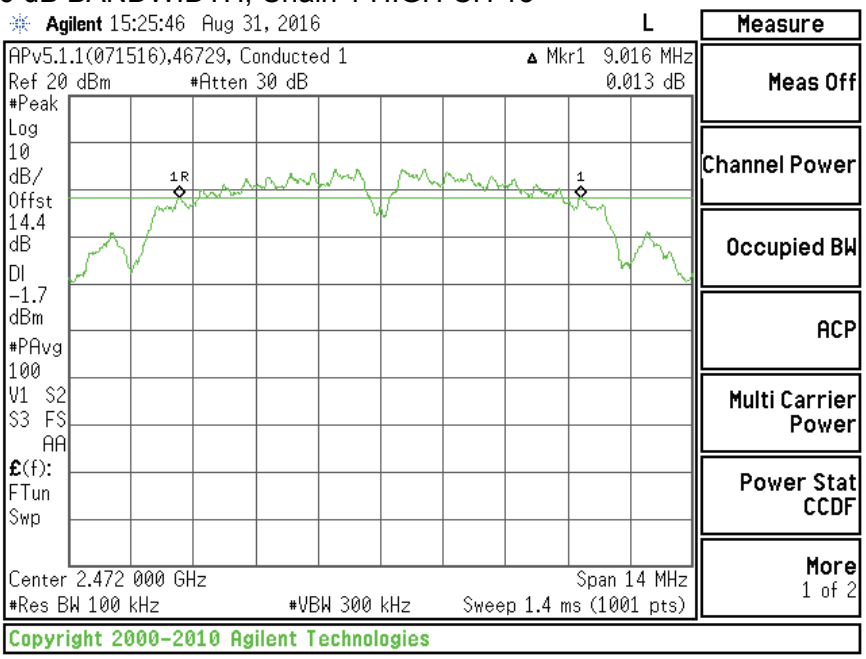
6 dB BANDWIDTH, Chain 1 HIGH CH 12



6 dB BANDWIDTH, Chain 1 HIGH CH 13



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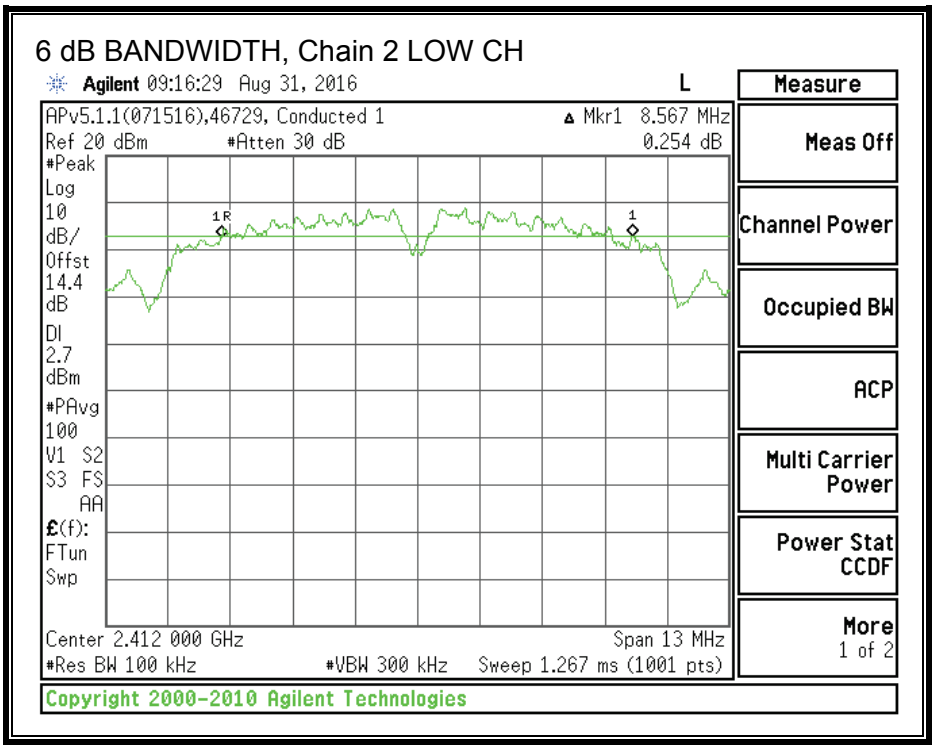
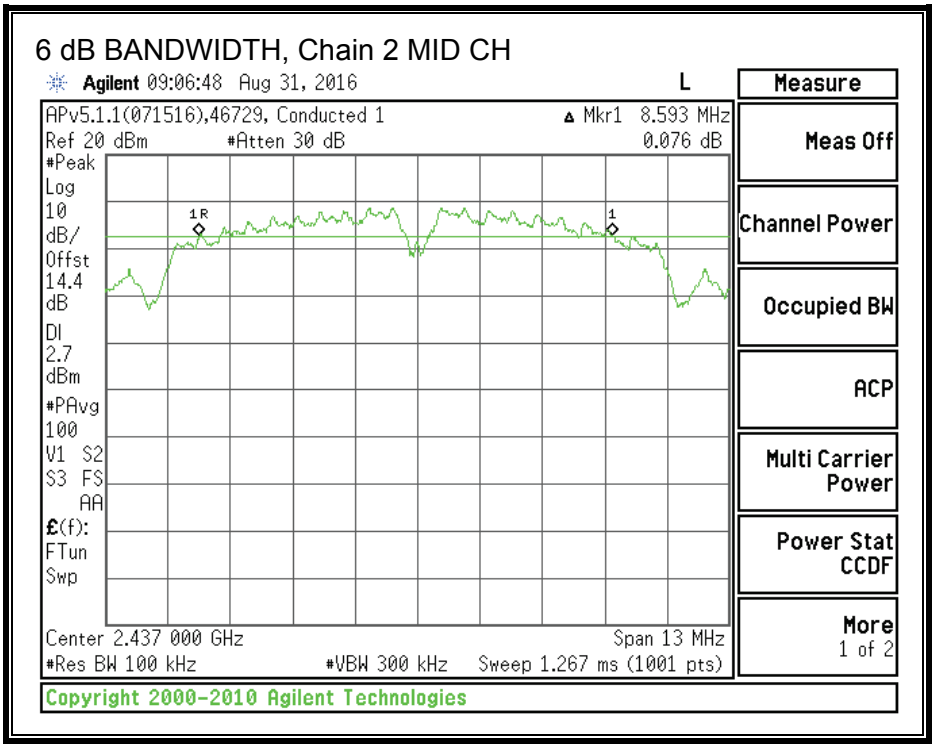
6 dB BANDWIDTH, Chain 2





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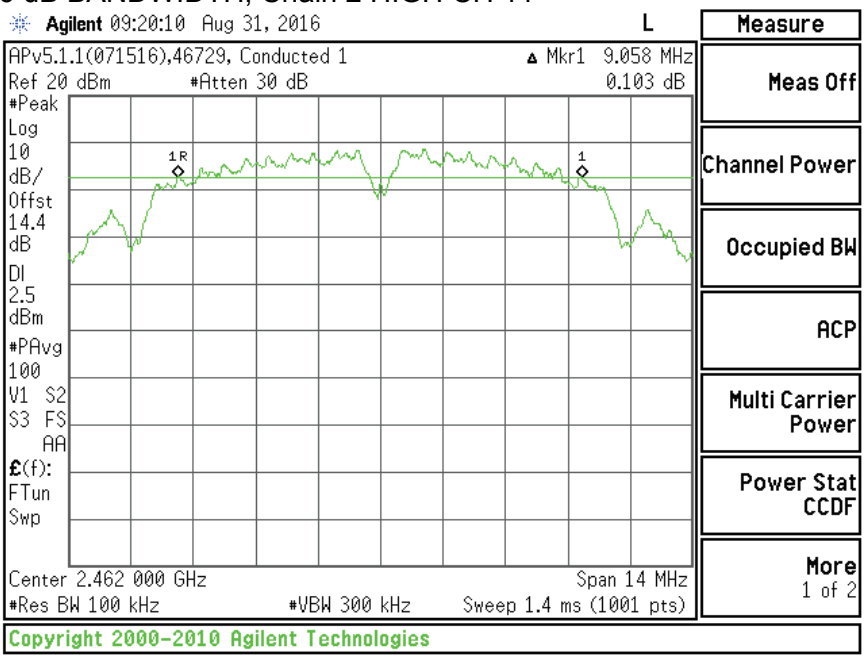
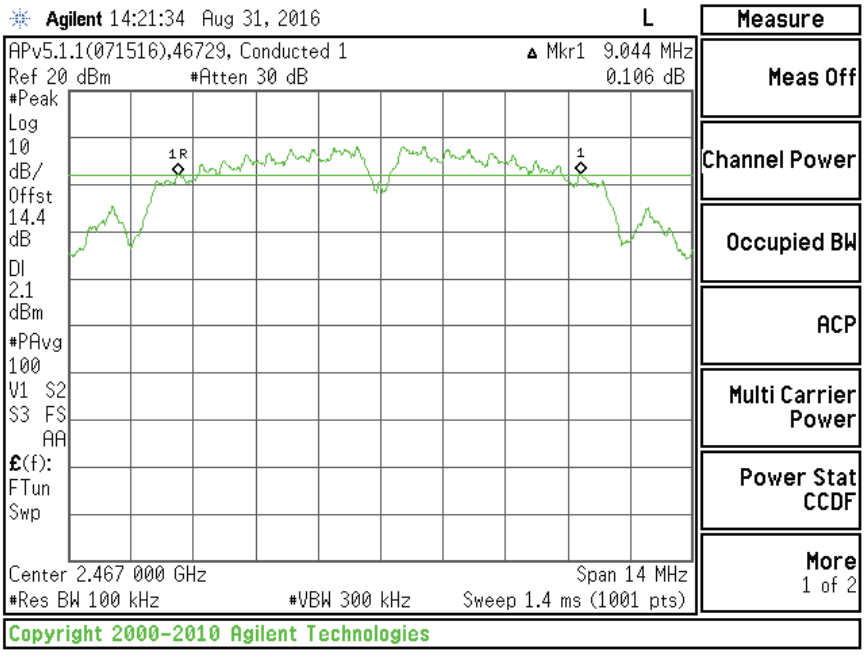
6 dB BANDWIDTH, Chain 2 HIGH CH 11



6 dB BANDWIDTH, Chain 2 HIGH CH 12



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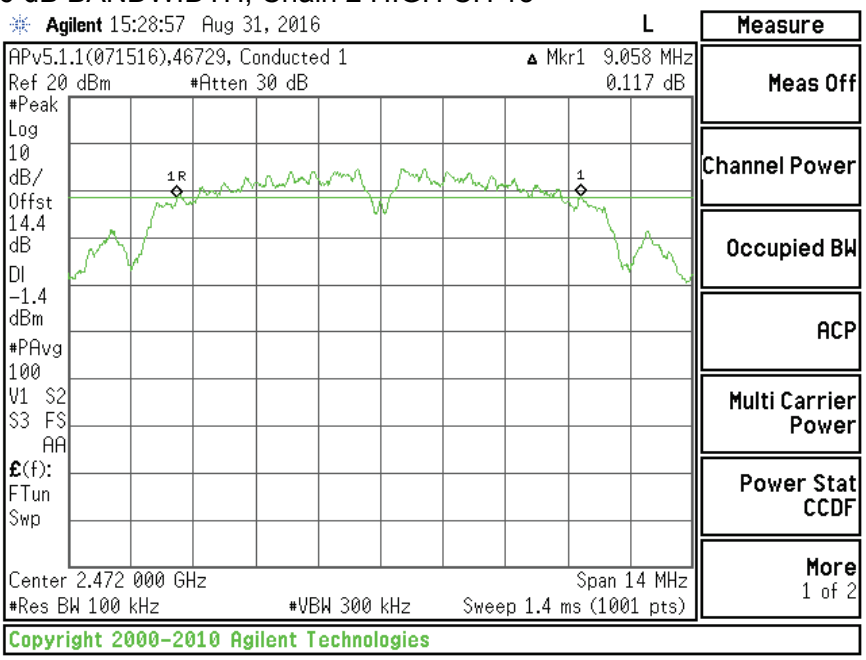
6 dB BANDWIDTH, Chain 2 HIGH CH 13



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8.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only. Testing per RSS-Gen Clause 6.6.

RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	2412	11.8524	11.8950	11.7739
Mid	2437	11.4310	11.7211	11.7397
High Ch 11	2462	11.7817	11.7266	11.7712
High Ch 12	2467	11.7856	11.7781	11.6999
High Ch 13	2472	11.6010	11.5659	11.6292

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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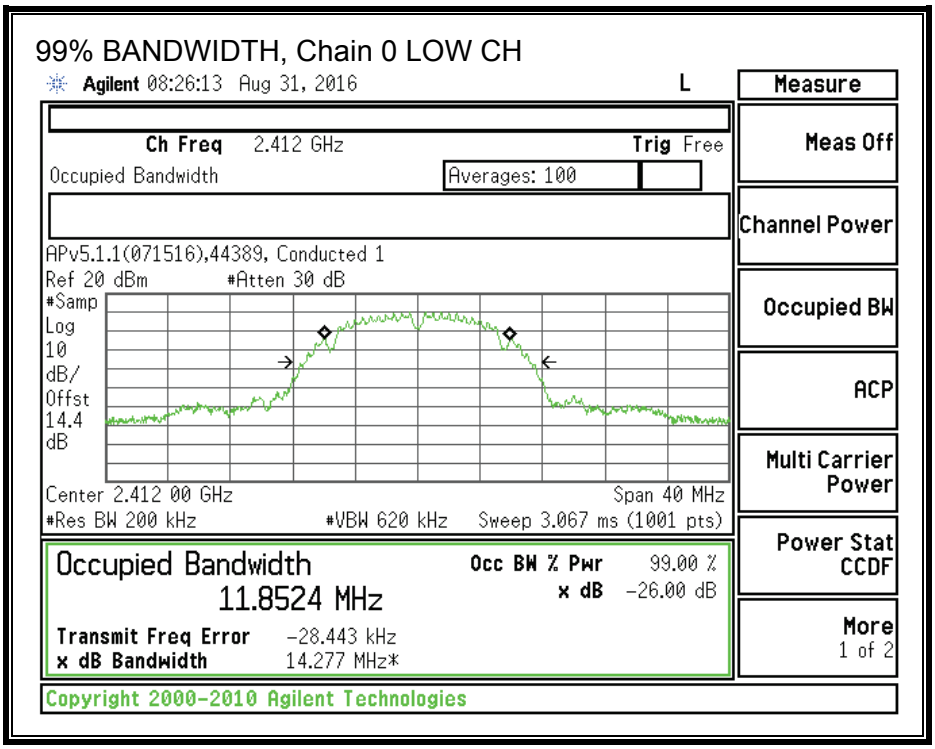
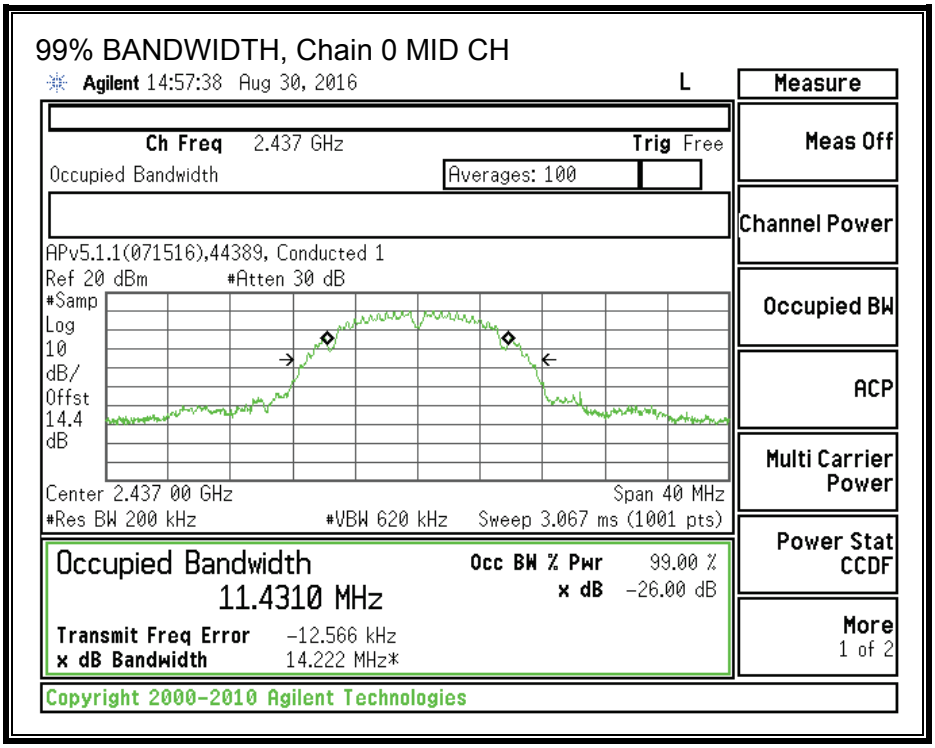
99% BANDWIDTH, Chain 0





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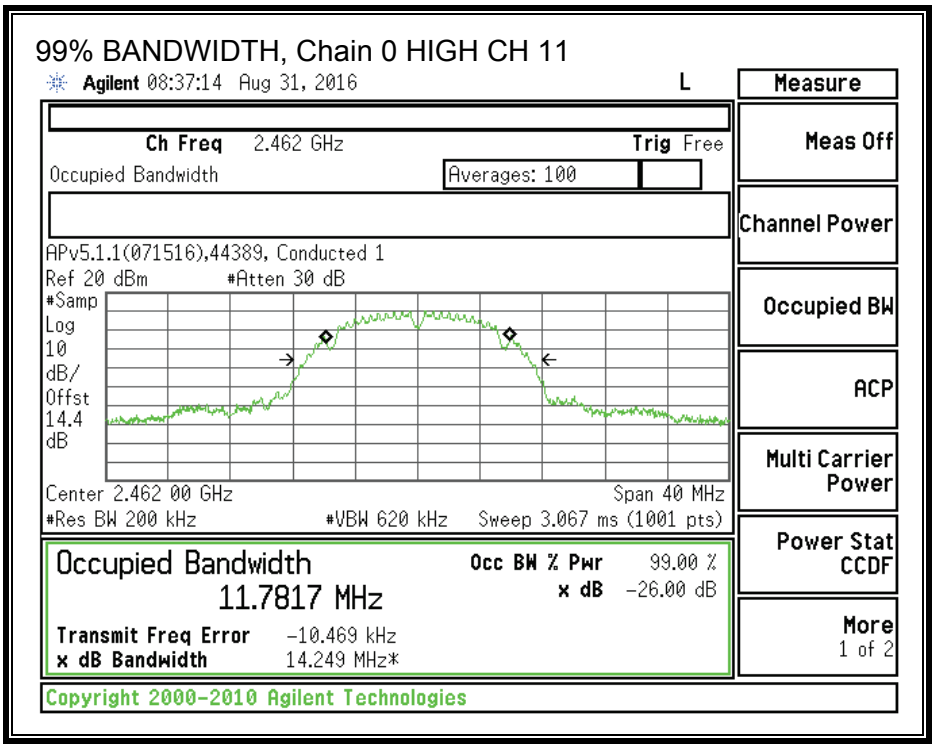

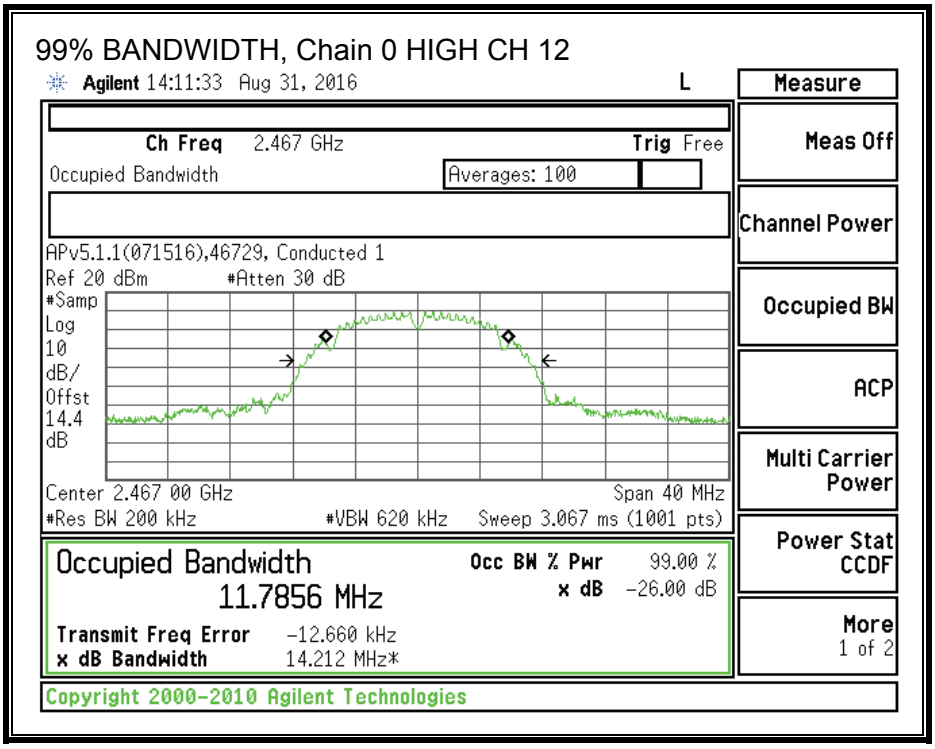

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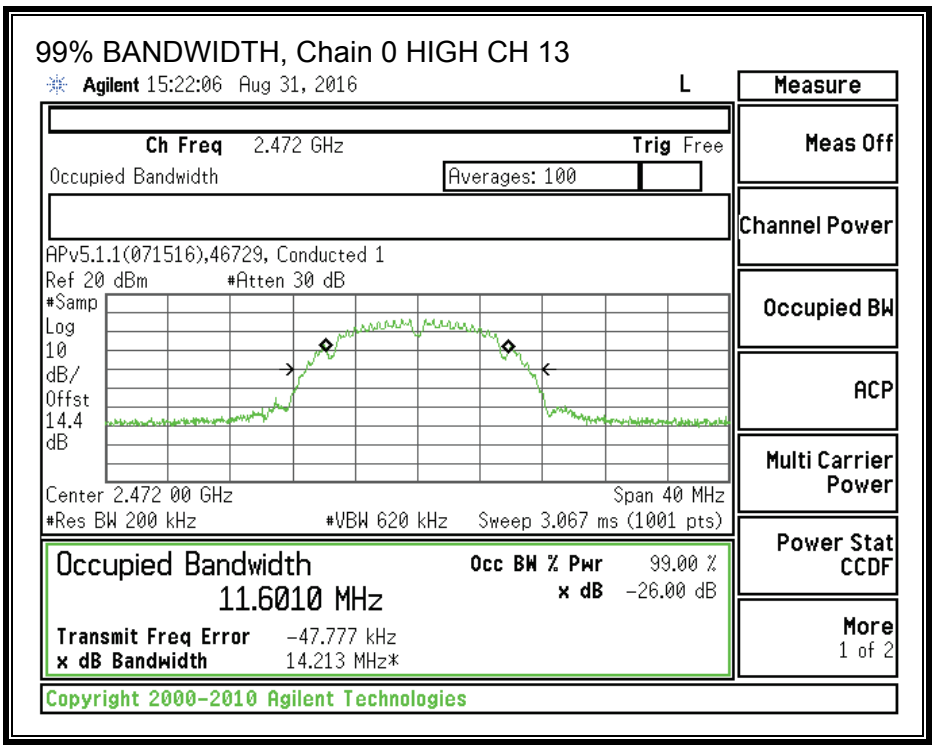
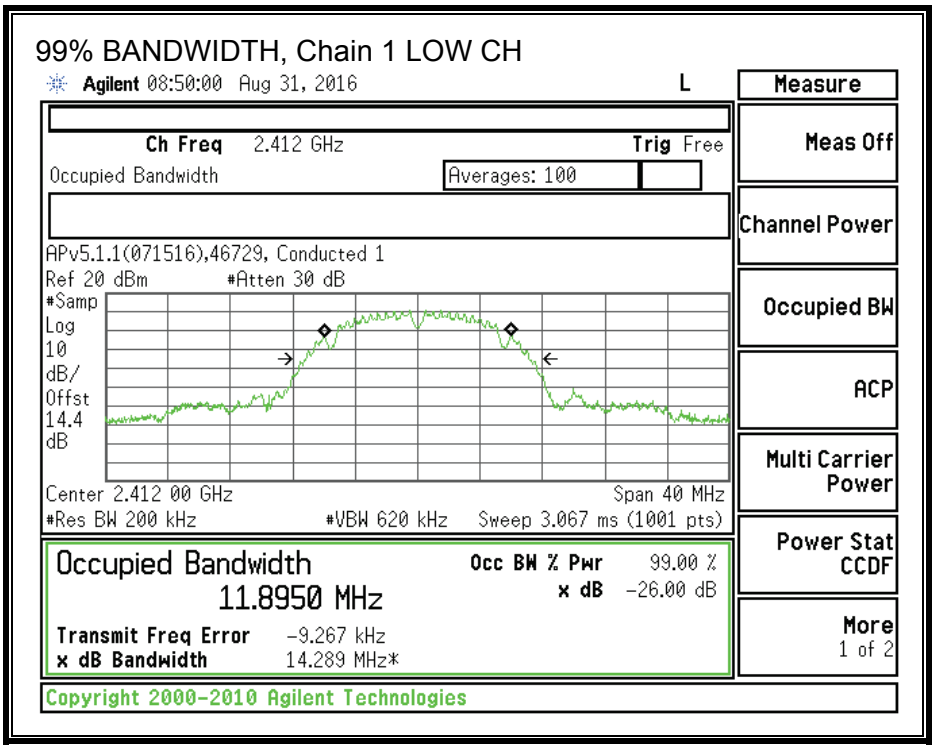


99% BANDWIDTH, Chain 1



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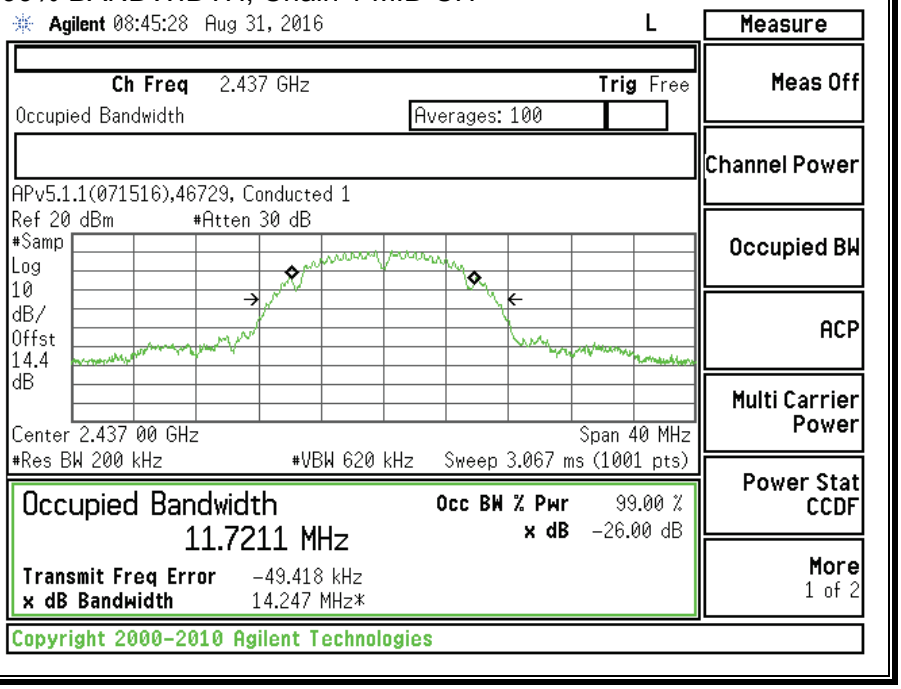
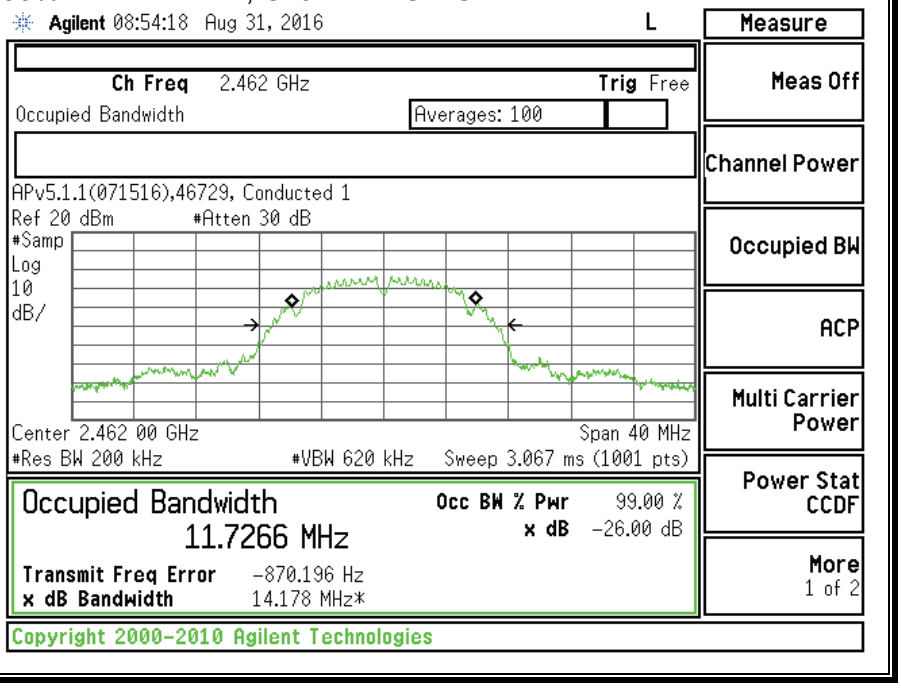
99% BANDWIDTH, Chain 1 MID CH



99% BANDWIDTH, Chain 1 HIGH CH 11



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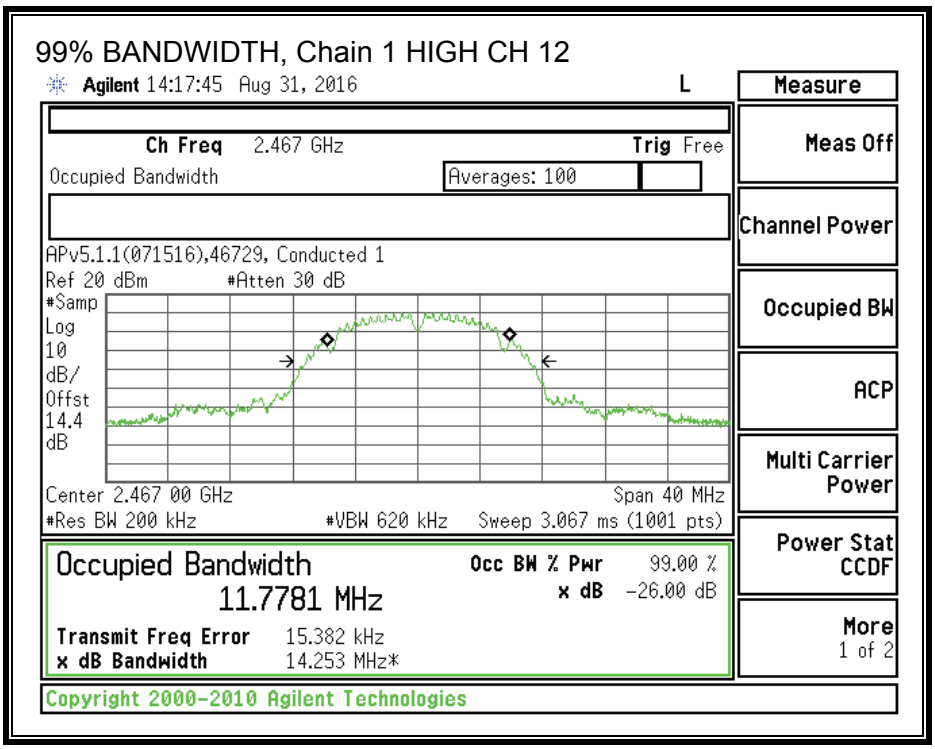

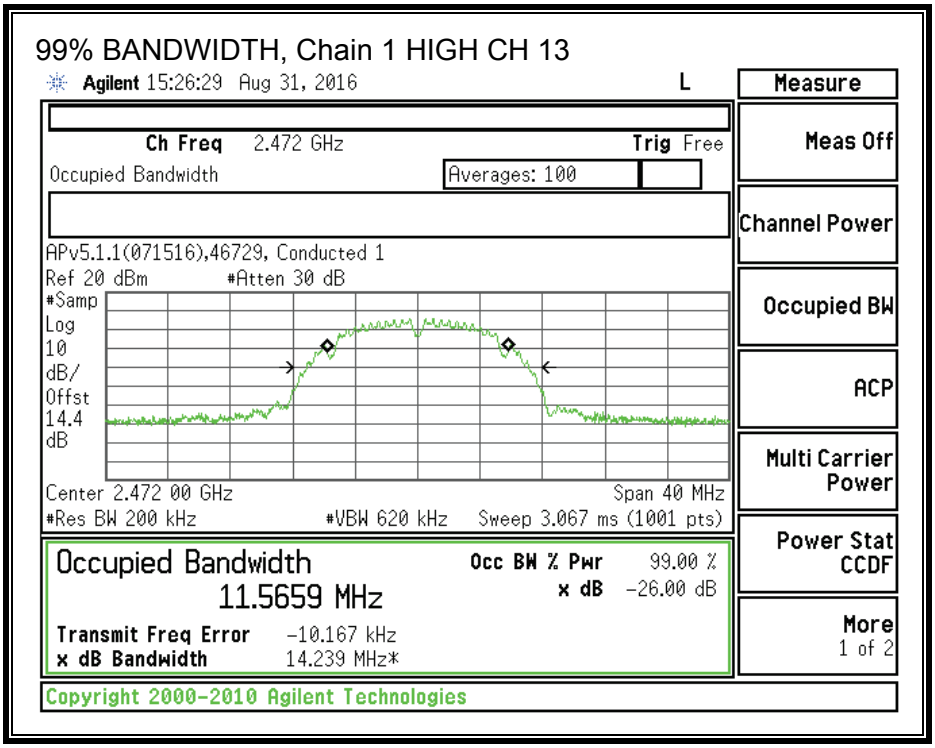

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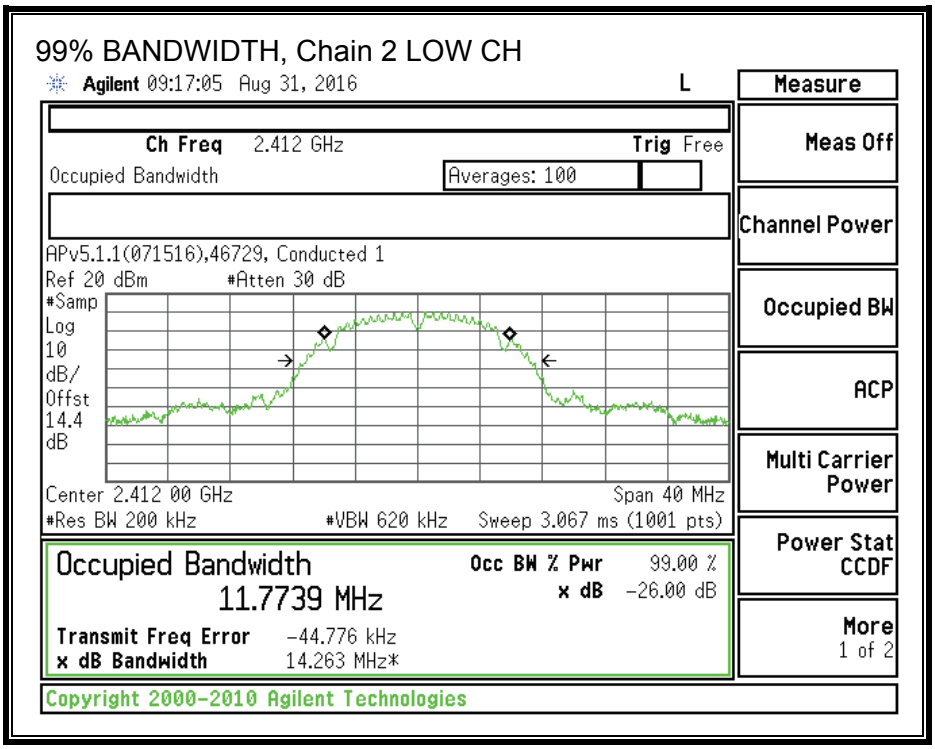
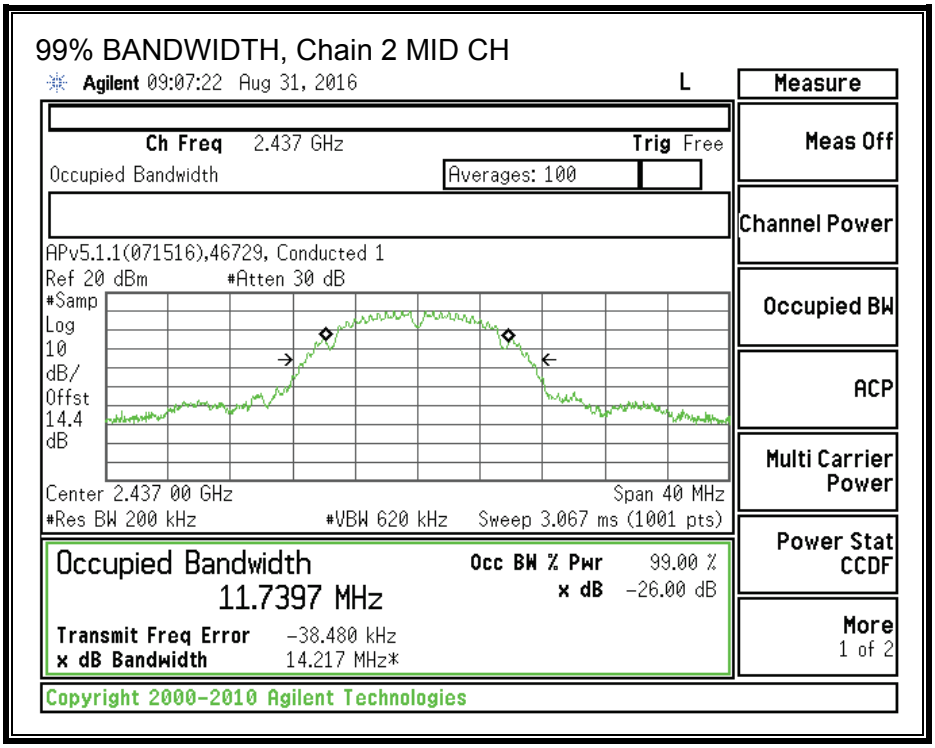
99% BANDWIDTH, Chain 2





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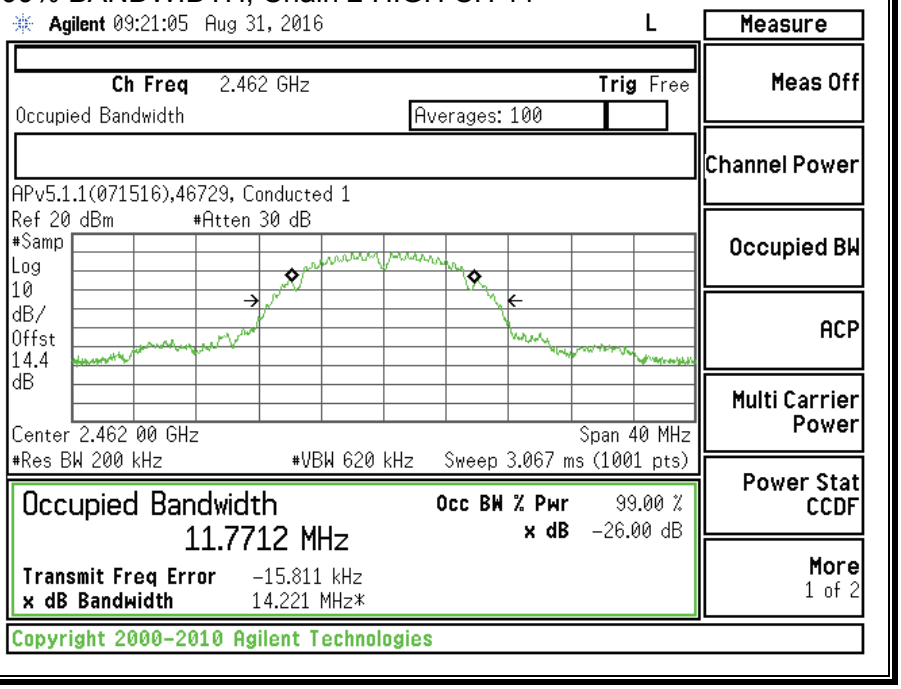
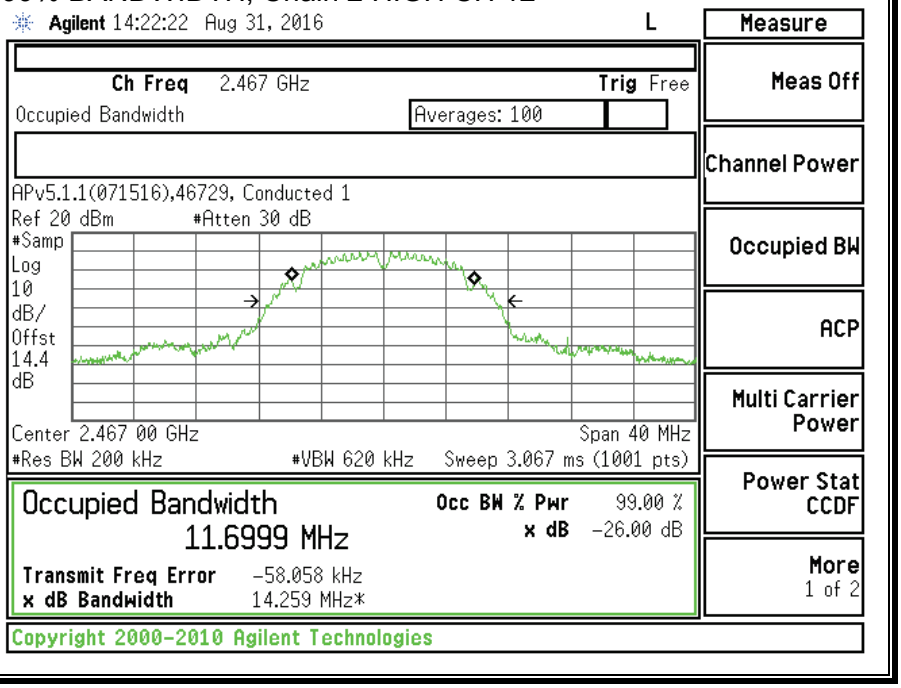
99% BANDWIDTH, Chain 2 HIGH CH 11



99% BANDWIDTH, Chain 2 HIGH CH 12



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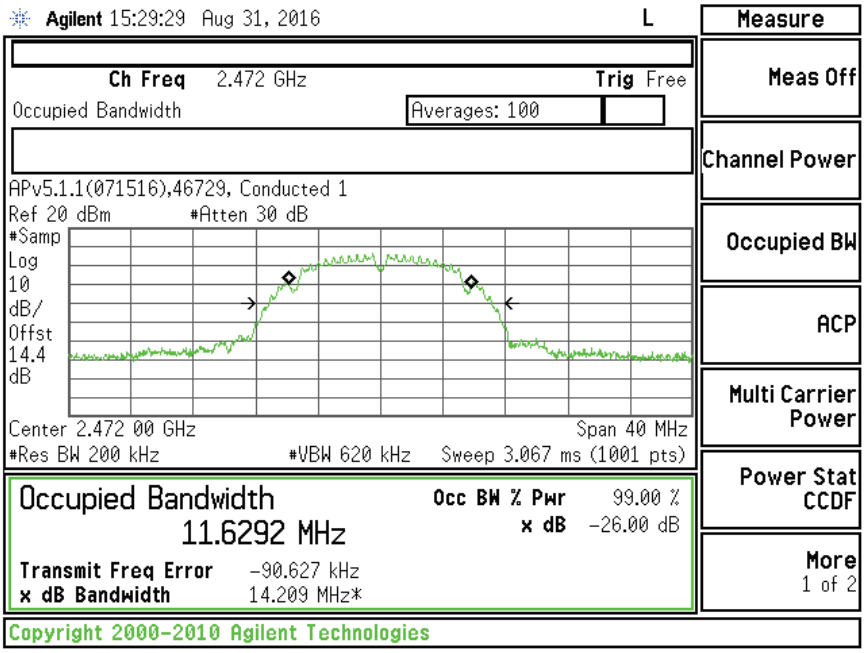
99% BANDWIDTH, Chain 2 HIGH CH 13



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8.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

IC RSS-247 5.4 (4)

FCC - For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS - For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

Date: 2016-10-03
Tester: Niklas Haydon / Jeff Cabrera

DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11b. Per KDB 662911, no array gain is added for power when N_{ANT} </= 4. Therefore, the directional gain is as follows:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
6.00	6.00	6.00	6.00

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RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	6.00	30.00	30	36	30.00
Mid	2437	6.00	30.00	30	36	30.00
High 11	2462	6.00	30.00	30	36	30.00
High 12	2467	6.00	30.00	30	36	30.00
High 13	2472	6.00	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	15.94	16.06	16.16	20.83	30.00	-9.17
Mid	2437	15.99	16.02	16.37	20.90	30.00	-9.10
High 11	2462	15.40	16.12	16.32	20.74	30.00	-9.26
High 12	2467	16.02	15.89	16.06	20.76	30.00	-9.24
High 13	2472	14.23	13.71	14.17	18.81	30.00	-11.19

Note – The above are gated average power measurements.

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8.2.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-247 5.2 (2)

For digitally modulated systems, the power spectral density conducted form the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

RESULTS

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-4.74	-3.85	-4.15	0.54	8.0	-7.5
Mid	2437	-4.12	-3.66	-4.06	0.83	8.0	-7.2
High 11	2462	-4.23	-3.47	-4.09	0.85	8.0	-7.1
High 12	2467	-4.71	-4.31	-4.84	0.16	8.0	-7.8
High 13	2472	-8.32	-8.97	-8.05	-3.66	8.0	-11.7

Note – Peak method used, therefore duty cycle correction not included.

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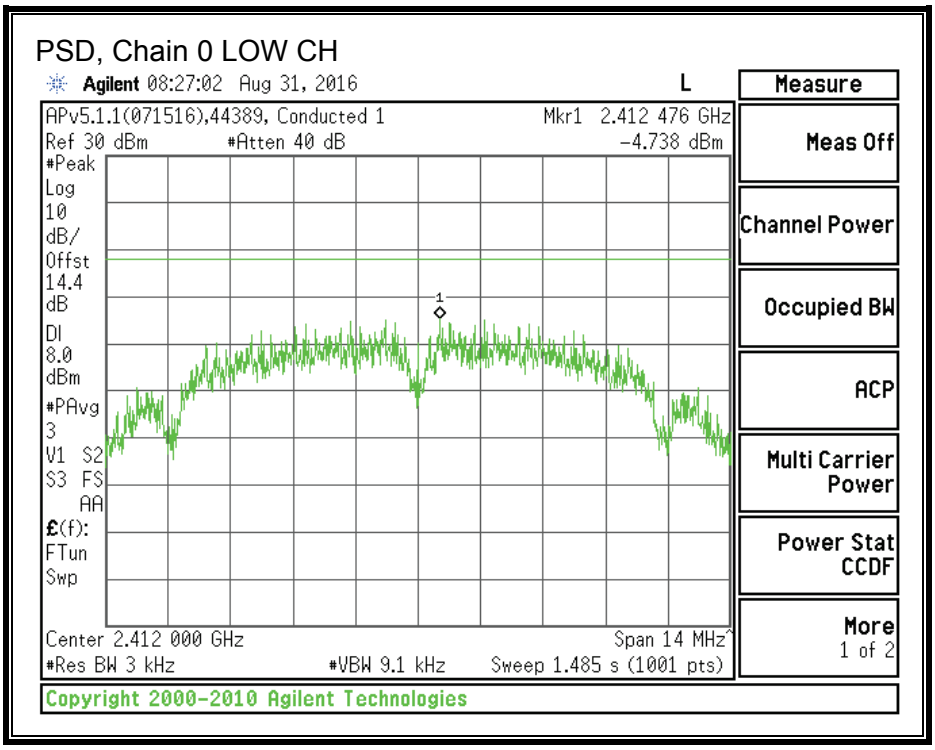
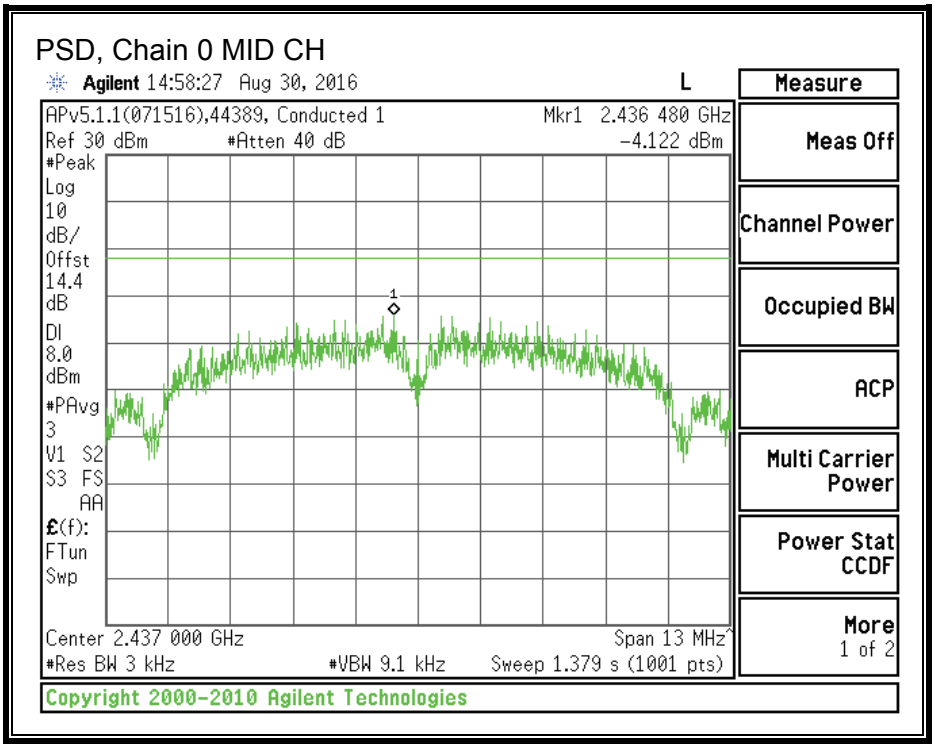
PSD, Chain 0





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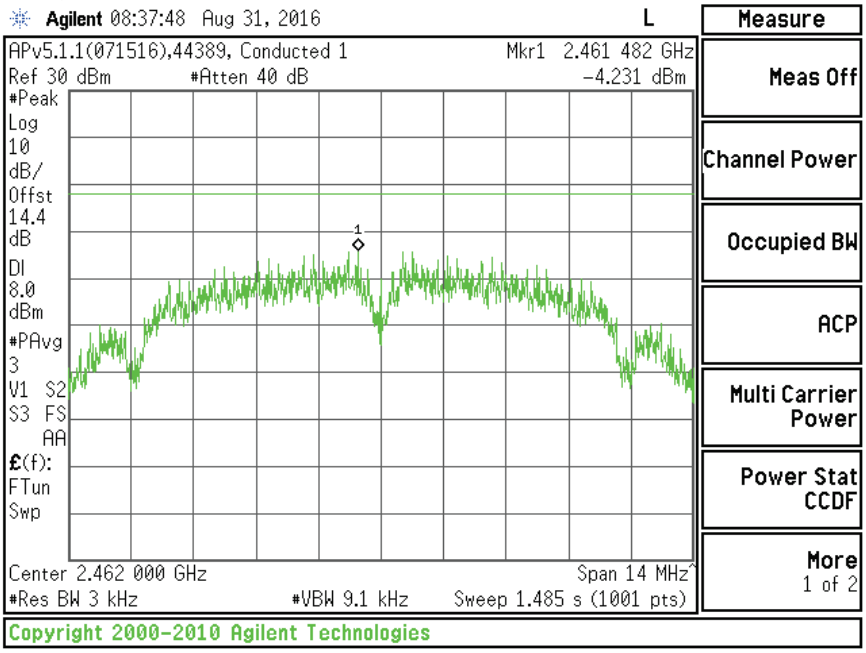
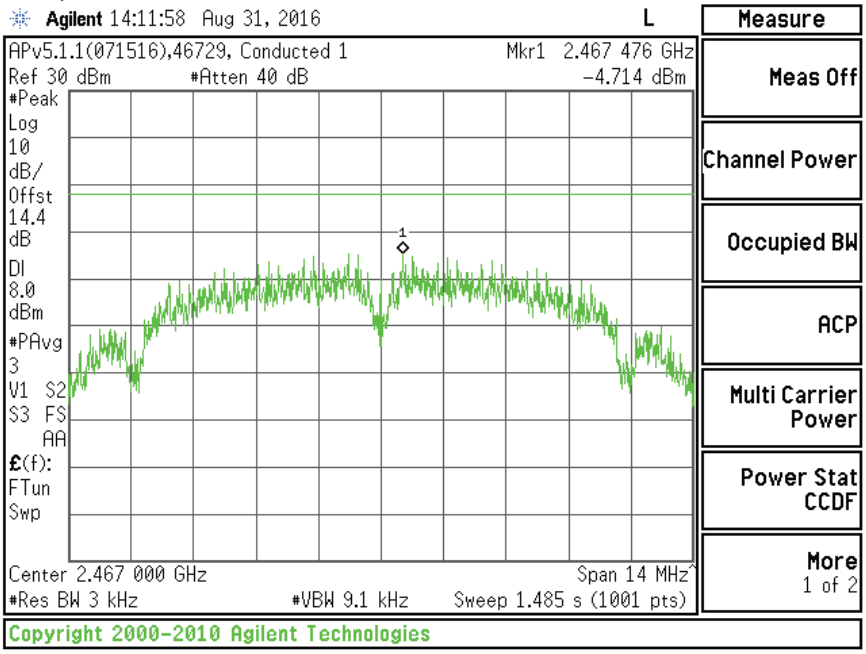
PSD, Chain 0 HIGH CH 11



PSD, Chain 0 HIGH CH 12



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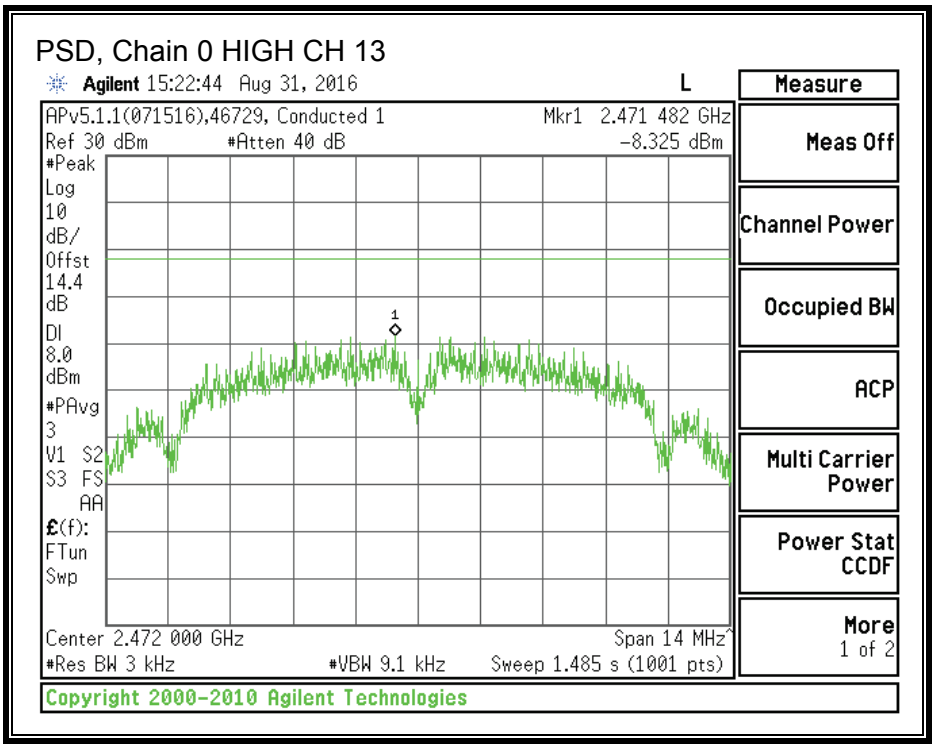
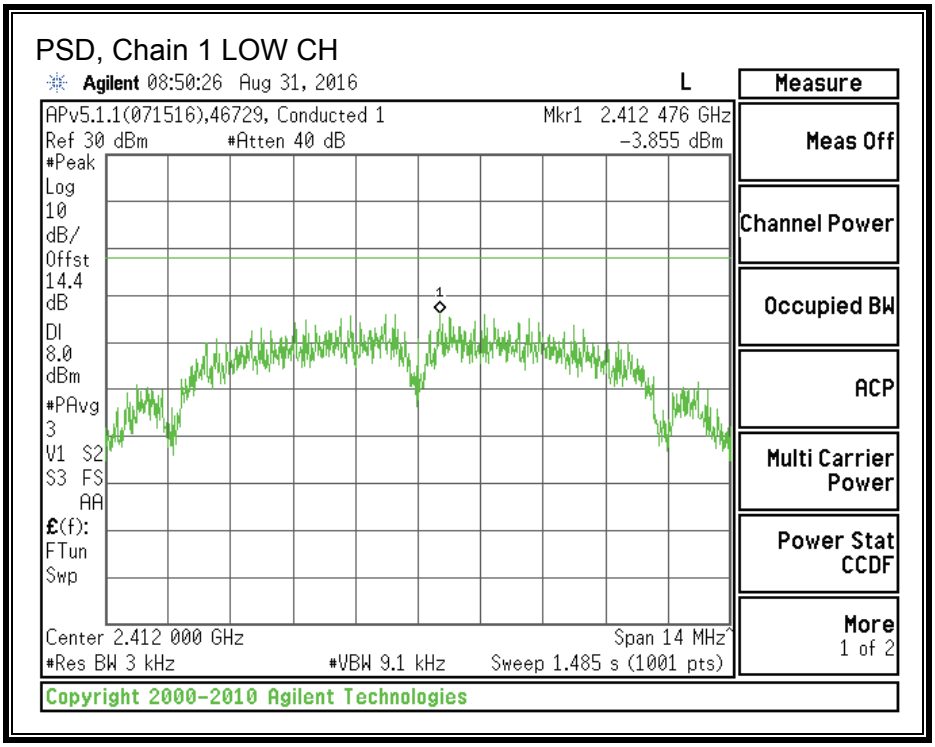


PSD, Chain 1



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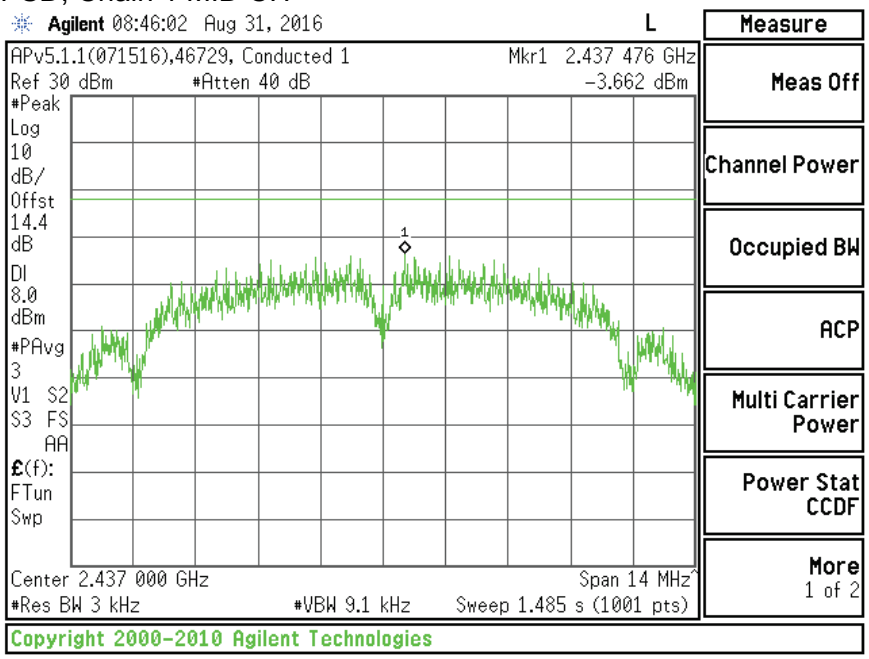
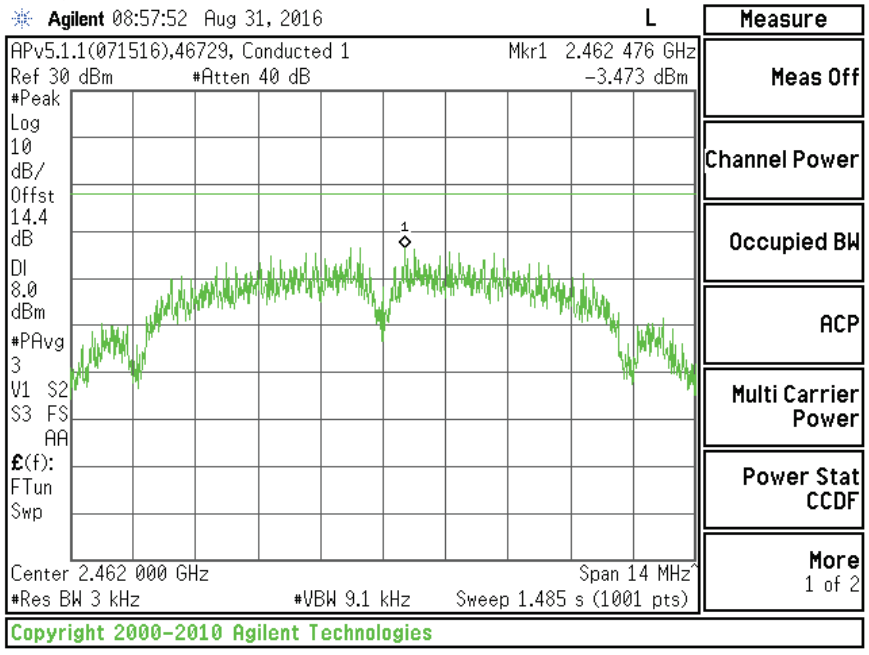
PSD, Chain 1 MID CH



PSD, Chain 1 HIGH CH 11



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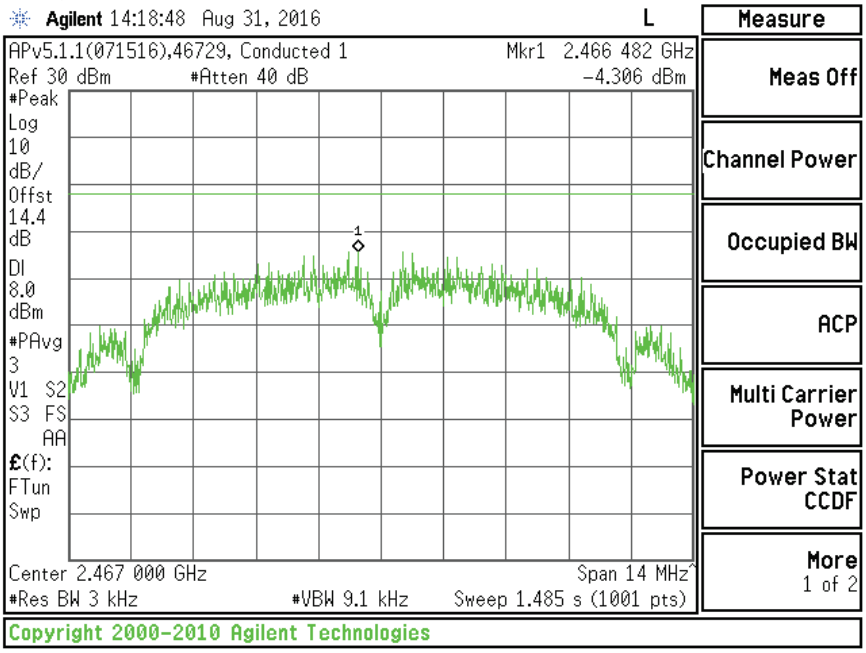
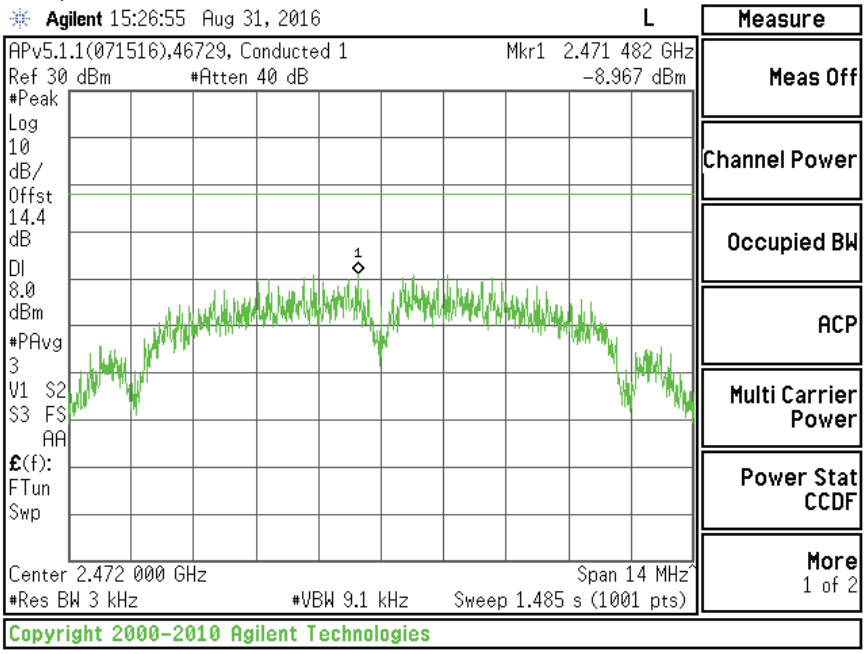
PSD, Chain 1 HIGH CH 12



PSD, Chain 1 HIGH CH 13



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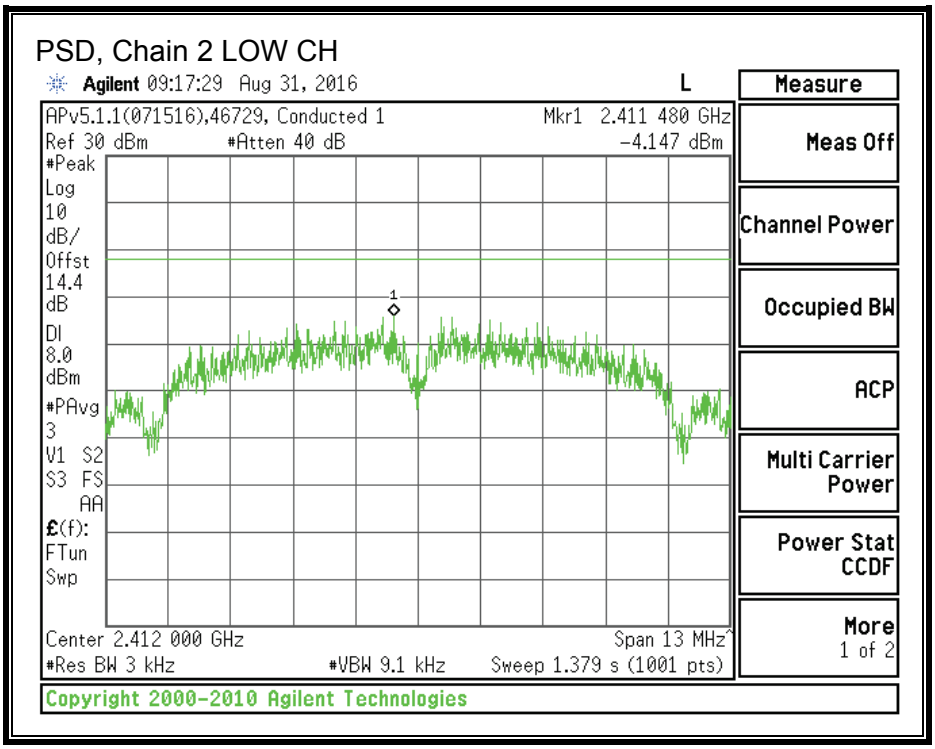
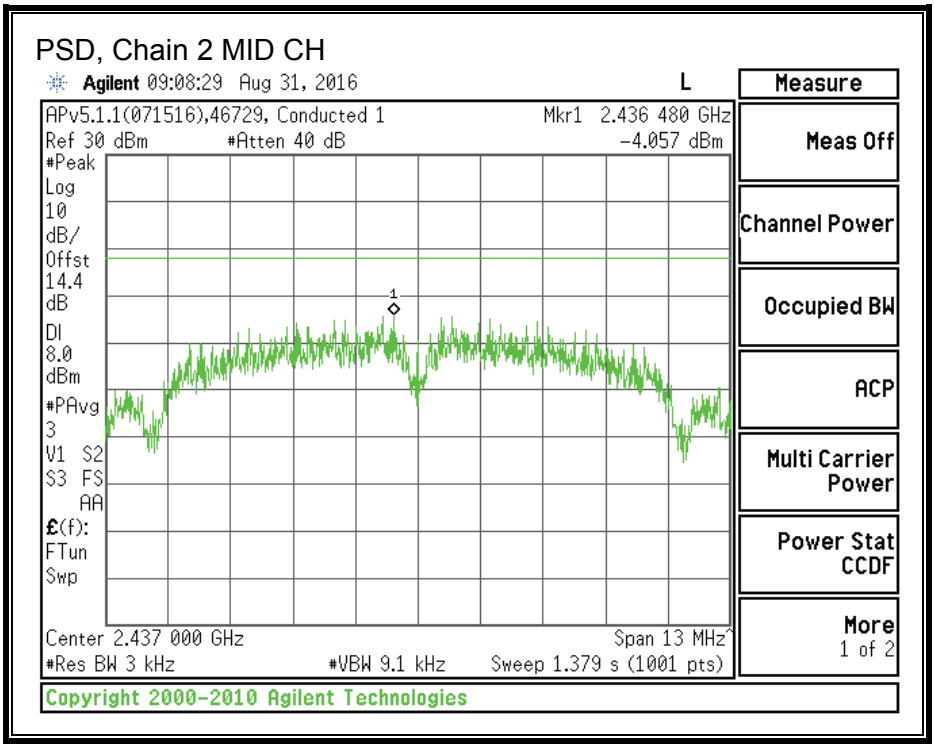
PSD, Chain 2





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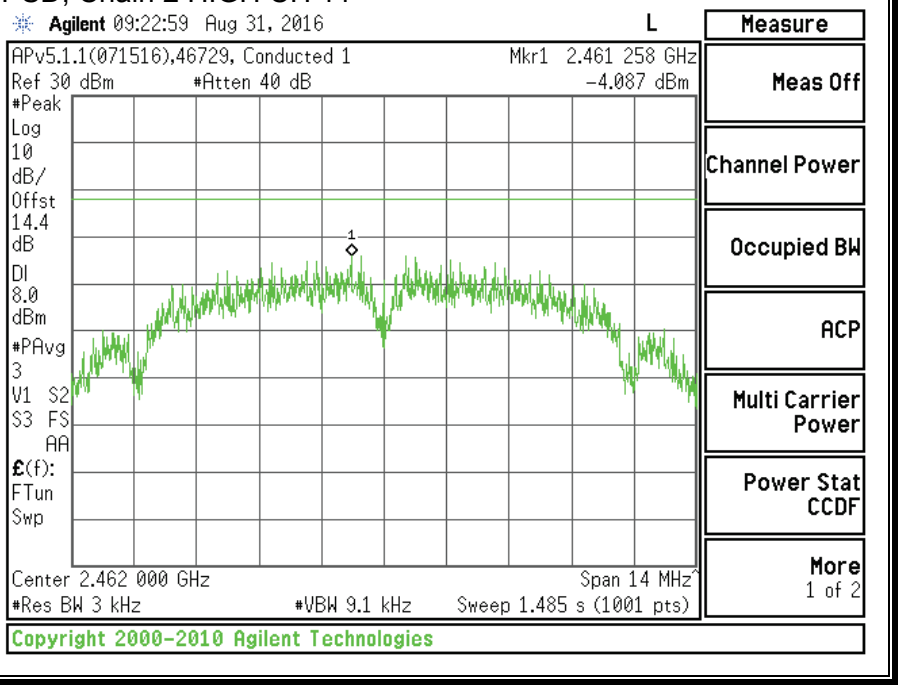
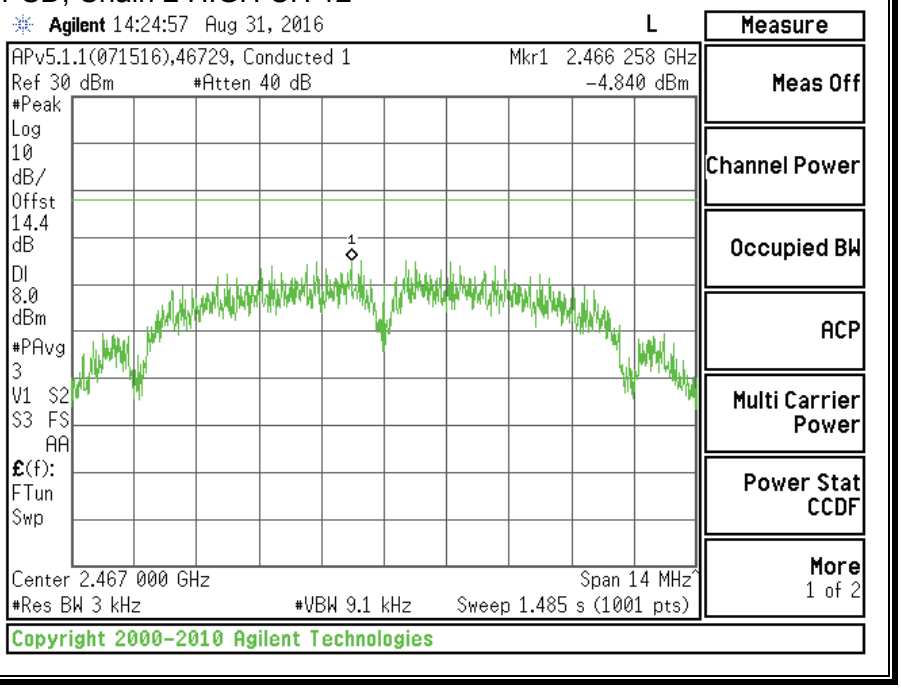
PSD, Chain 2 HIGH CH 11



PSD, Chain 2 HIGH CH 12



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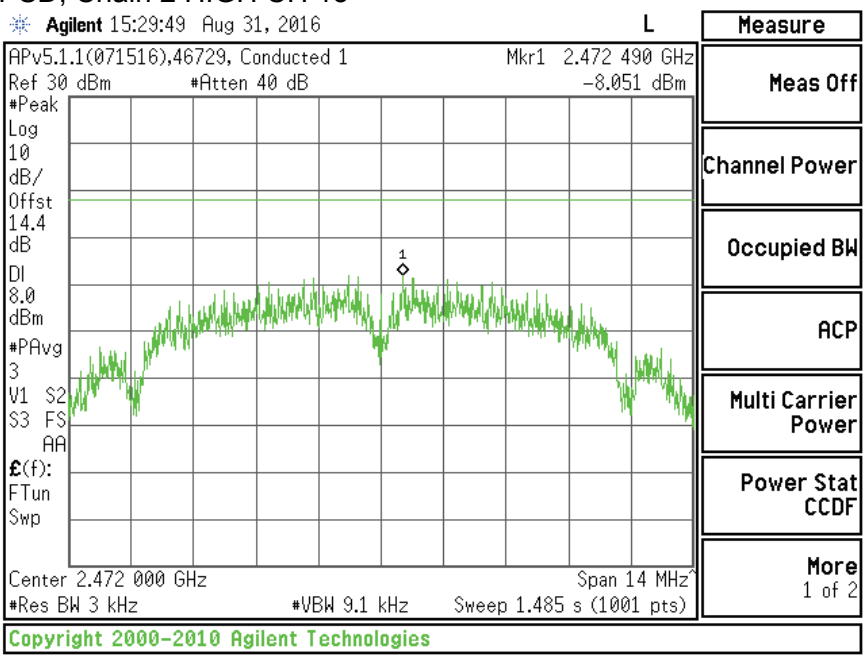
PSD, Chain 2 HIGH CH 13



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8.2.5. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-247 5.5

FCC - In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RSS - In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

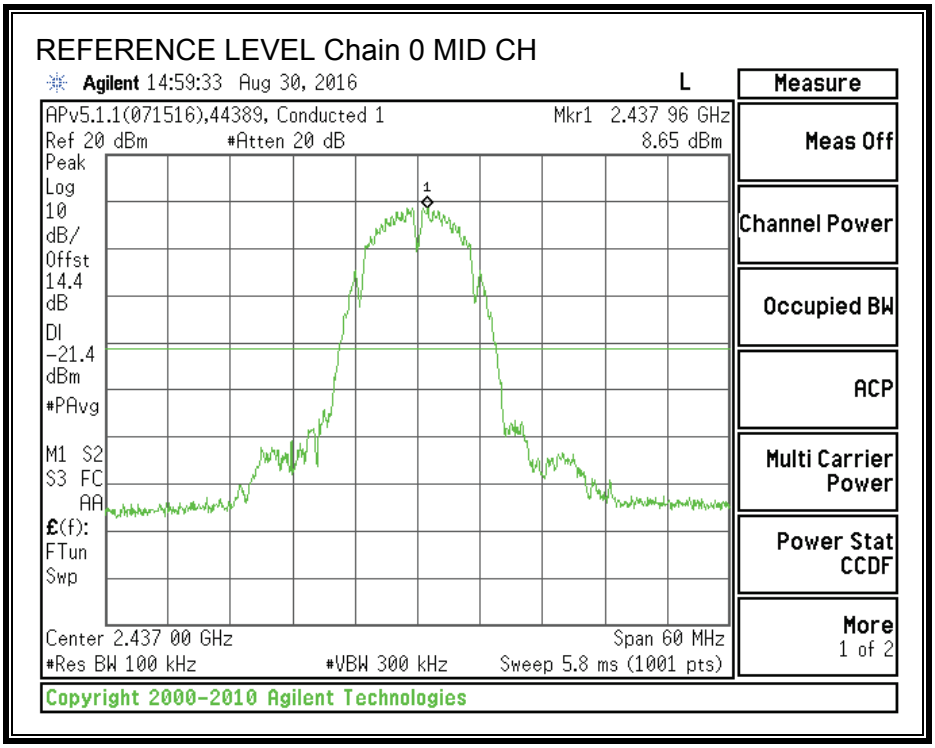
RESULTS

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

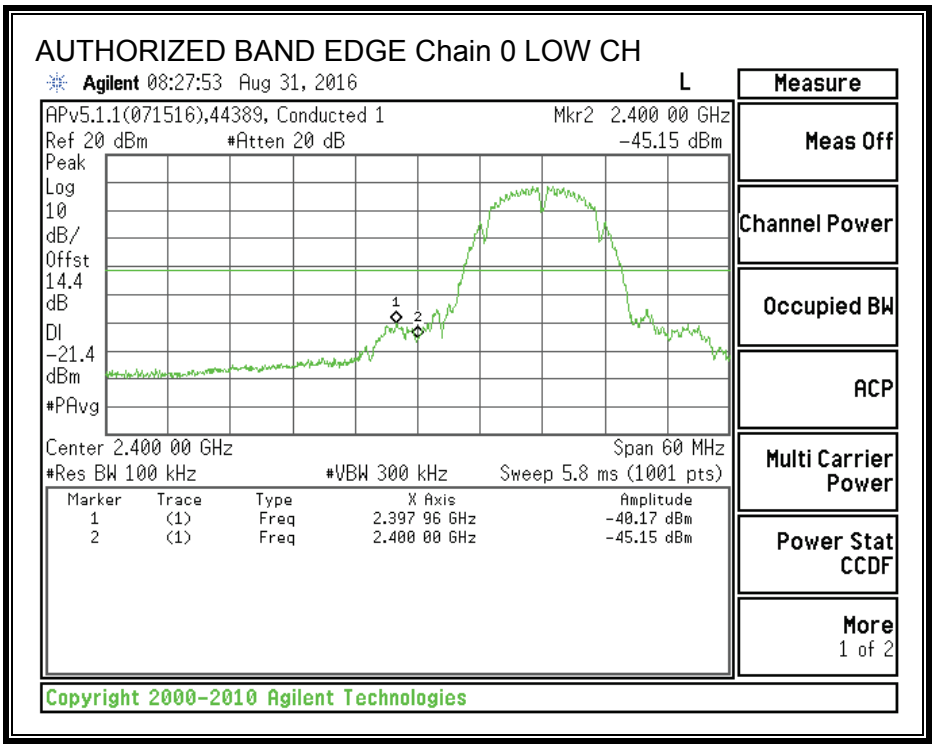
This report shall not be reproduced except in full, without the written approval of UL LLC.

RESULTS

IN-BAND REFERENCE LEVEL, Chain 0



LOW CHANNEL BANDEDGE, Chain 0



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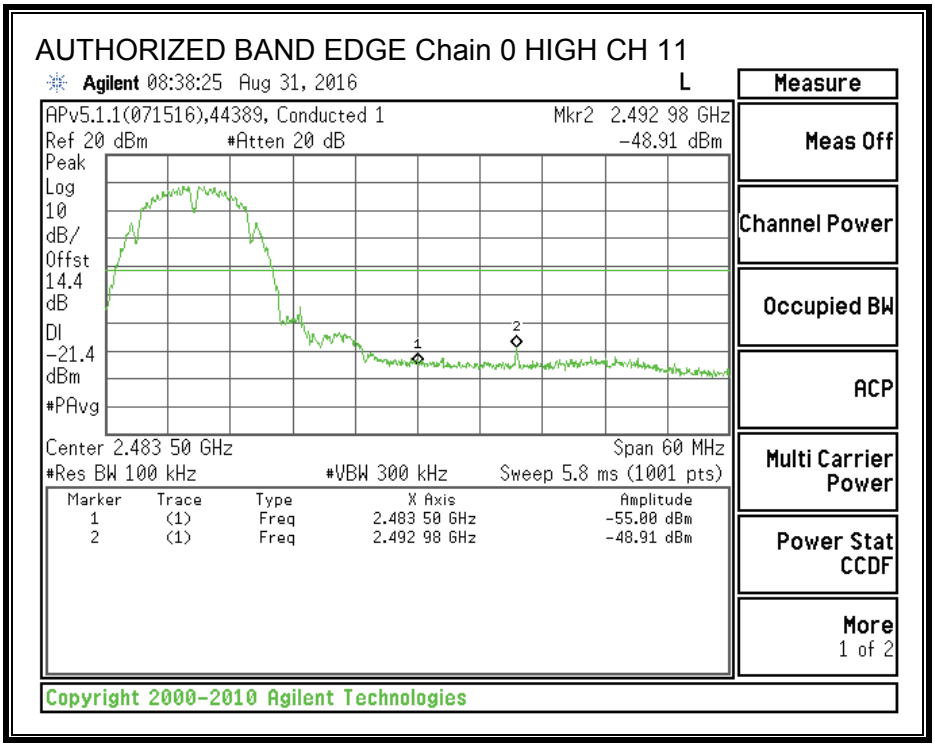
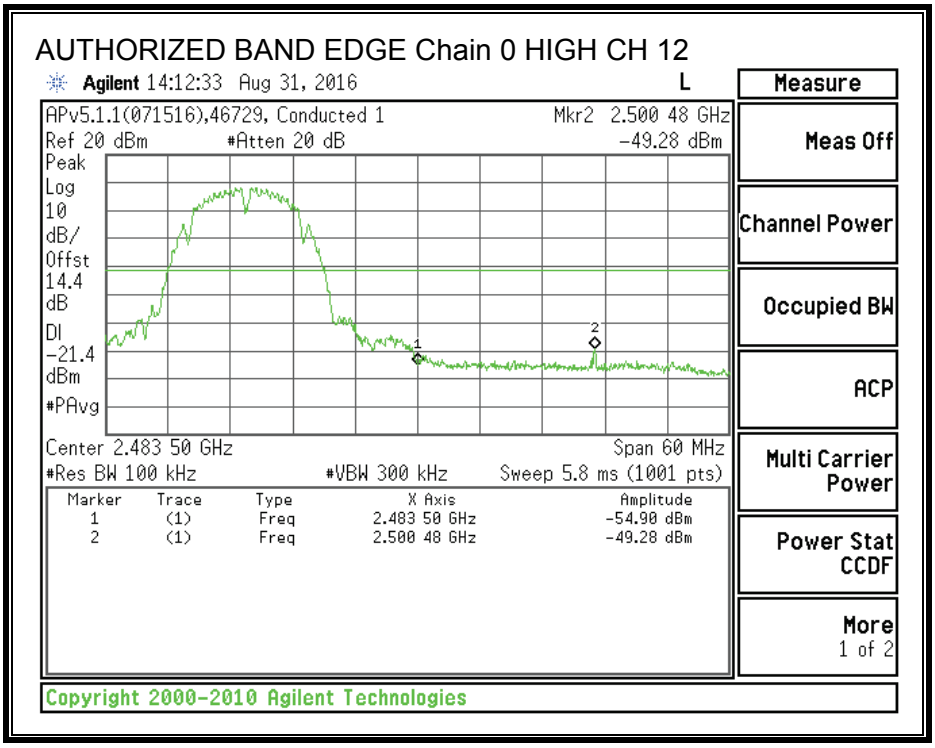
HIGH CHANNEL BANDEDGE, Chain 0





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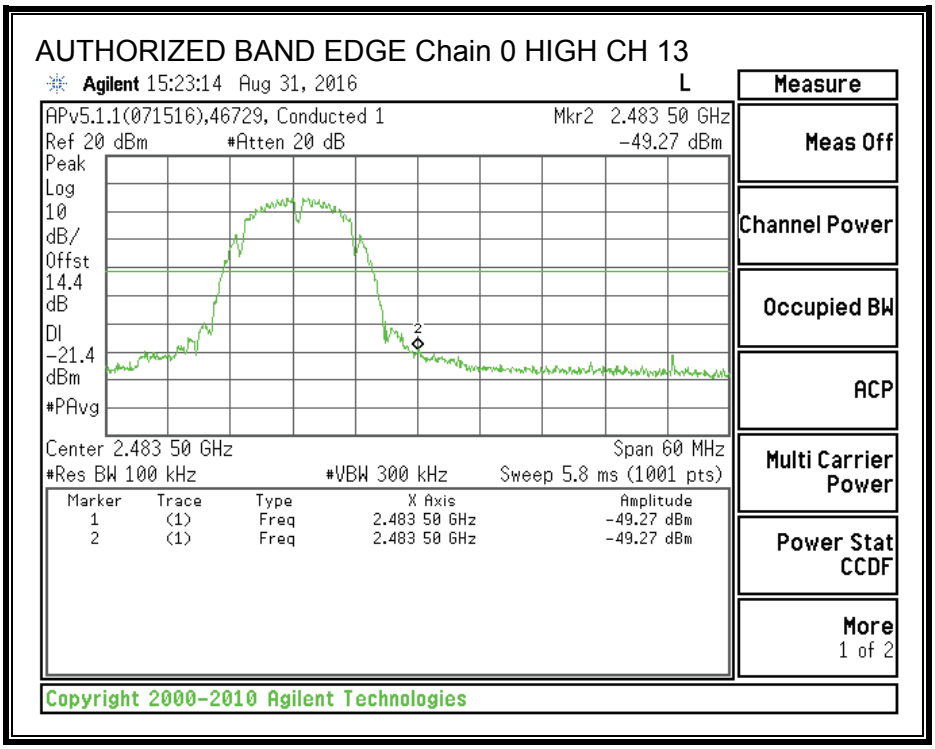
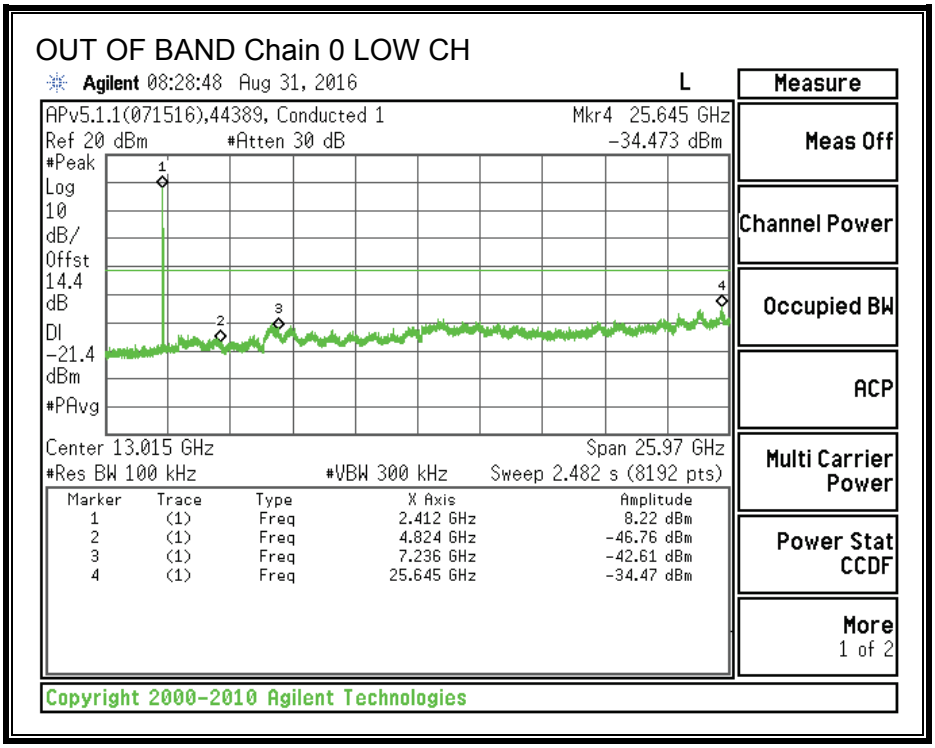


OUT-OF-BAND EMISSIONS, Chain 0



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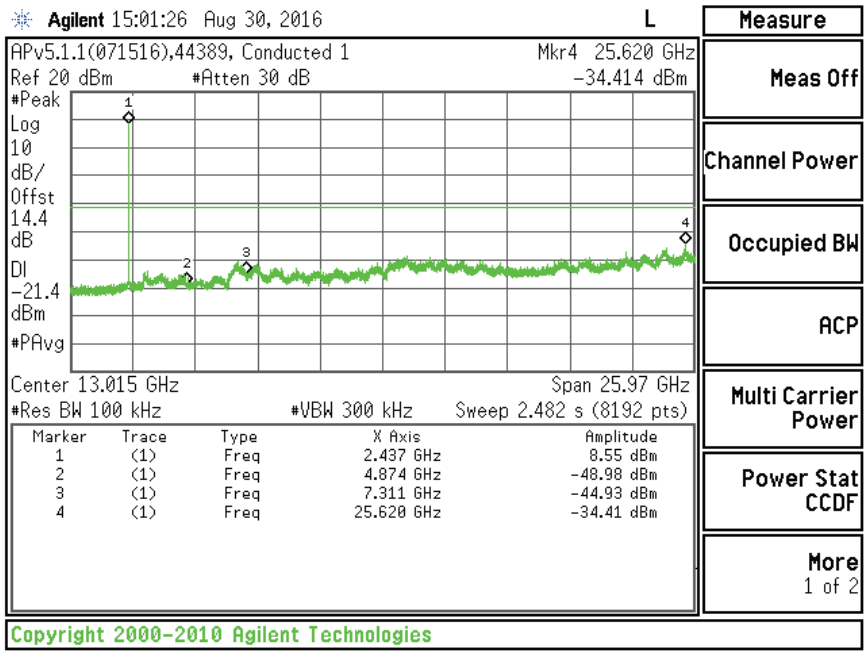
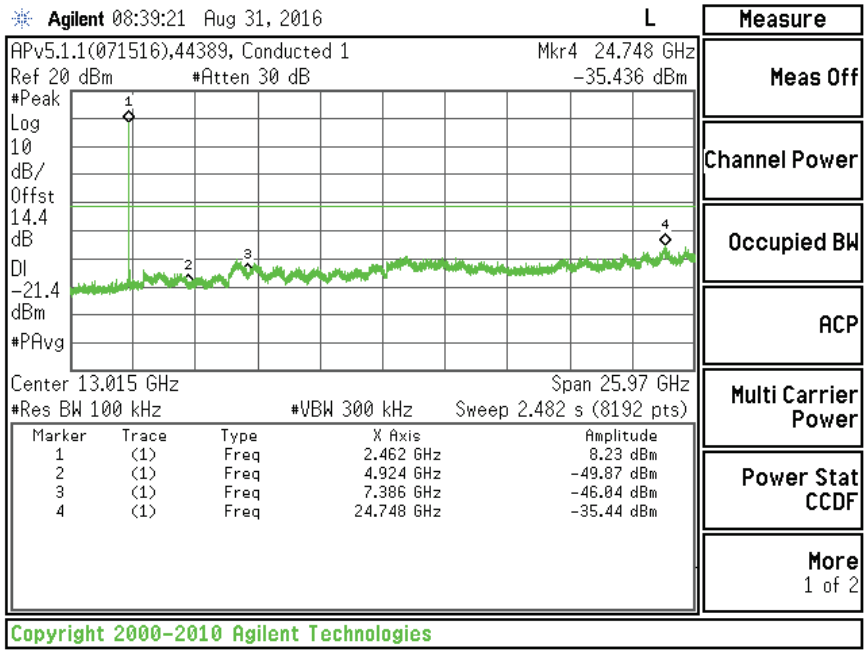
OUT OF BAND Chain 0 MID CH



OUT OF BAND Chain 0 HIGH CH 11



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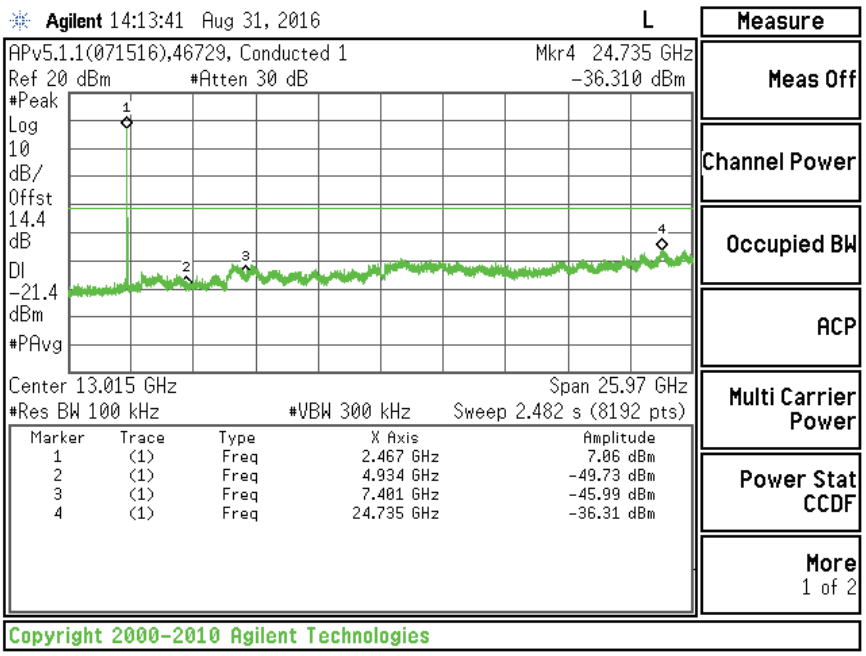
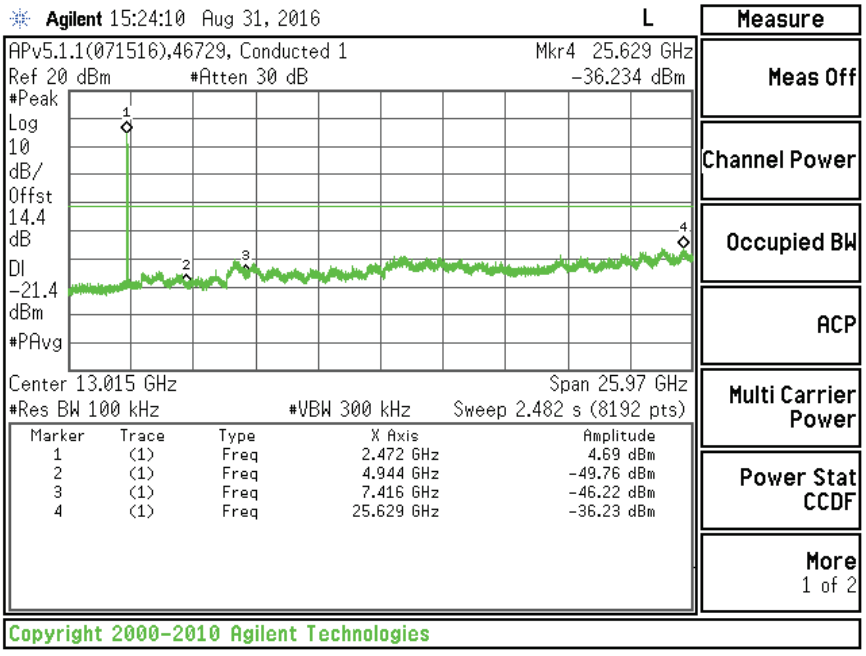
OUT OF BAND Chain 0 HIGH CH 12



OUT OF BAND Chain 0 HIGH CH 13



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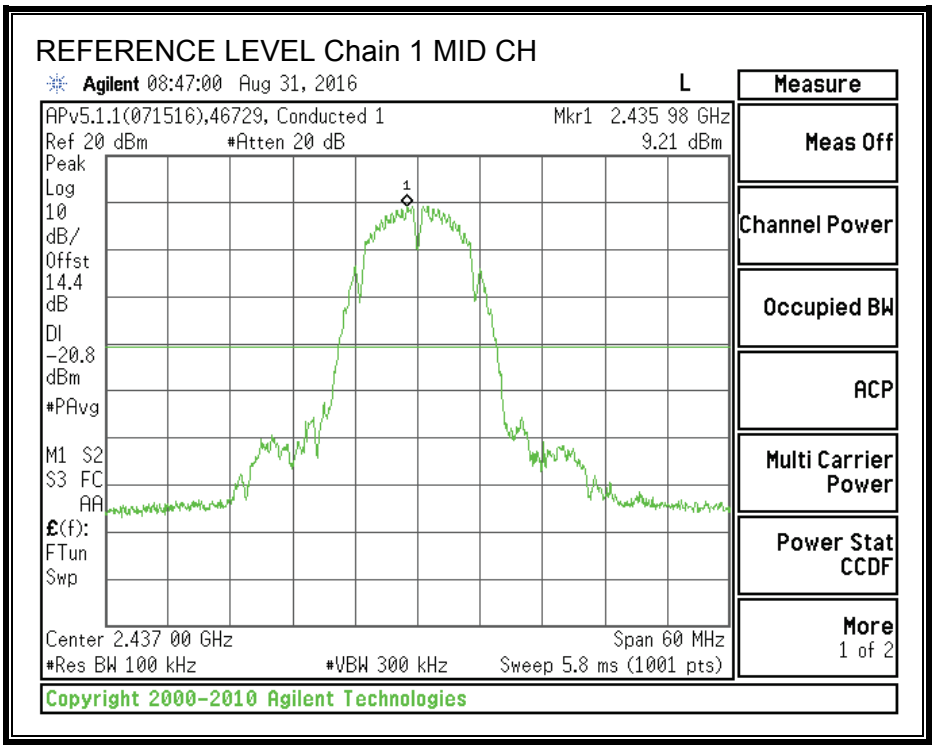
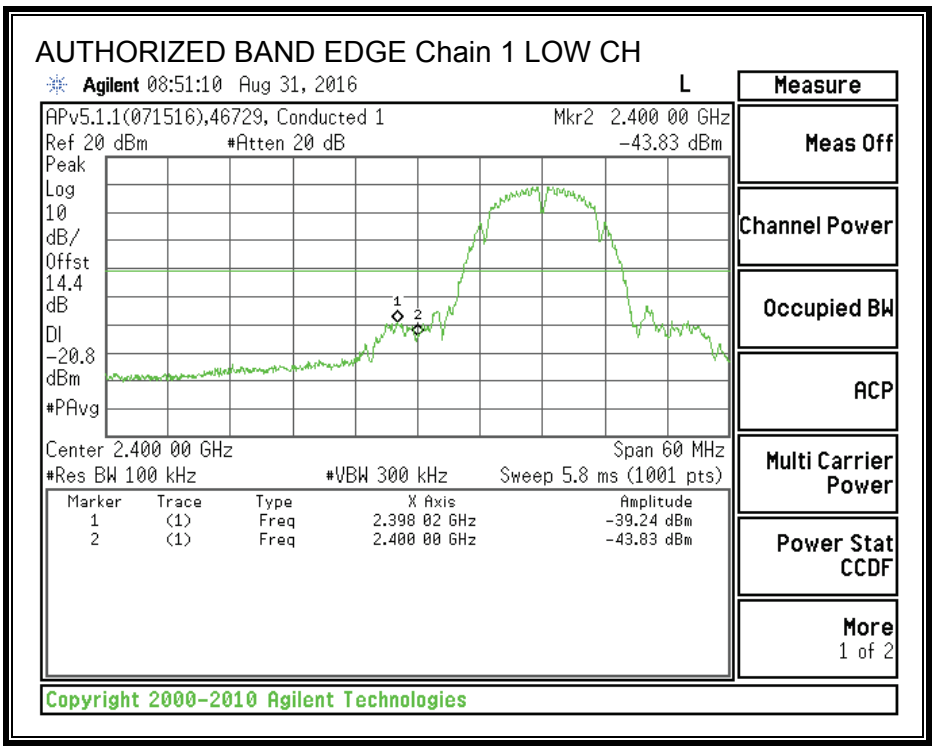
IN-BAND REFERENCE LEVEL, Chain 1



LOW CHANNEL BANDEDGE, Chain 1



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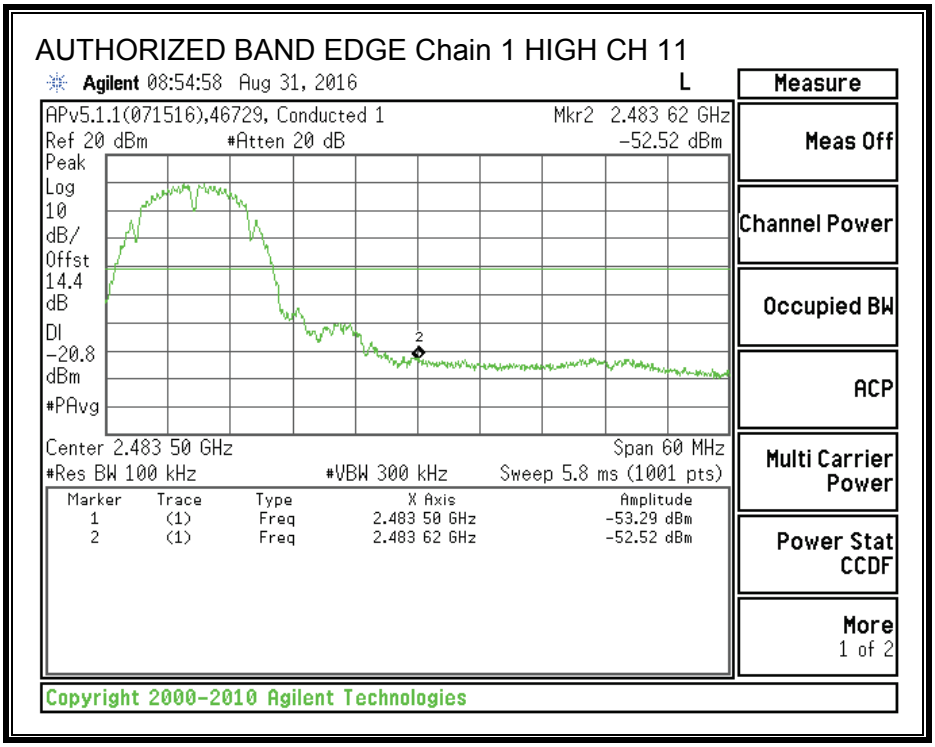
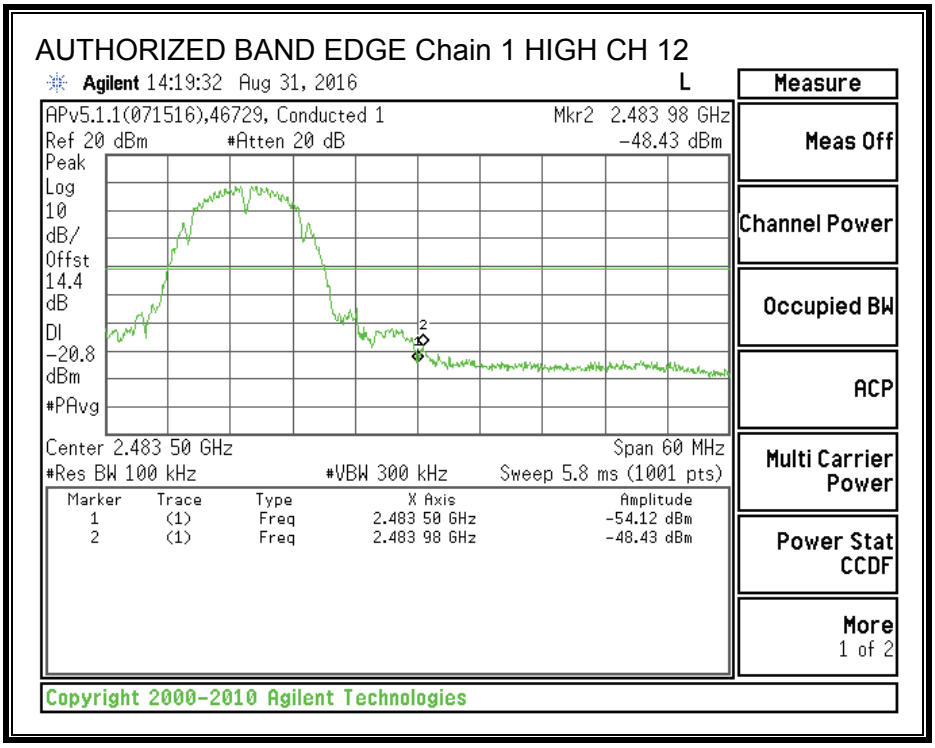
HIGH CHANNEL BANDEDGE, Chain 1





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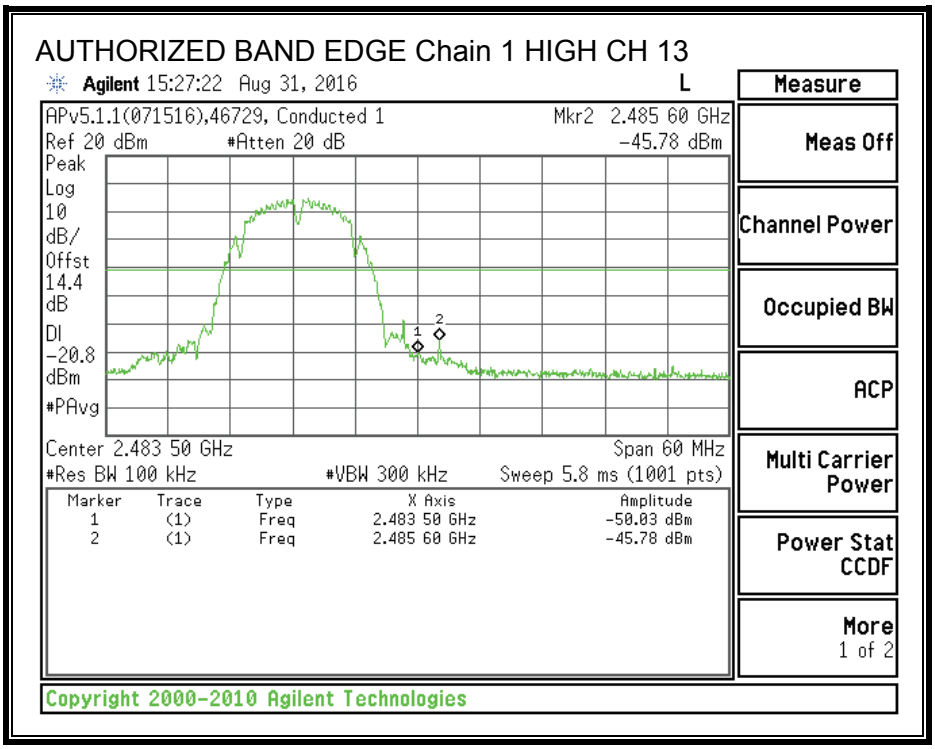
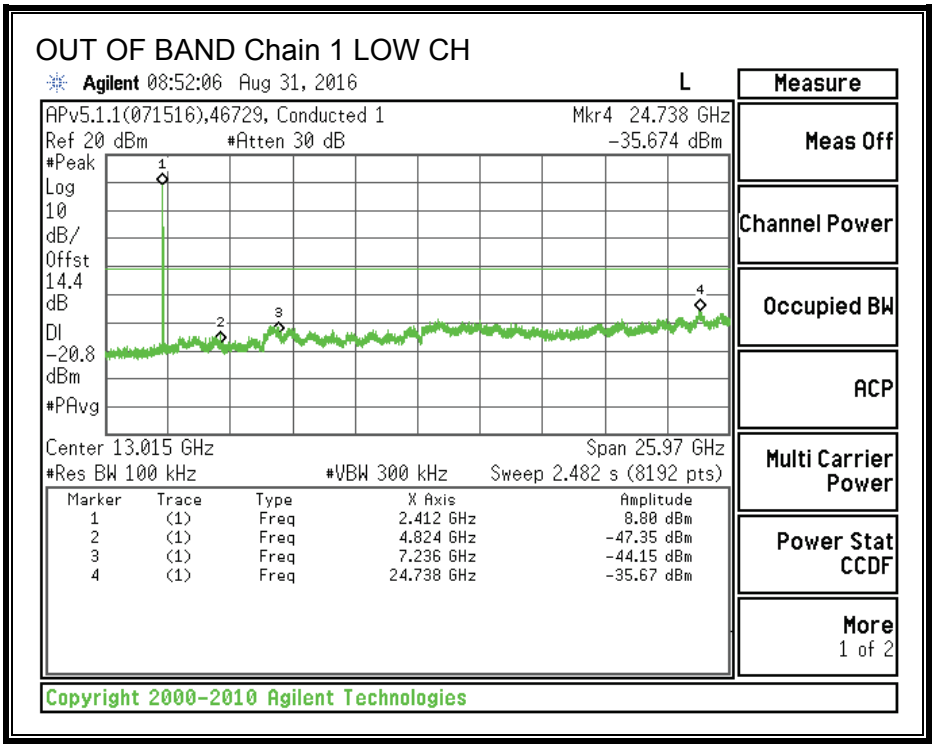


OUT-OF-BAND EMISSIONS, Chain 1



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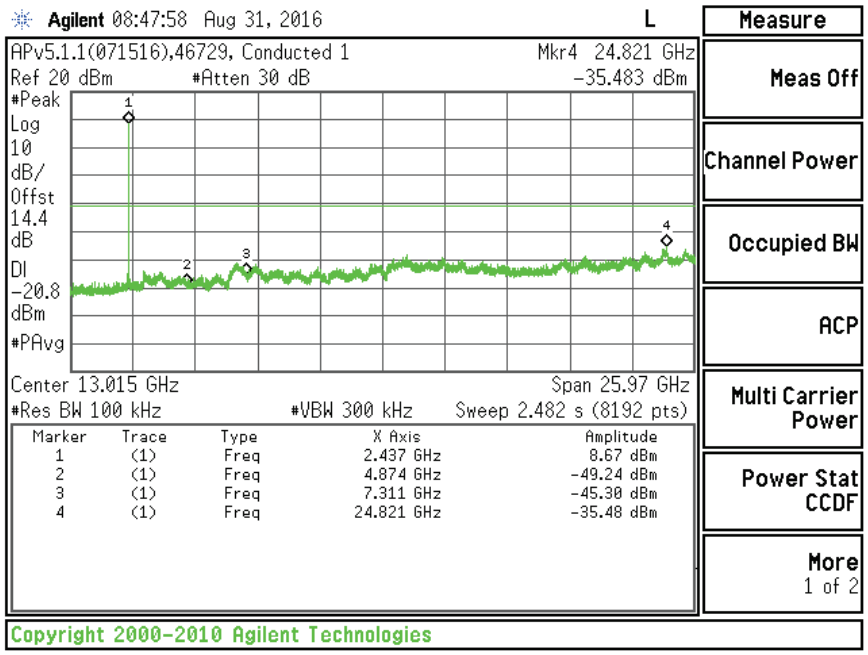
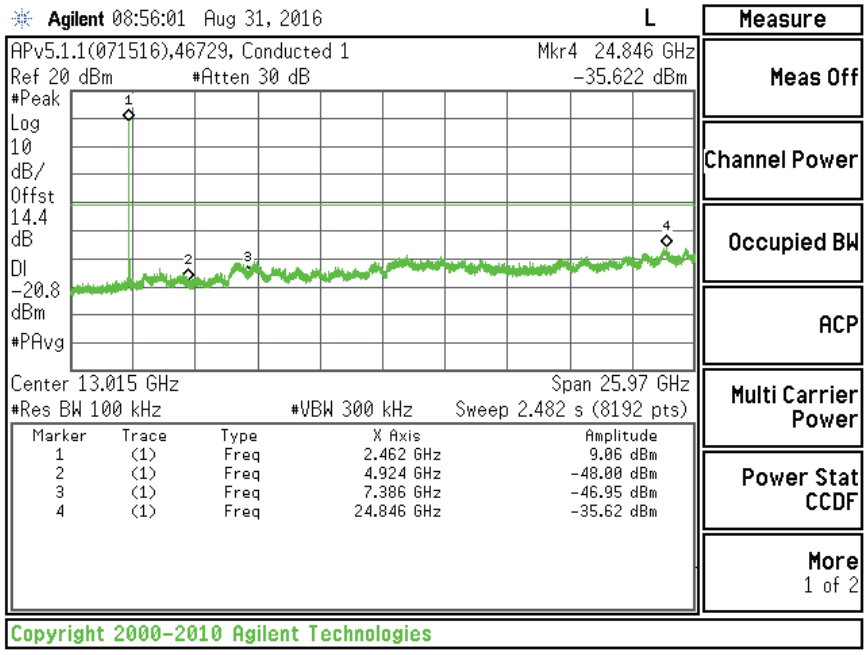
OUT OF BAND Chain 1 MID CH



OUT OF BAND Chain 1 HIGH CH 11



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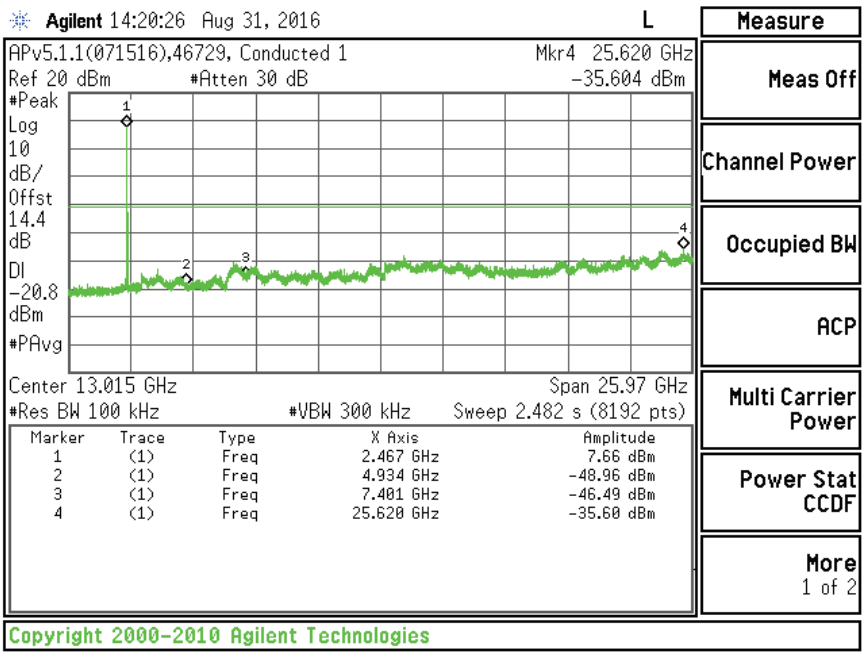
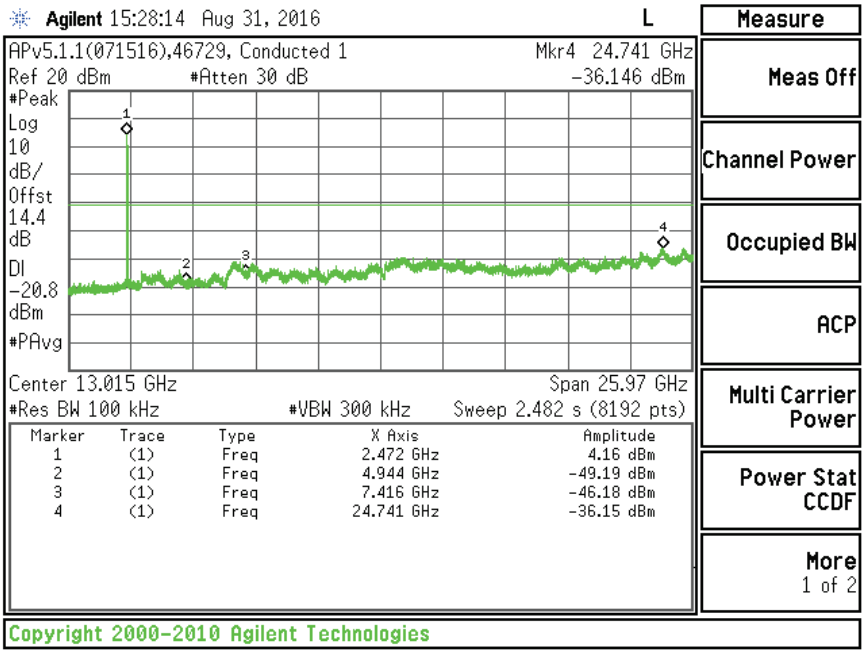
OUT OF BAND Chain 1 HIGH CH 12



OUT OF BAND Chain 1 HIGH CH 13



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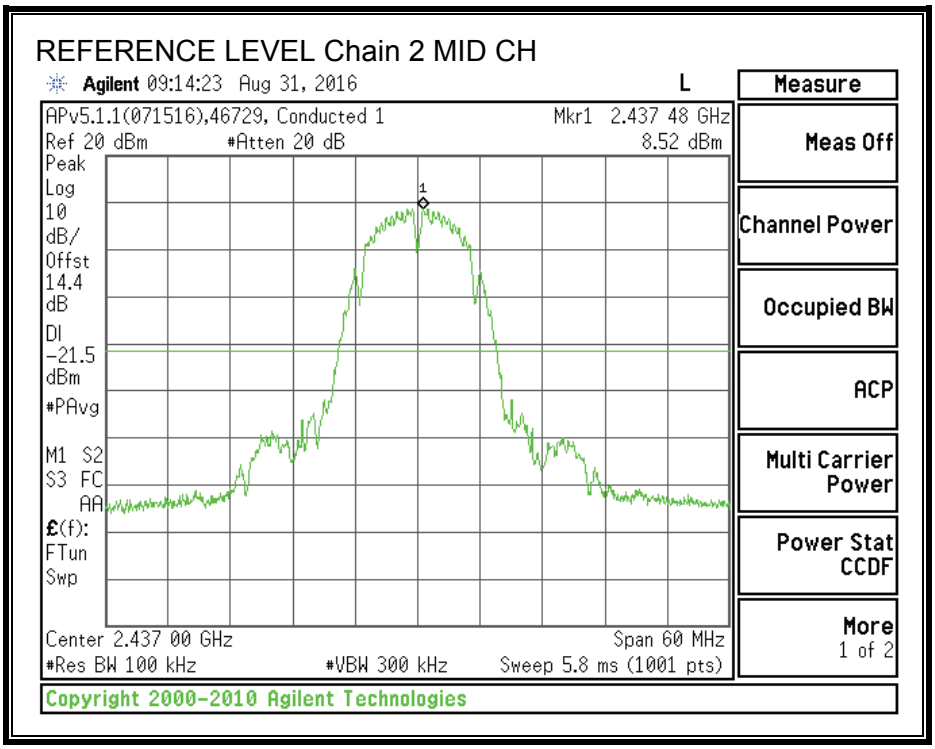
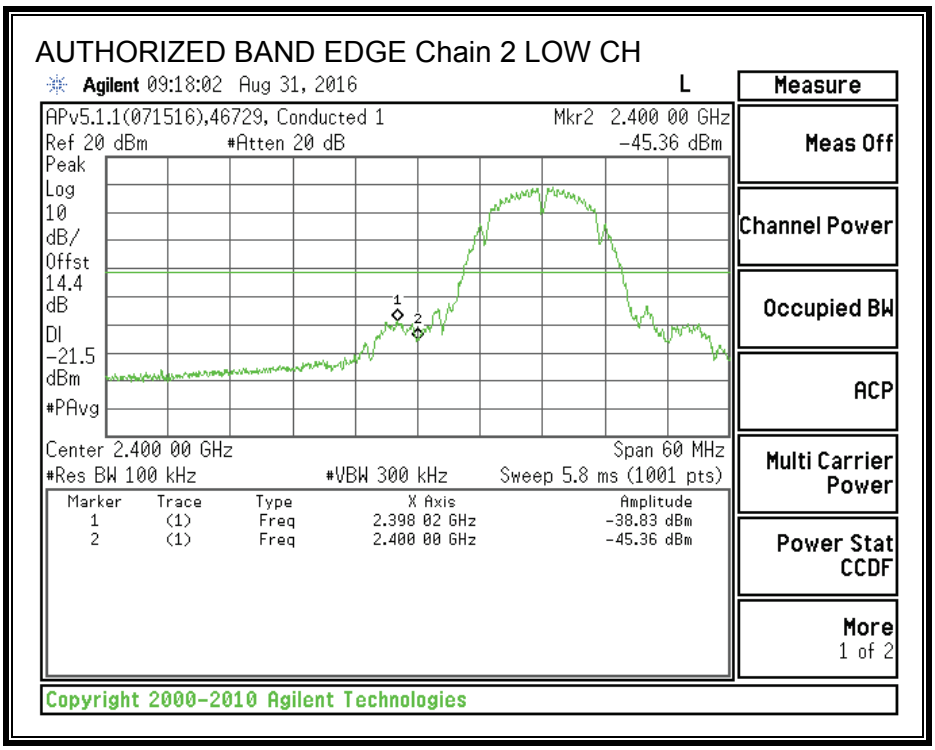
IN-BAND REFERENCE LEVEL, Chain 2



LOW CHANNEL BANDEDGE, Chain 2



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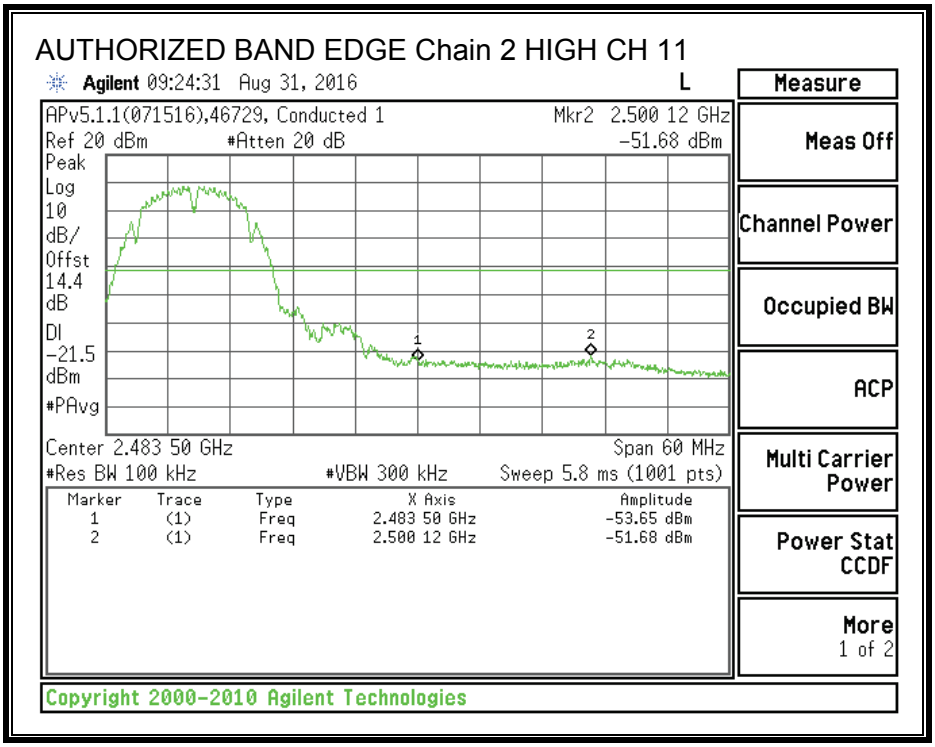
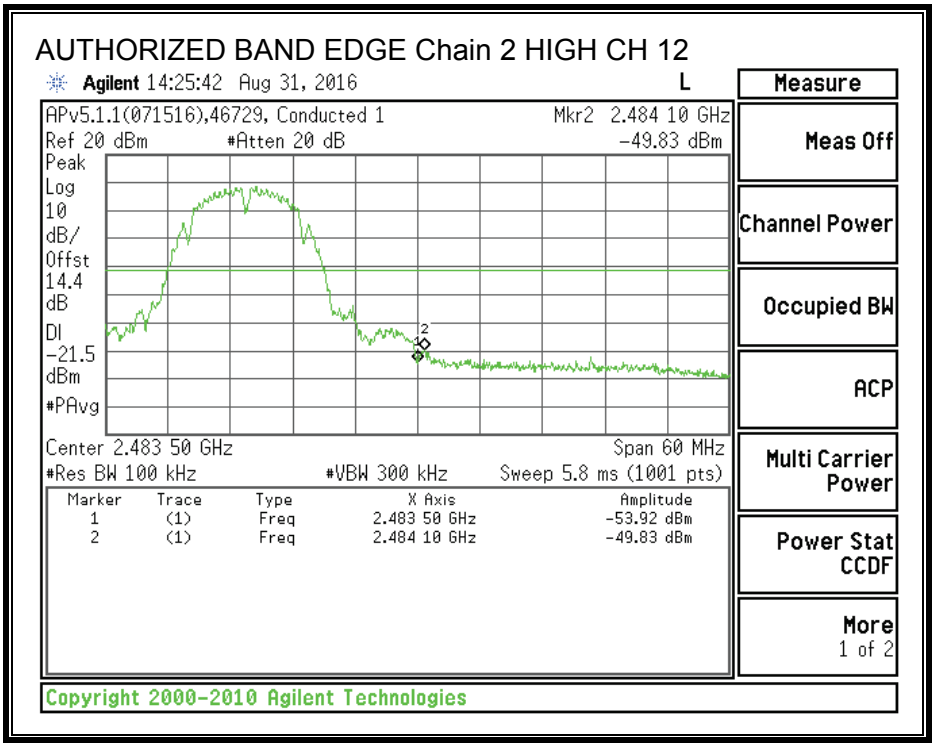
HIGH CHANNEL BANDEDGE, Chain 2





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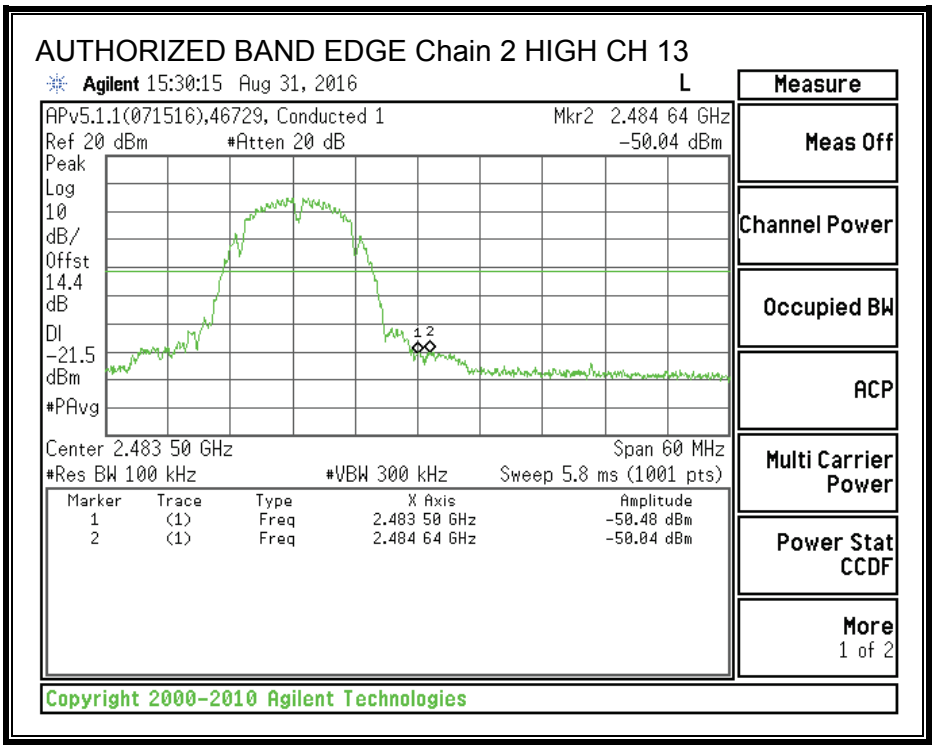
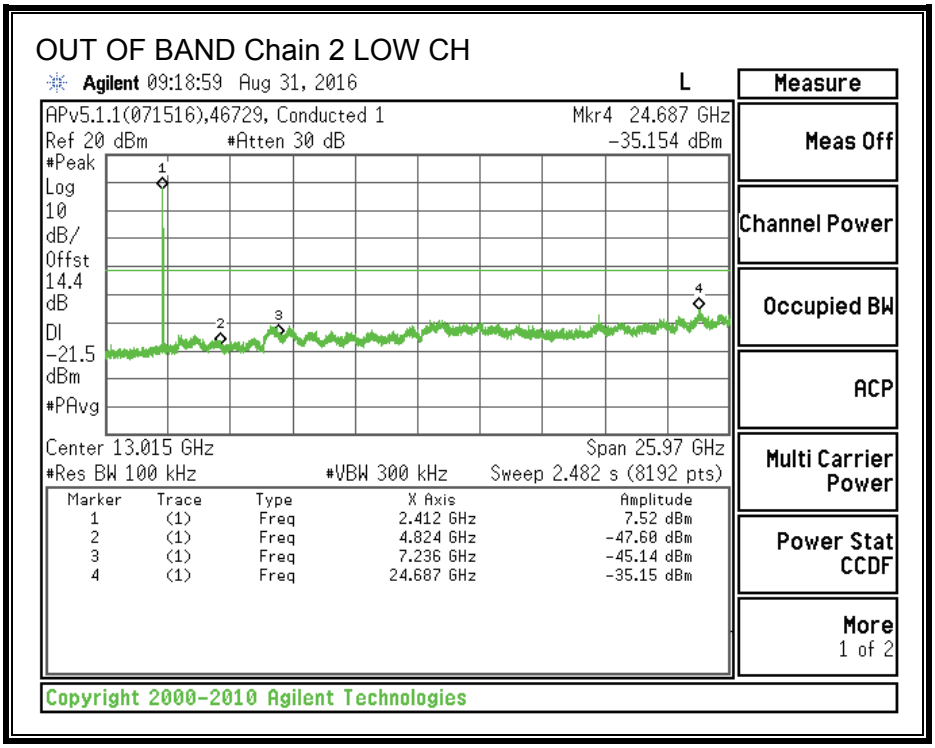


OUT-OF-BAND EMISSIONS, Chain 2



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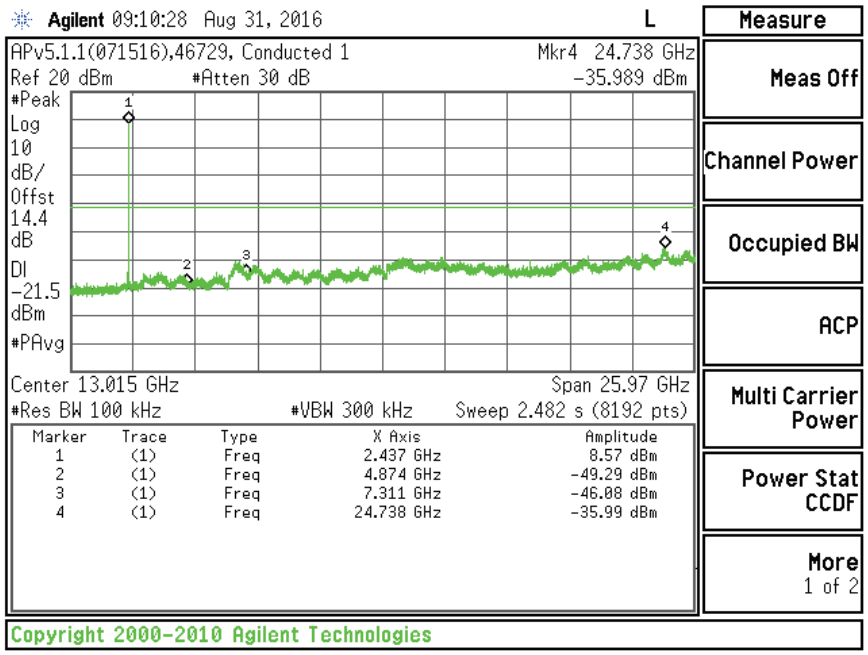
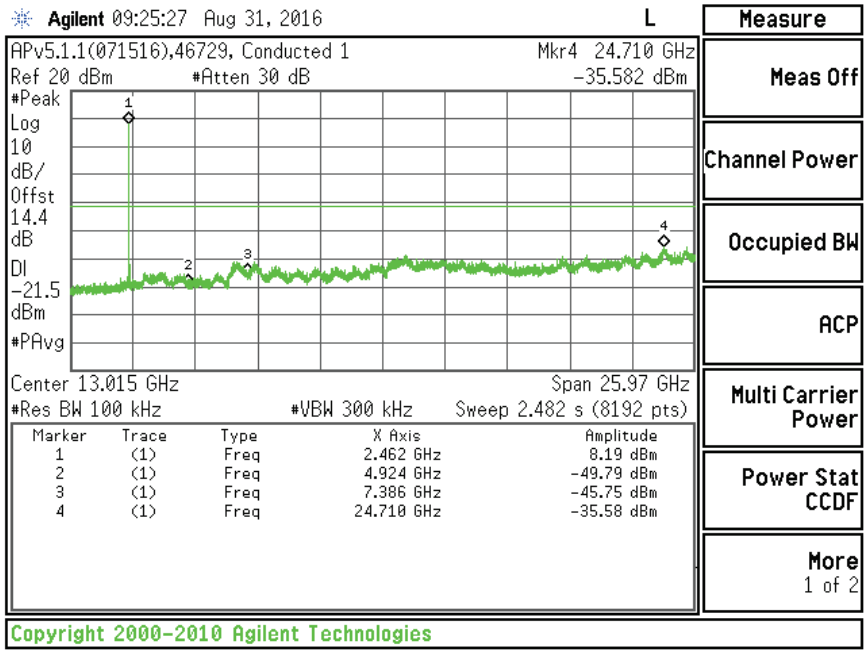
OUT OF BAND Chain 2 MID CH



OUT OF BAND Chain 2 HIGH CH 11



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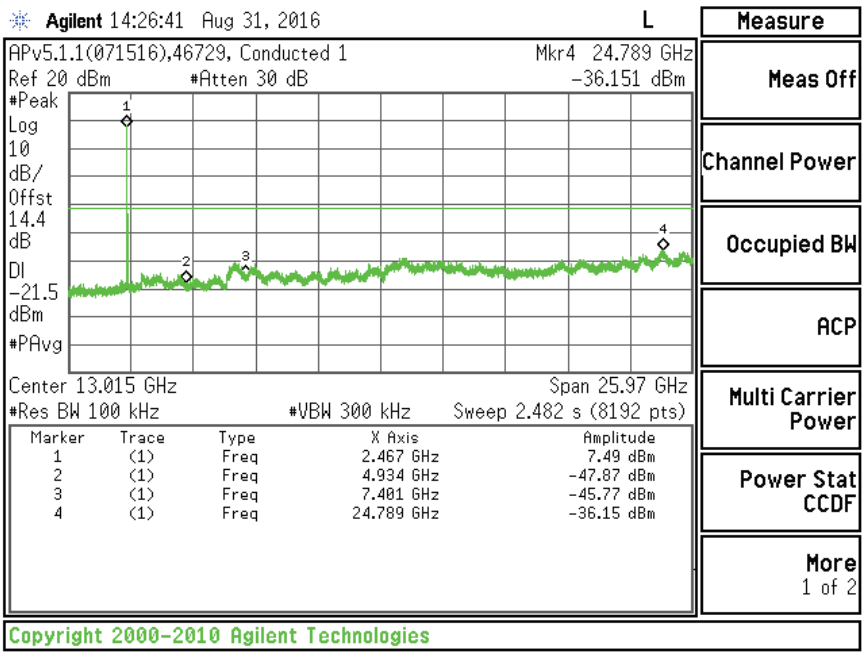
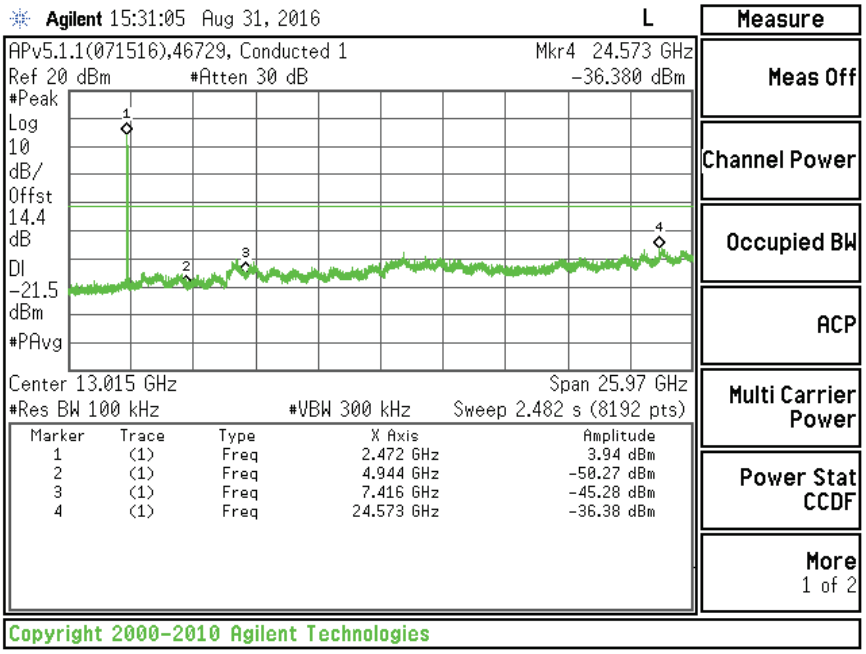
OUT OF BAND Chain 2 HIGH CH 12



OUT OF BAND Chain 2 HIGH CH 13



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8.3. 802.11g MODE IN THE 2.4 GHz BAND

8.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-247 5.2 (1)

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	2412	15.528	15.600	15.960	0.5
Mid	2437	15.203	15.576	15.960	0.5
High CH11	2462	15.504	15.576	15.936	0.5
High CH12	2467	15.528	15.576	16.025	0.5
High CH13	2472	15.528	15.576	15.720	0.5

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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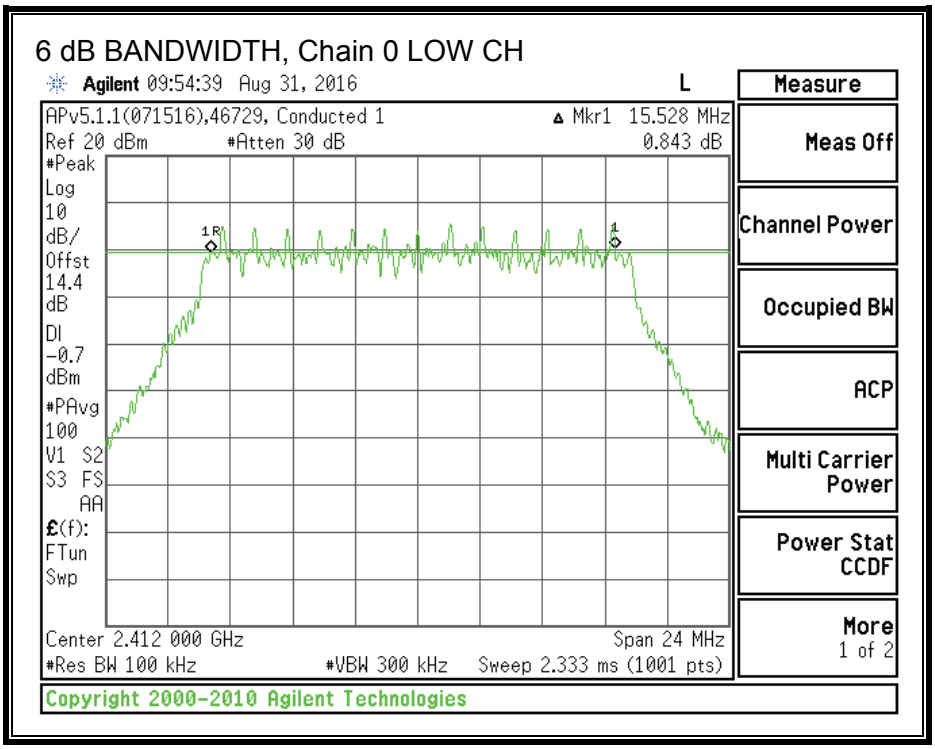
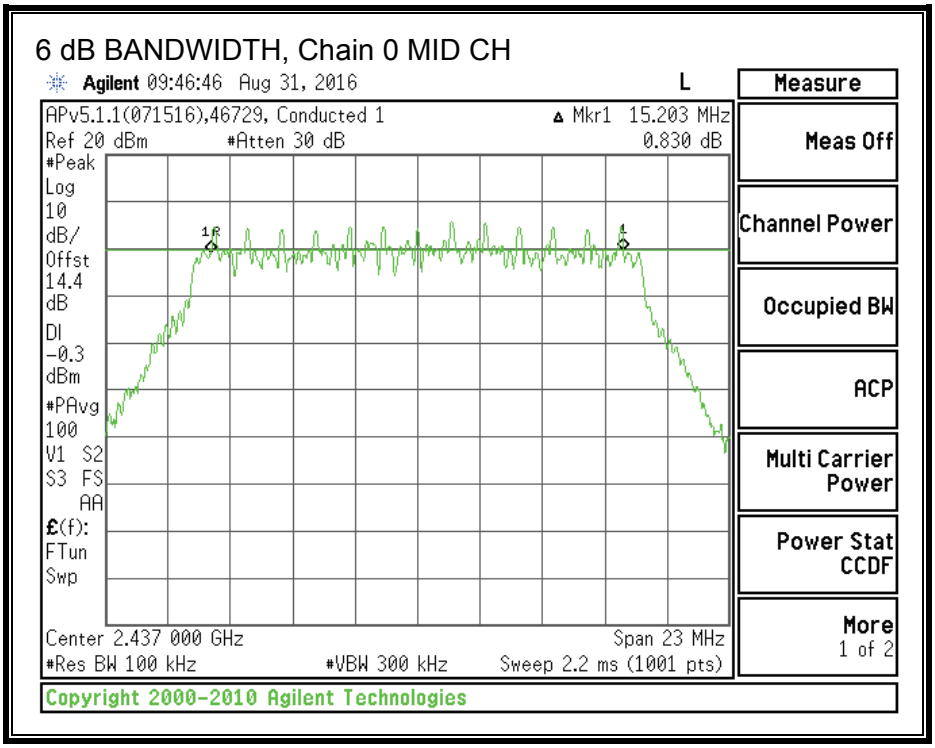
6 dB BANDWIDTH, Chain 0





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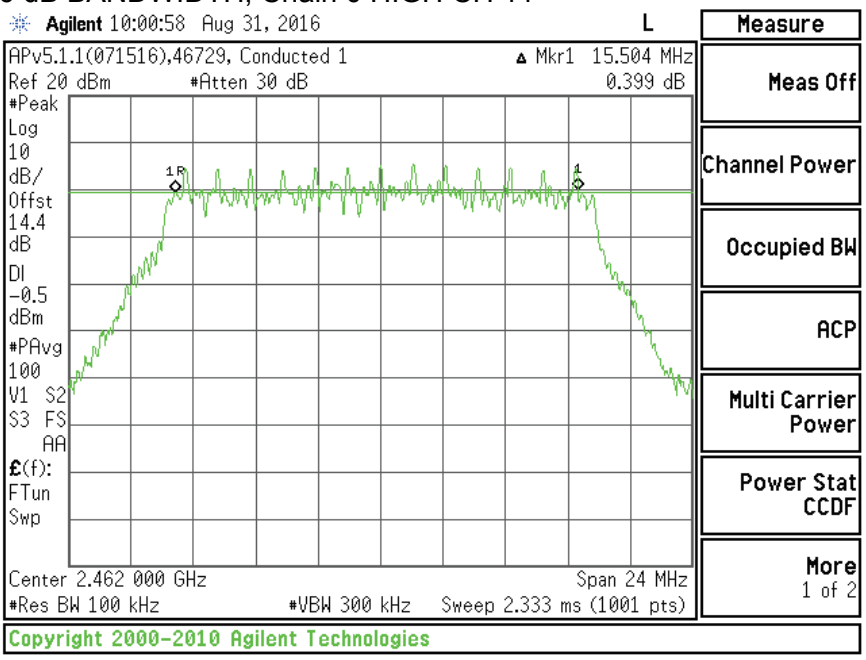
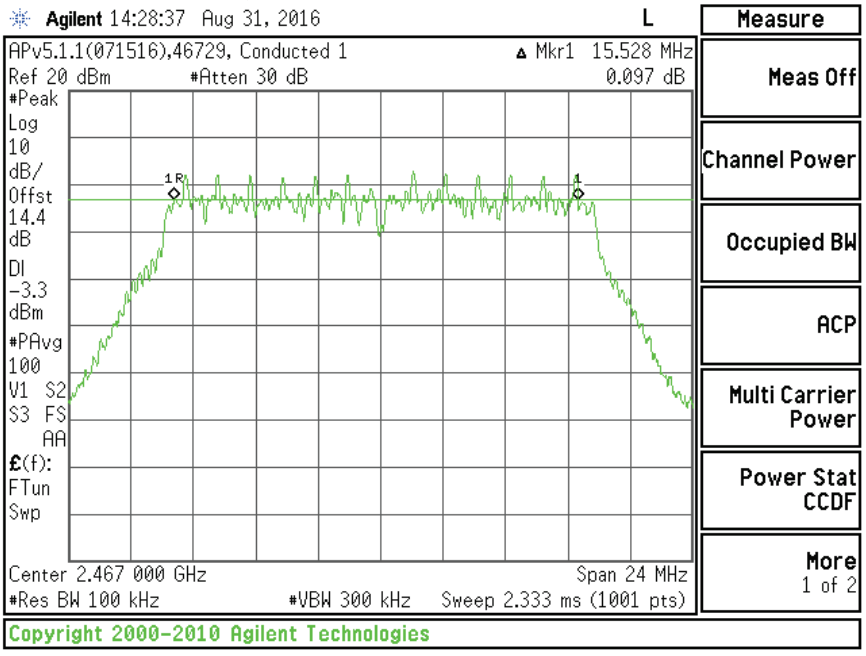
6 dB BANDWIDTH, Chain 0 HIGH CH 11



6 dB BANDWIDTH, Chain 0 HIGH CH 12



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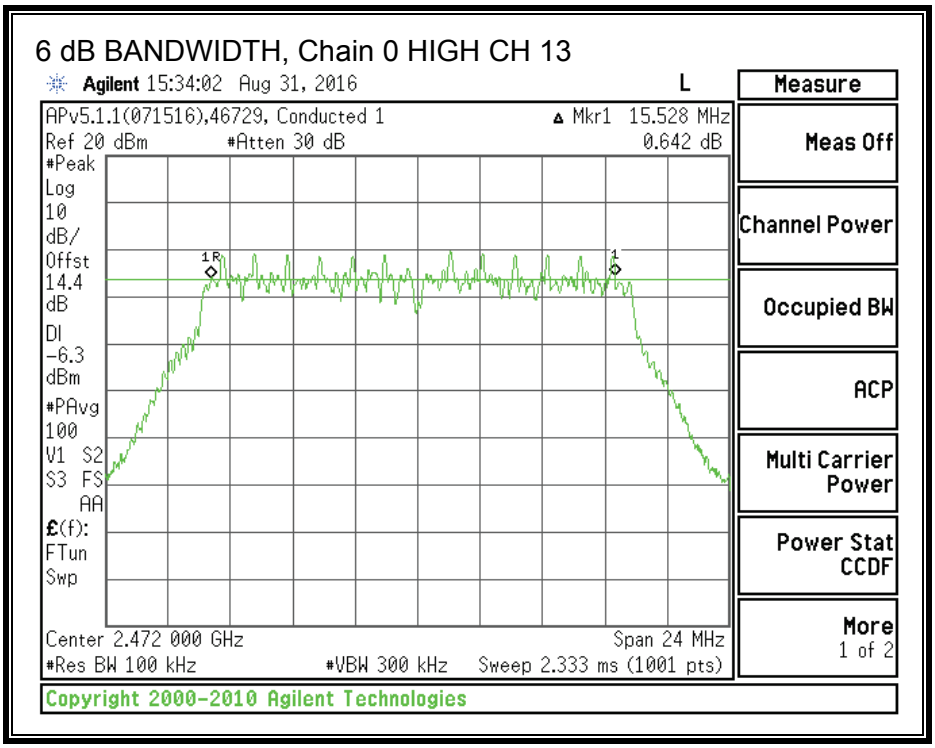
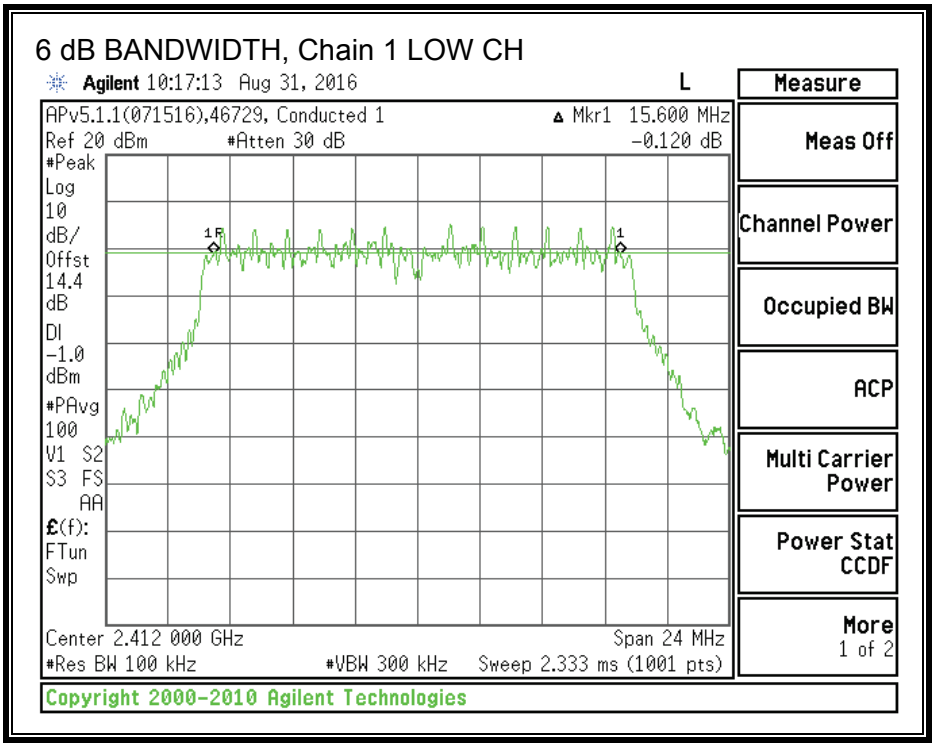


6 dB BANDWIDTH, Chain 1



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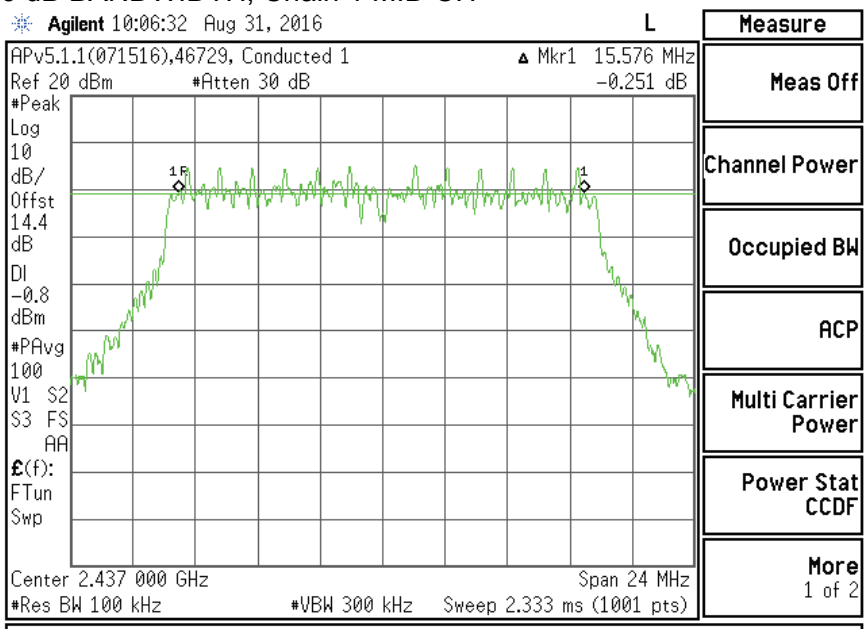
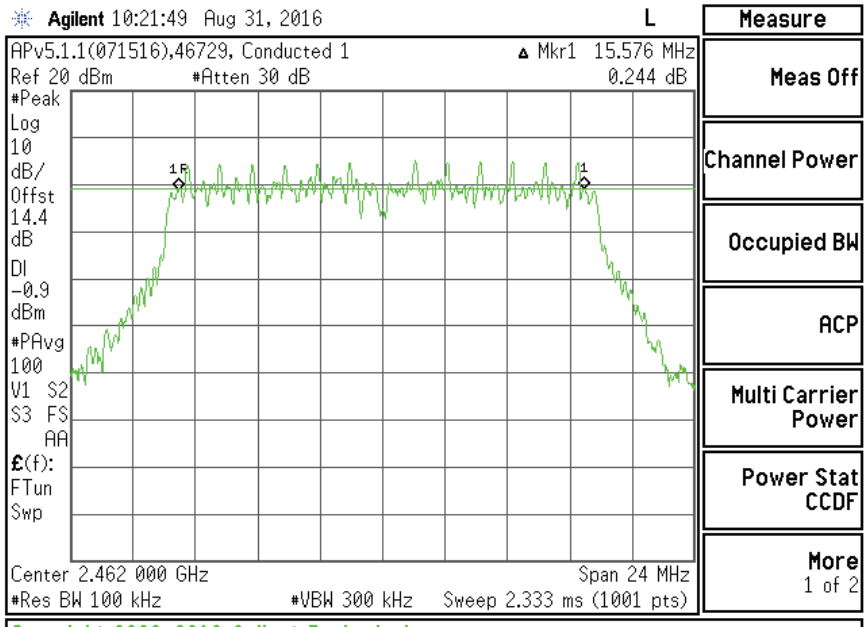
6 dB BANDWIDTH, Chain 1 MID CH



6 dB BANDWIDTH, Chain 1 HIGH CH 11



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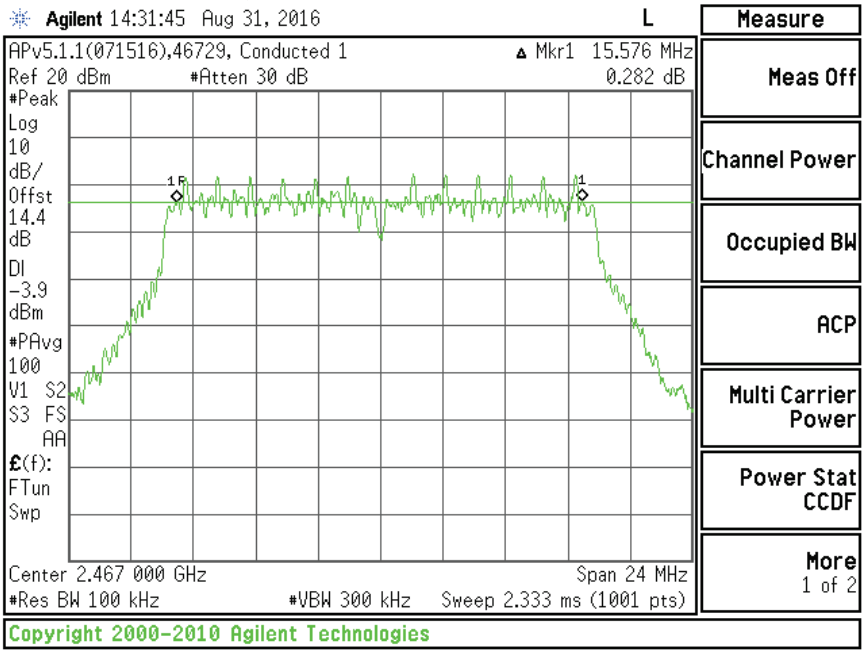
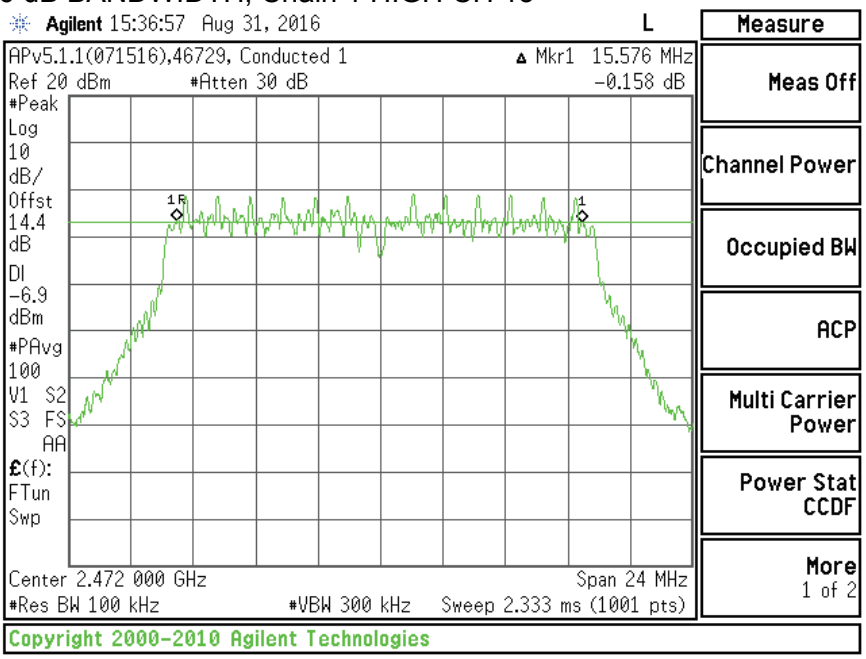
6 dB BANDWIDTH, Chain 1 HIGH CH 12



6 dB BANDWIDTH, Chain 1 HIGH CH 13



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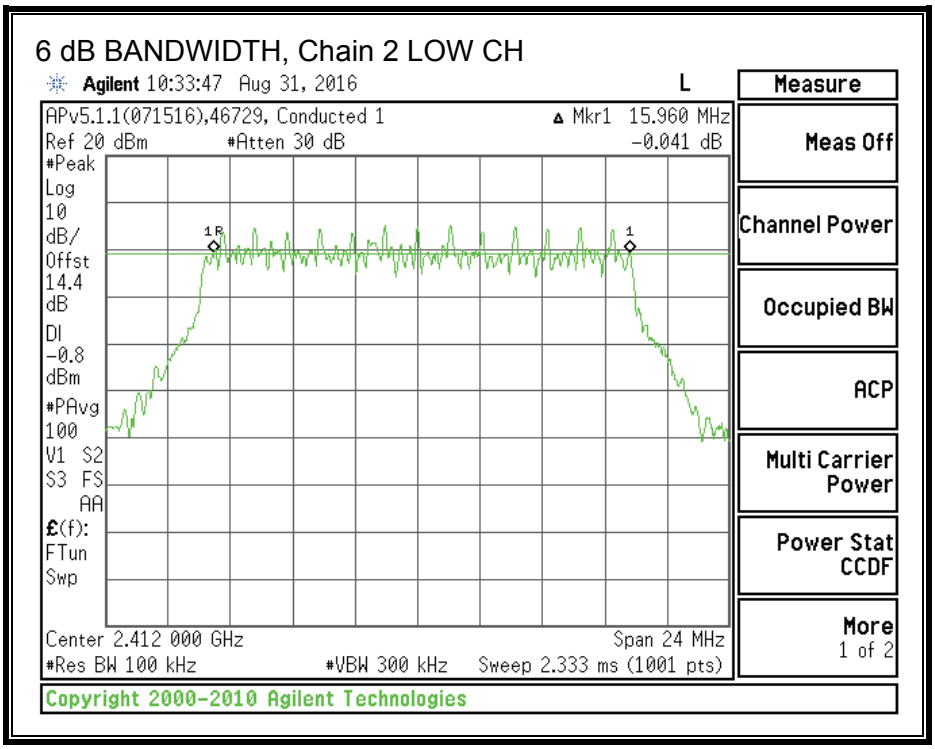
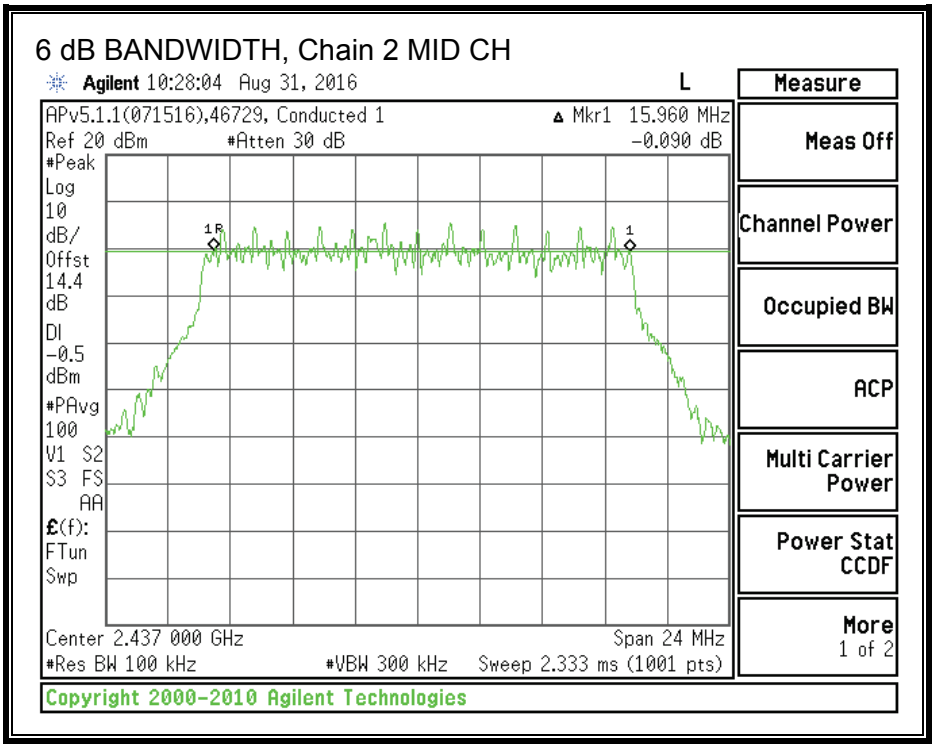
6 dB BANDWIDTH, Chain 2





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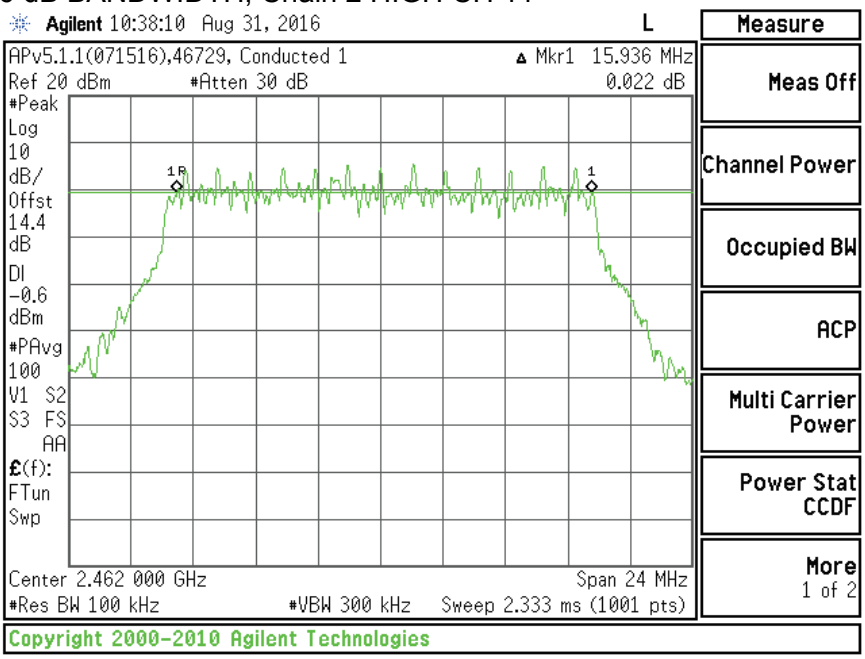
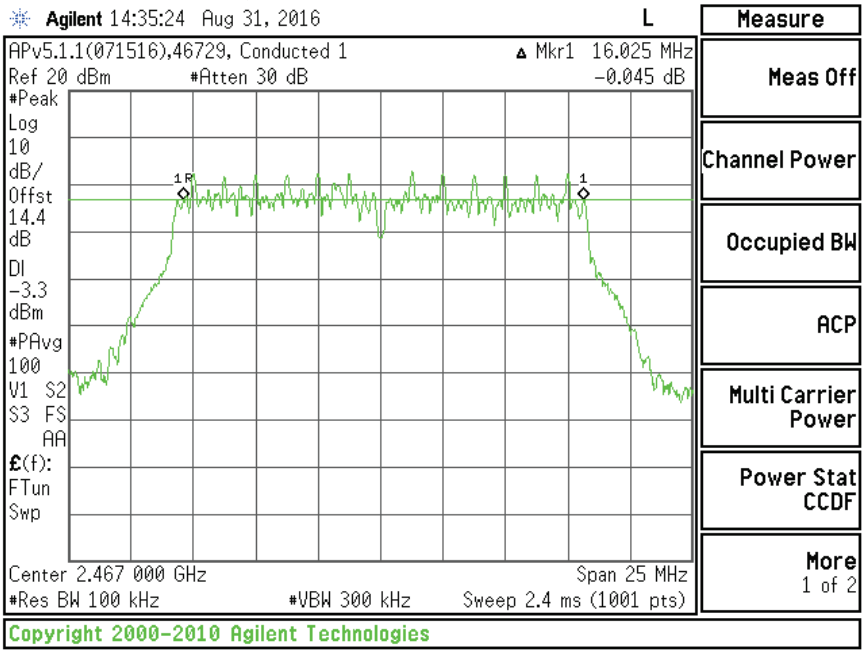
6 dB BANDWIDTH, Chain 2 HIGH CH 11



6 dB BANDWIDTH, Chain 2 HIGH CH 12



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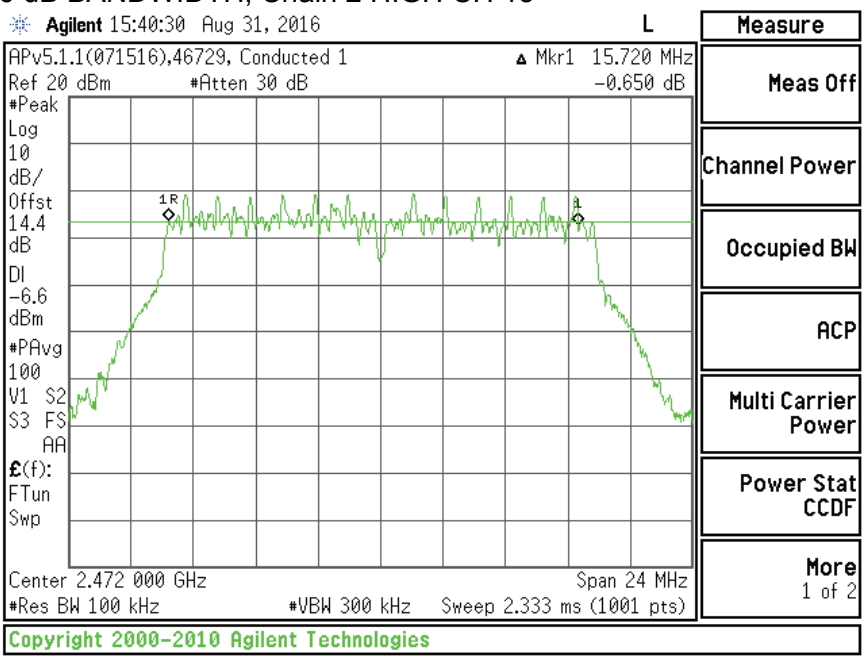
6 dB BANDWIDTH, Chain 2 HIGH CH 13



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8.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only. Testing per RSS-Gen Clause 6.6.

RESULTS

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	2412	16.5641	16.5214	16.3923
Mid	2437	16.7010	16.1857	16.4206
High Ch 11	2462	16.4733	16.5526	16.3876
High Ch 12	2467	16.6522	16.3092	16.4372
High Ch 13	2472	16.5573	16.4759	16.2529

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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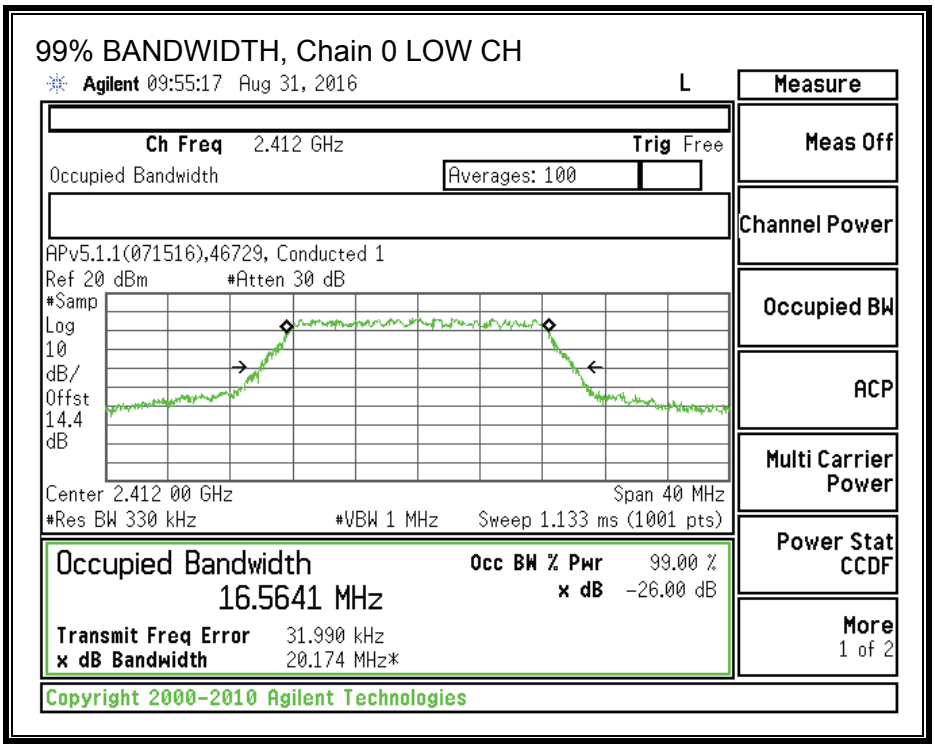
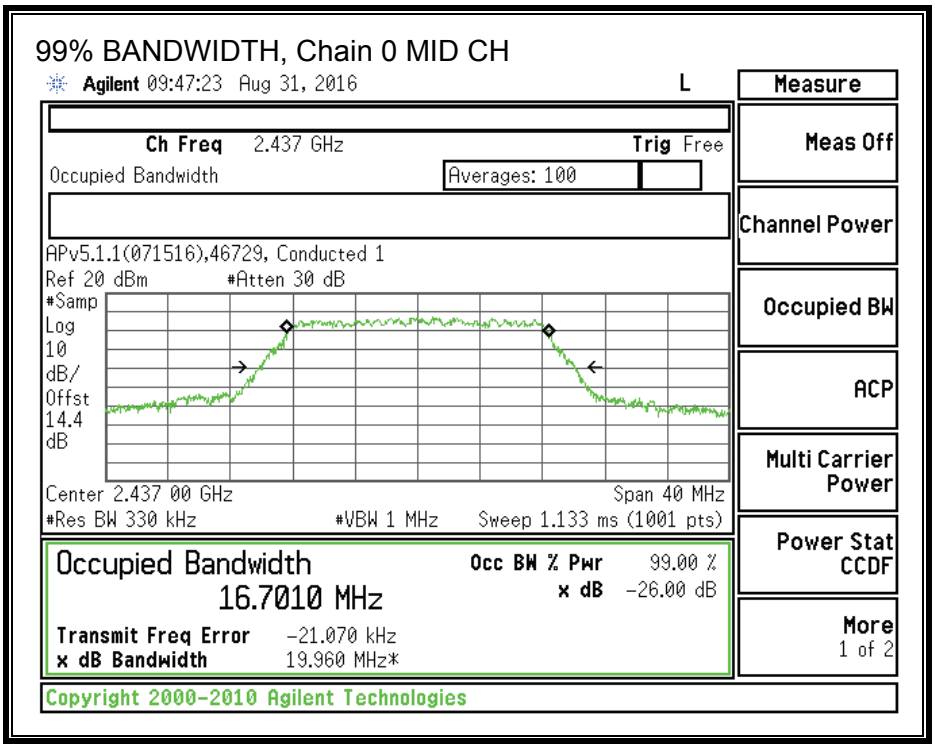
99% BANDWIDTH, Chain 0





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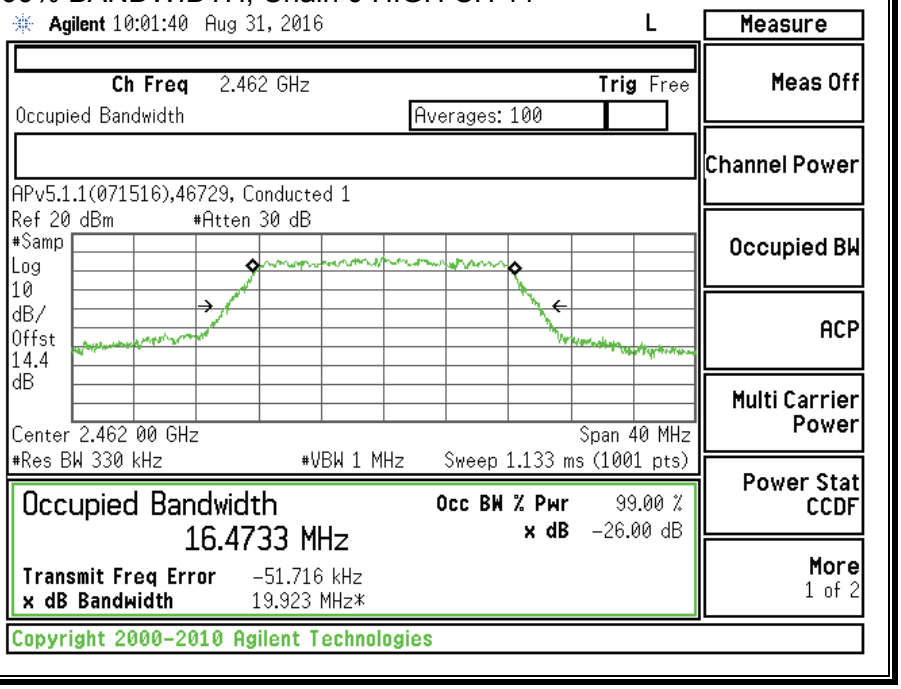
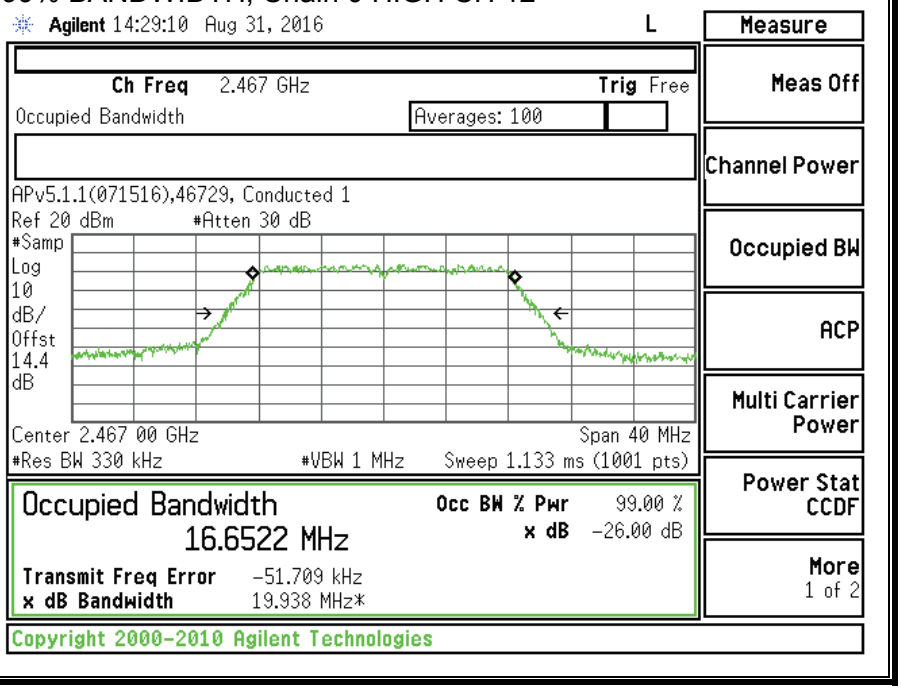
99% BANDWIDTH, Chain 0 HIGH CH 11



99% BANDWIDTH, Chain 0 HIGH CH 12



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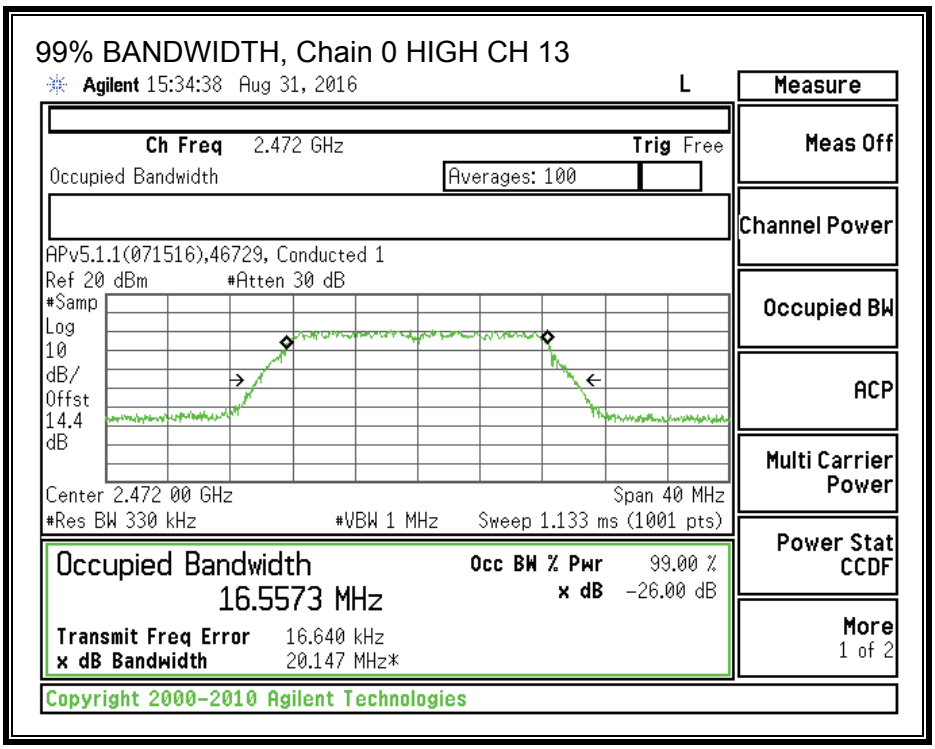
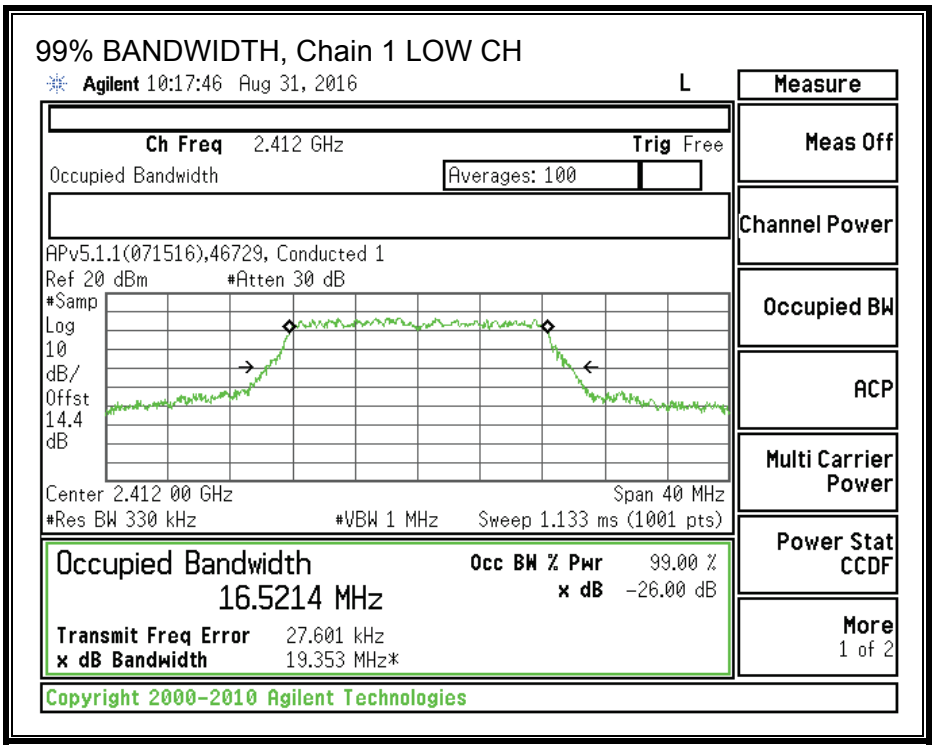


99% BANDWIDTH, Chain 1



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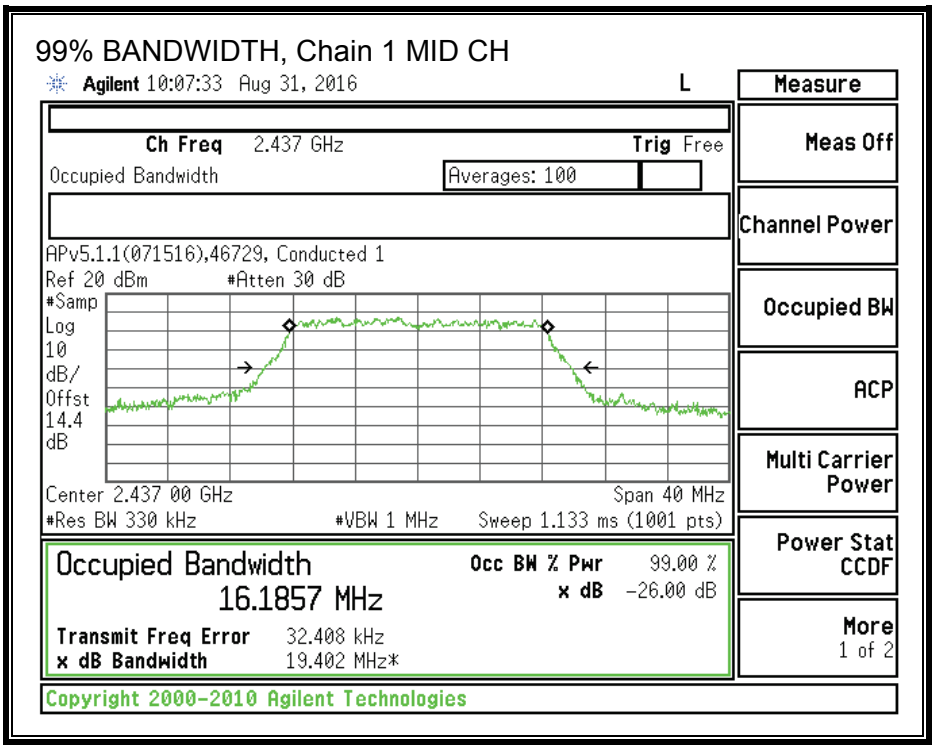

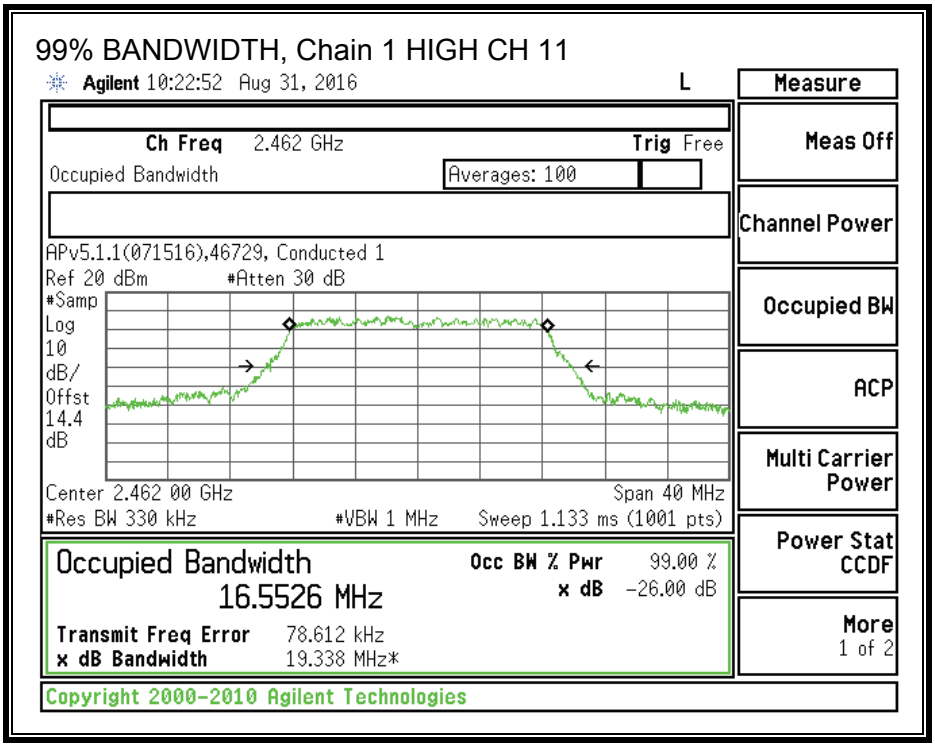

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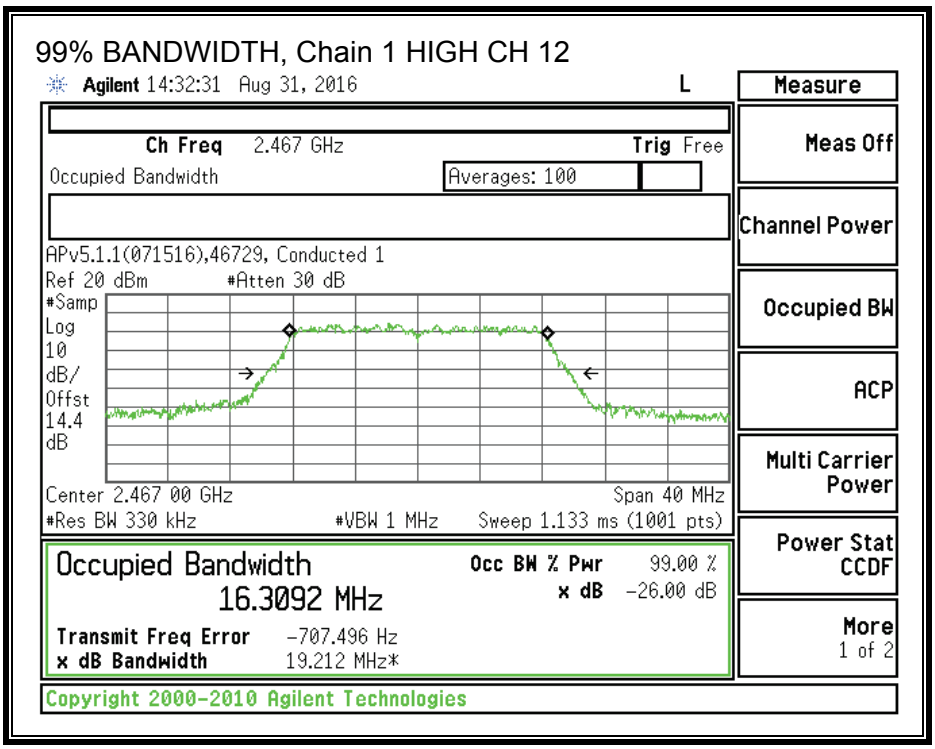

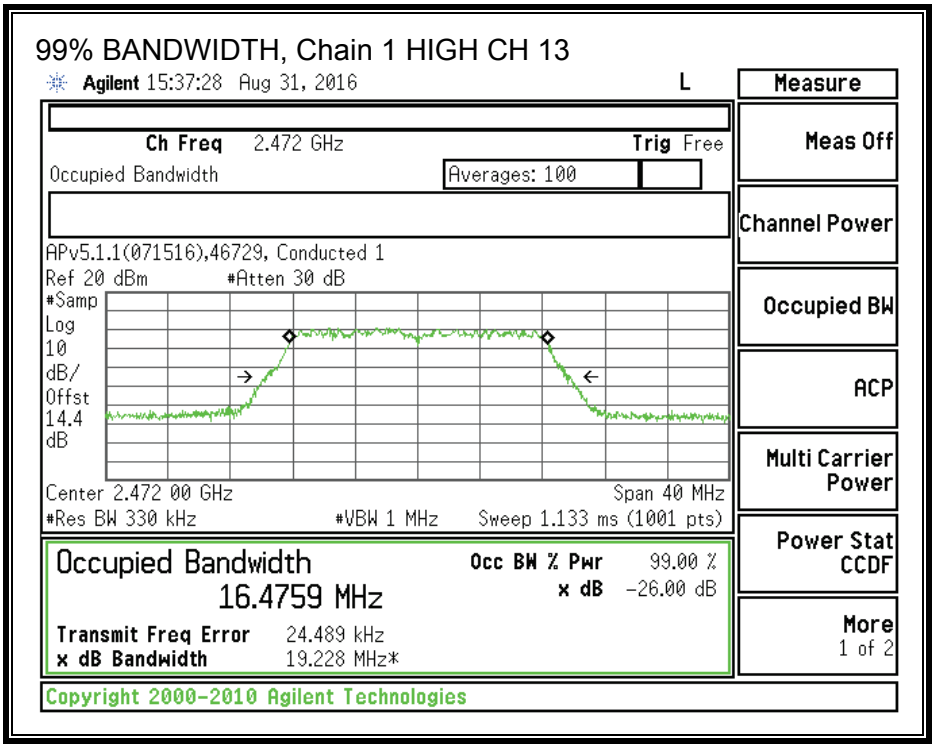

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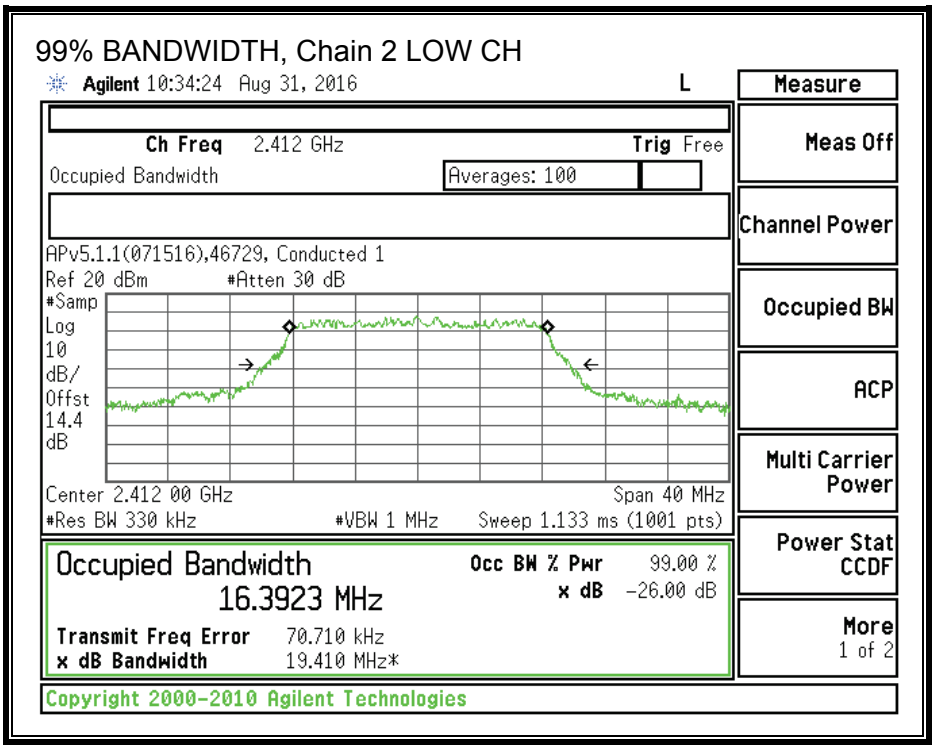
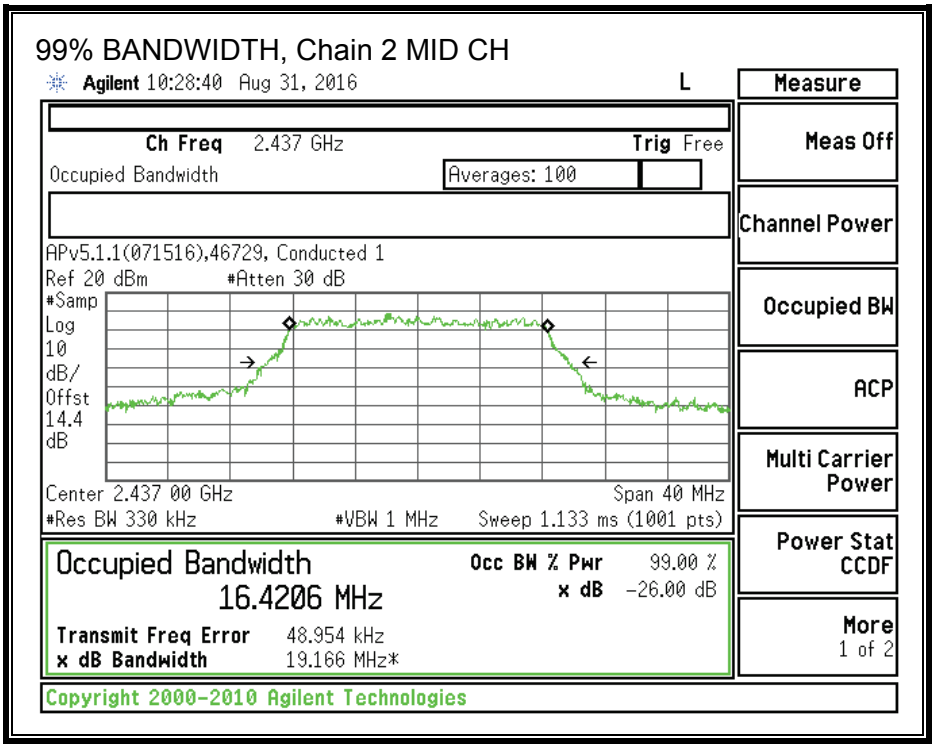
99% BANDWIDTH, Chain 2





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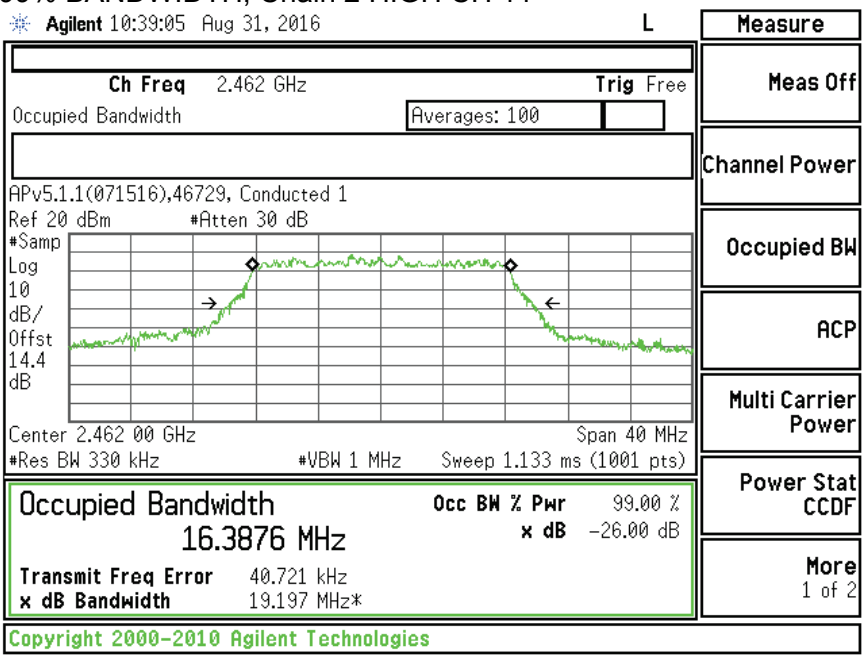
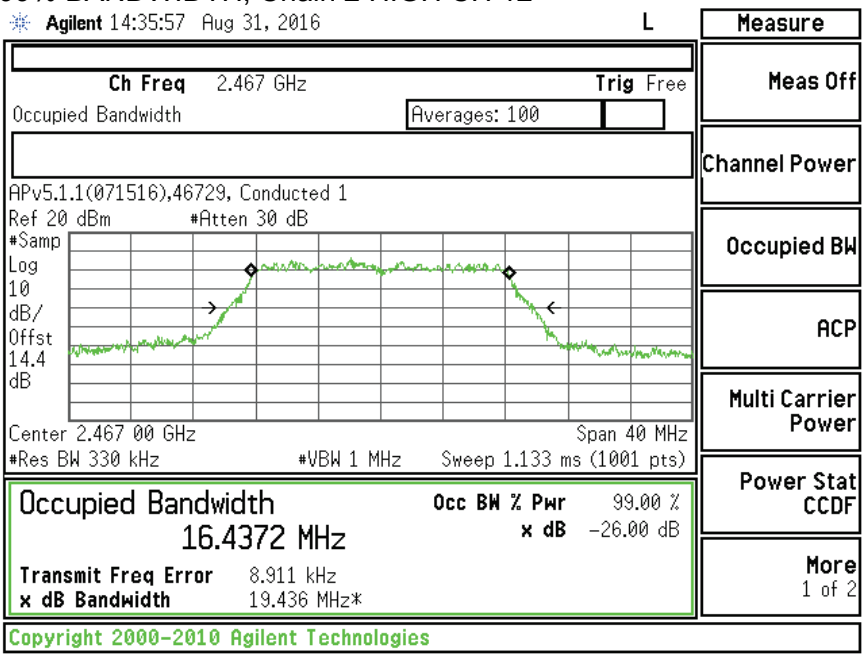
99% BANDWIDTH, Chain 2 HIGH CH 11



99% BANDWIDTH, Chain 2 HIGH CH 12



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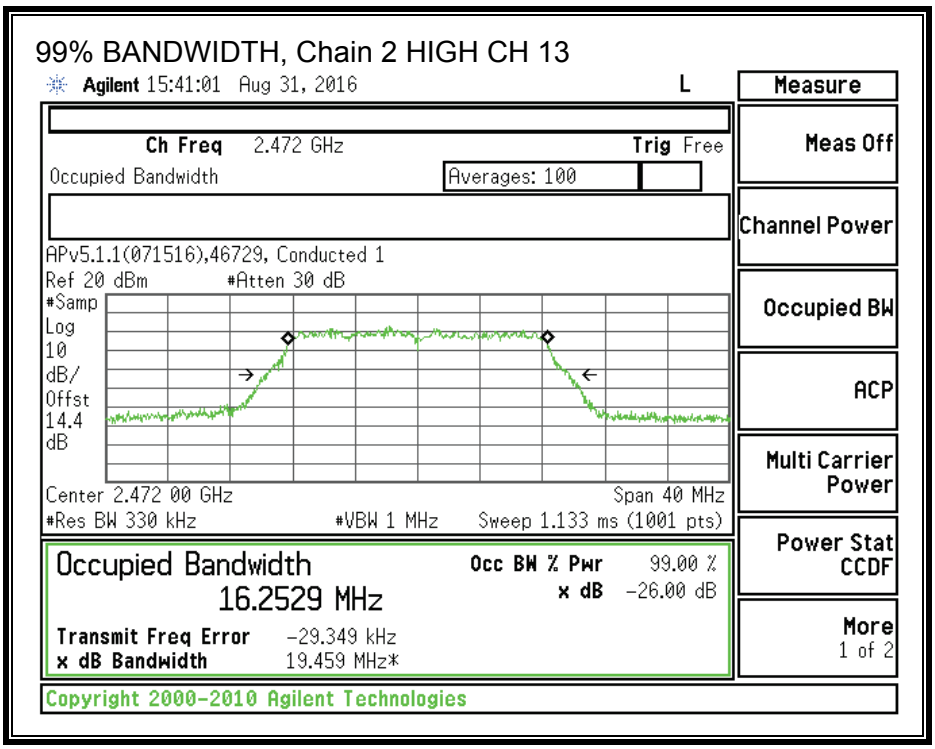

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8.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

IC RSS-247 5.4 (4)

FCC - For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS - For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

Date: 2016-10-03
Tester: Niklas Haydon / Jeff Cabrera

DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11g. Per KDB 662911, no array gain is added for power when N_{ANT} </= 4. Therefore, the directional gain is as follows:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Directional Gain (dBi)
6.00	6.00	6.00	6.00

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RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	6.00	30.00	30	36	30.00
Mid	2437	6.00	30.00	30	36	30.00
High 11	2462	6.00	30.00	30	36	30.00
High 12	2467	6.00	30.00	30	36	30.00
High 13	2472	6.00	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	14.08	13.81	14.15	18.79	30.00	-11.21
Mid	2437	14.11	13.75	14.20	18.80	30.00	-11.20
High 11	2462	14.14	13.58	13.84	18.63	30.00	-11.37
High 12	2467	12.68	12.58	13.08	17.56	30.00	-12.44
High 13	2472	10.10	9.85	10.24	14.84	30.00	-15.16

Note – The above are gated average power measurements.

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8.3.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-247 5.2 (2)

For digitally modulated systems, the power spectral density conducted form the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

RESULTS

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.58	-11.75	-4.74	-2.06	8.0	-10.1
Mid	2437	-6.21	-11.36	-5.63	-2.32	8.0	-10.3
High Ch 11	2462	-5.28	-11.76	-5.16	-1.75	8.0	-9.8
High Ch 12	2467	-15.47	-14.57	-14.73	-10.14	8.0	-18.1
High Ch 13	2472	-17.96	-17.64	-17.56	-12.95	8.0	-20.9

Note – Peak method used, therefore duty cycle correction not included.

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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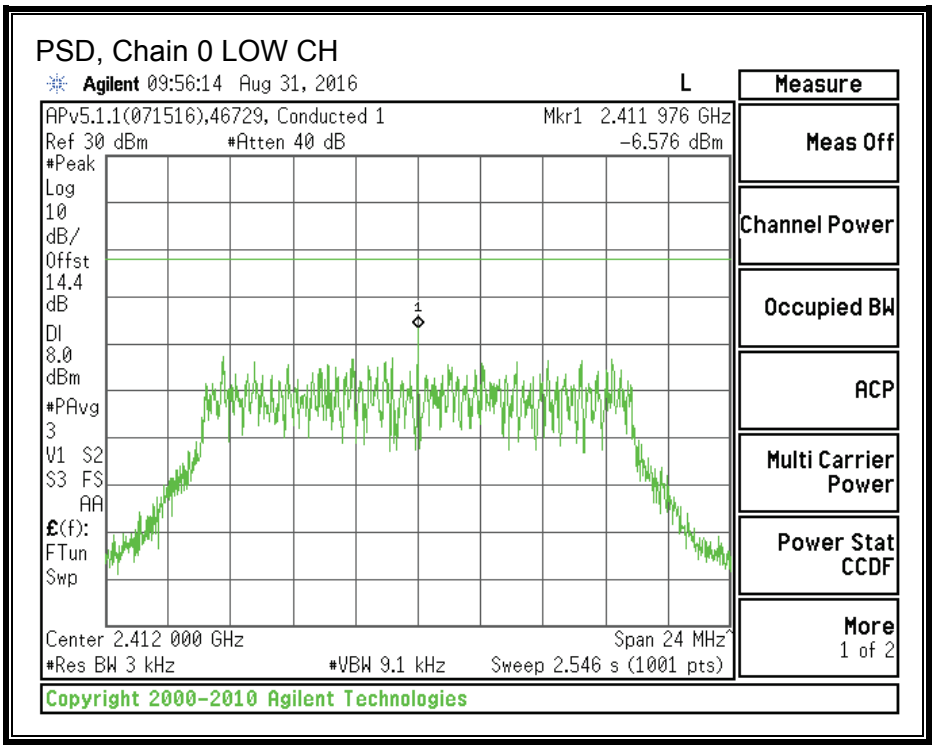
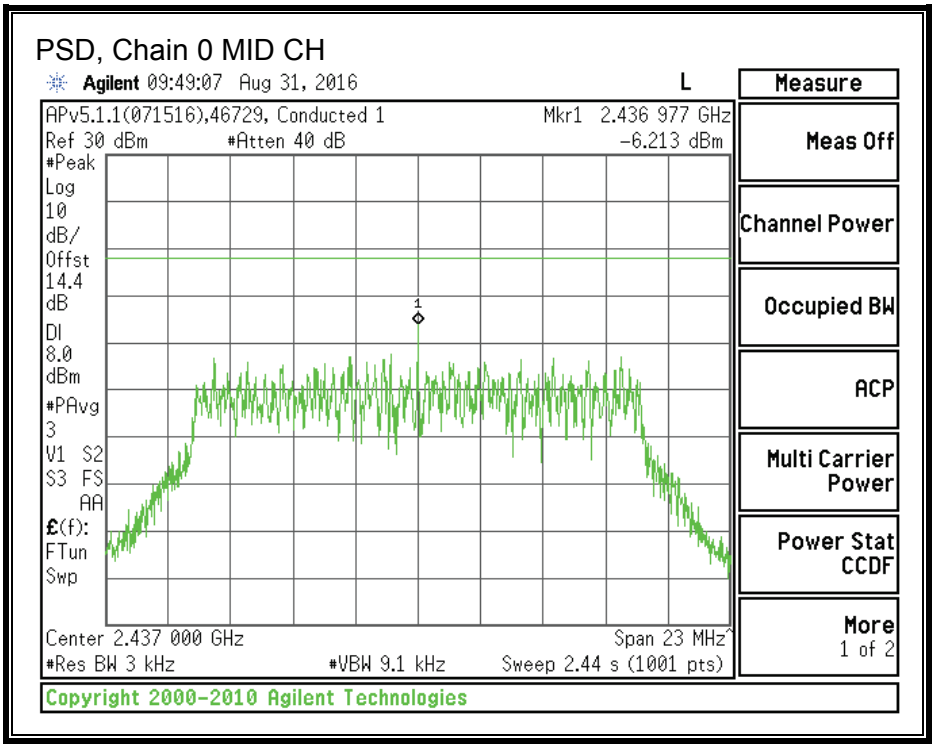
PSD, Chain 0





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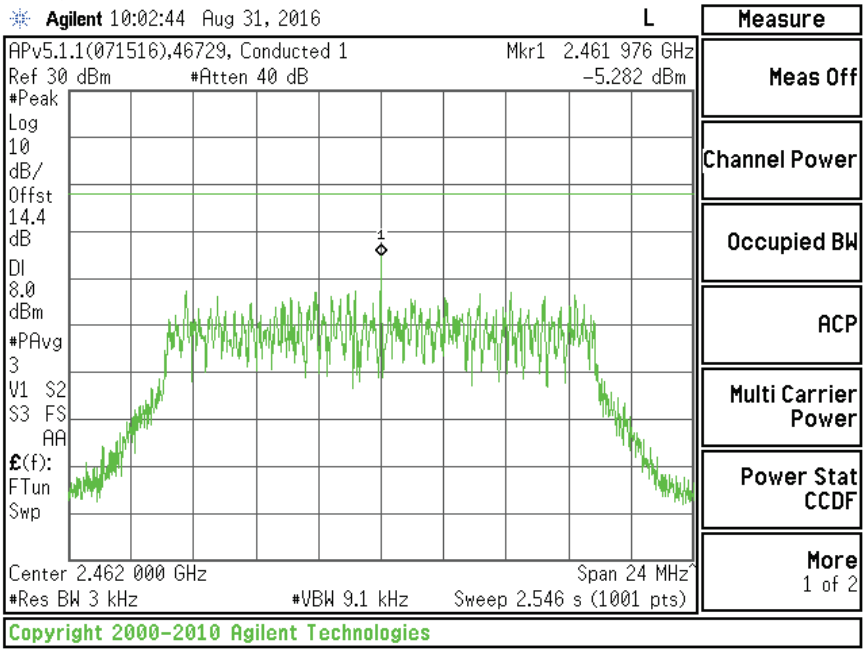
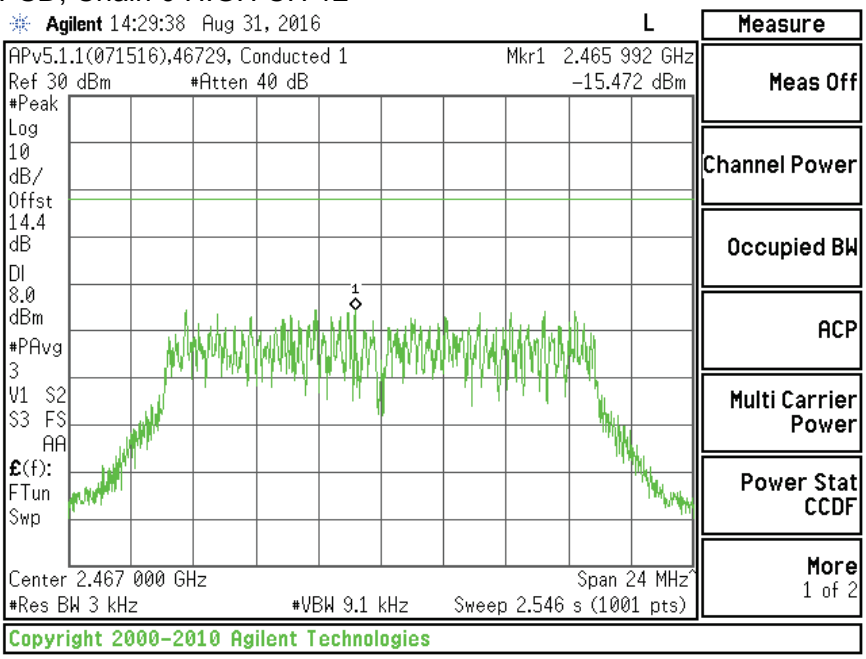
PSD, Chain 0 HIGH CH 11



PSD, Chain 0 HIGH CH 12



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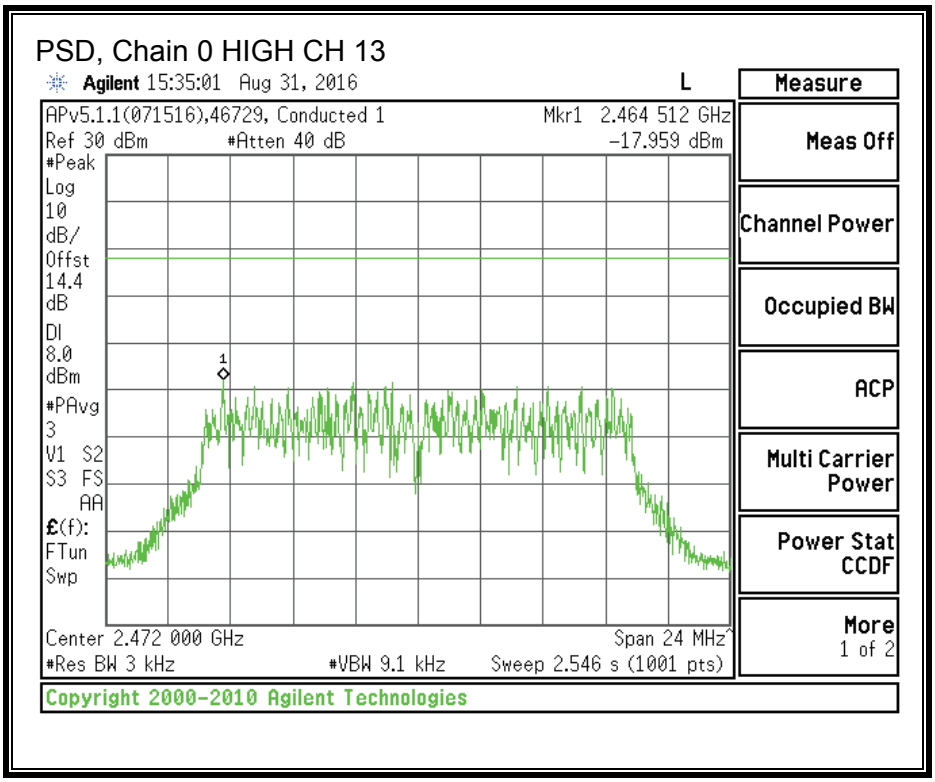
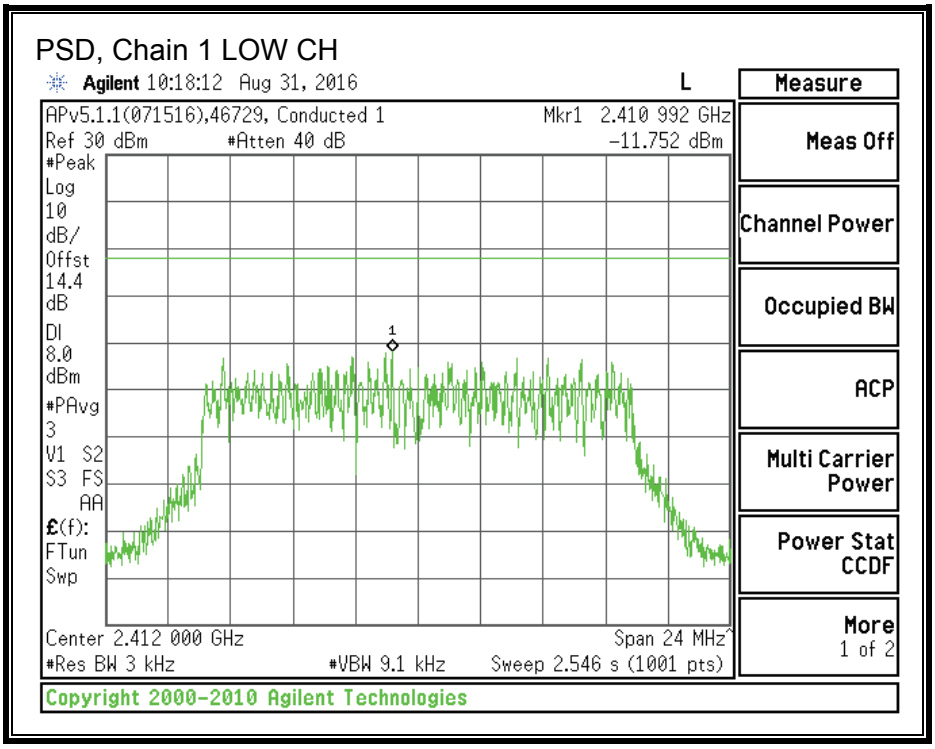


PSD, Chain 1



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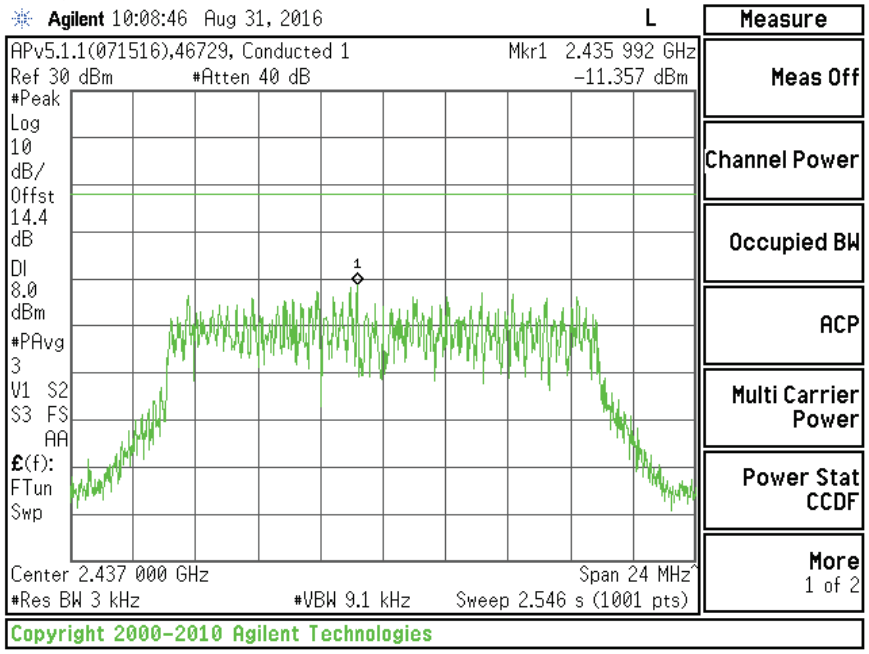
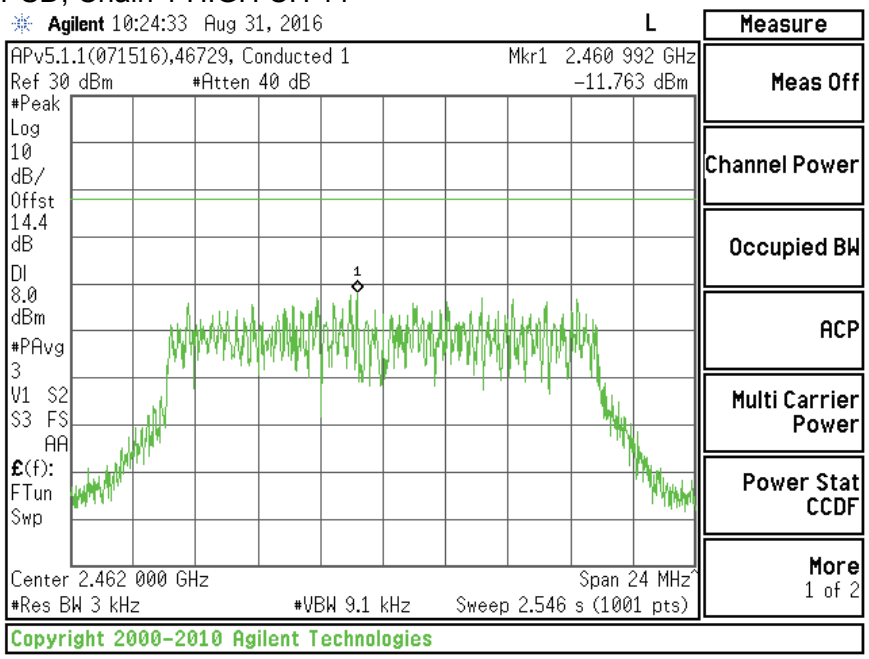
PSD, Chain 1 MID CH



PSD, Chain 1 HIGH CH 11



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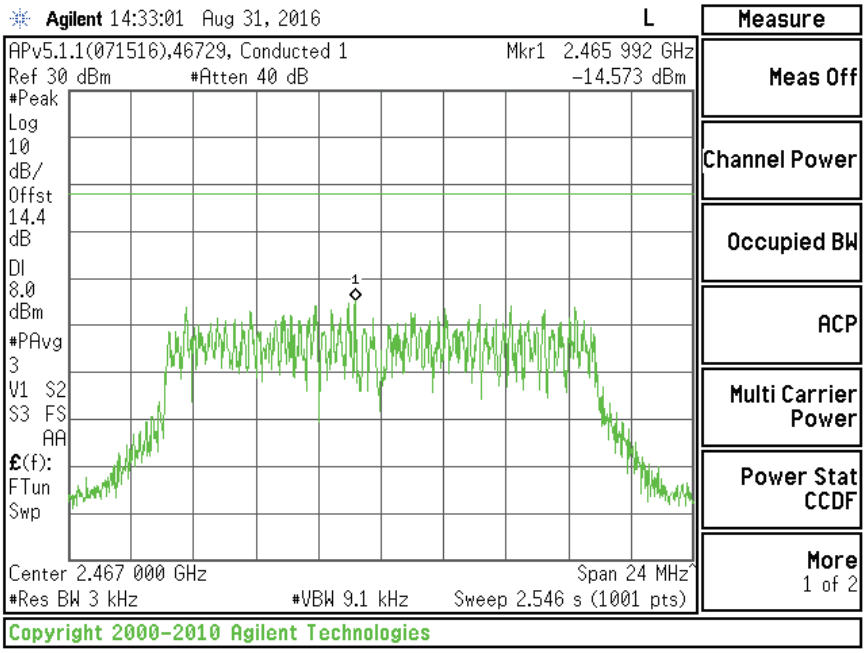
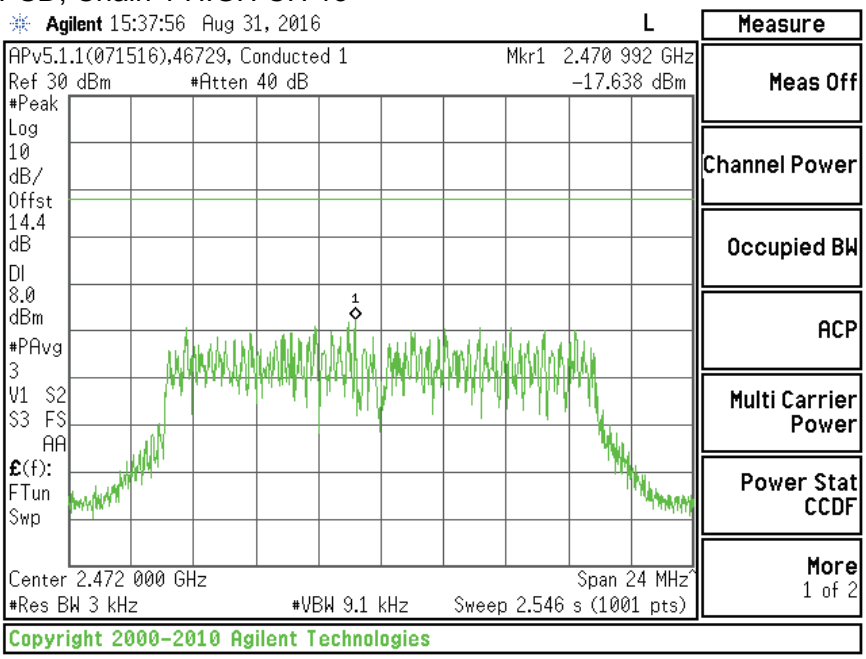
PSD, Chain 1 HIGH CH 12



PSD, Chain 1 HIGH CH 13



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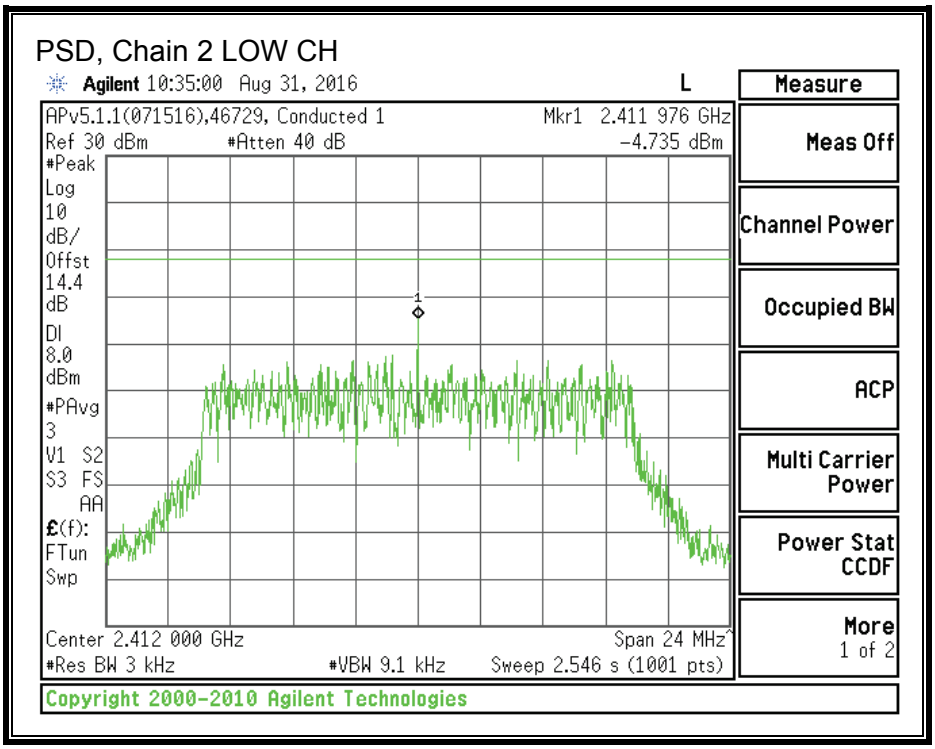
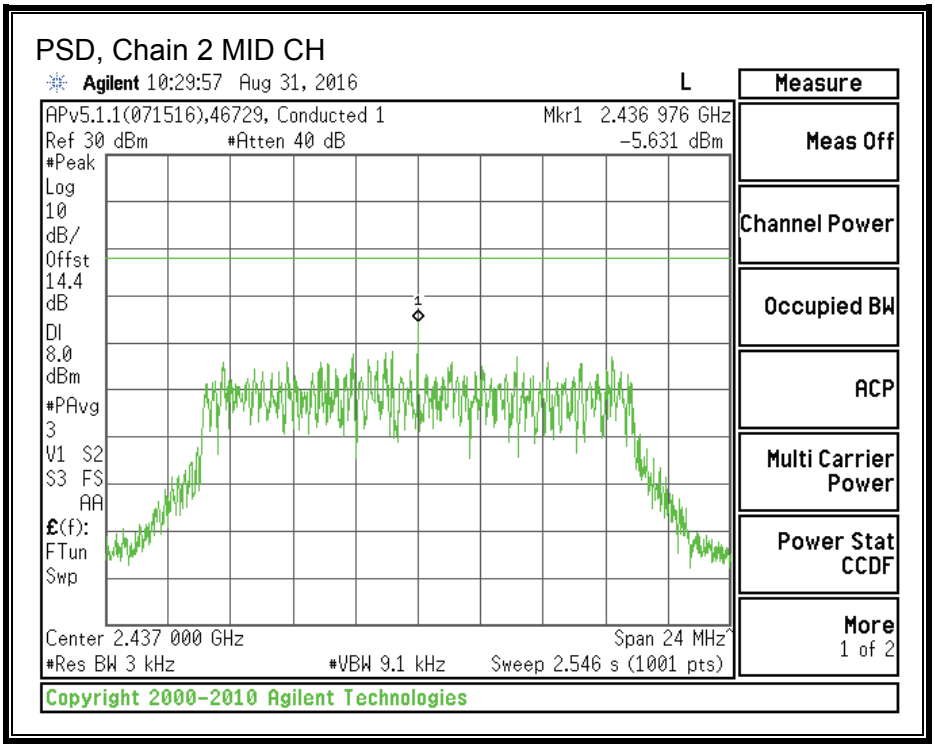
PSD, Chain 2





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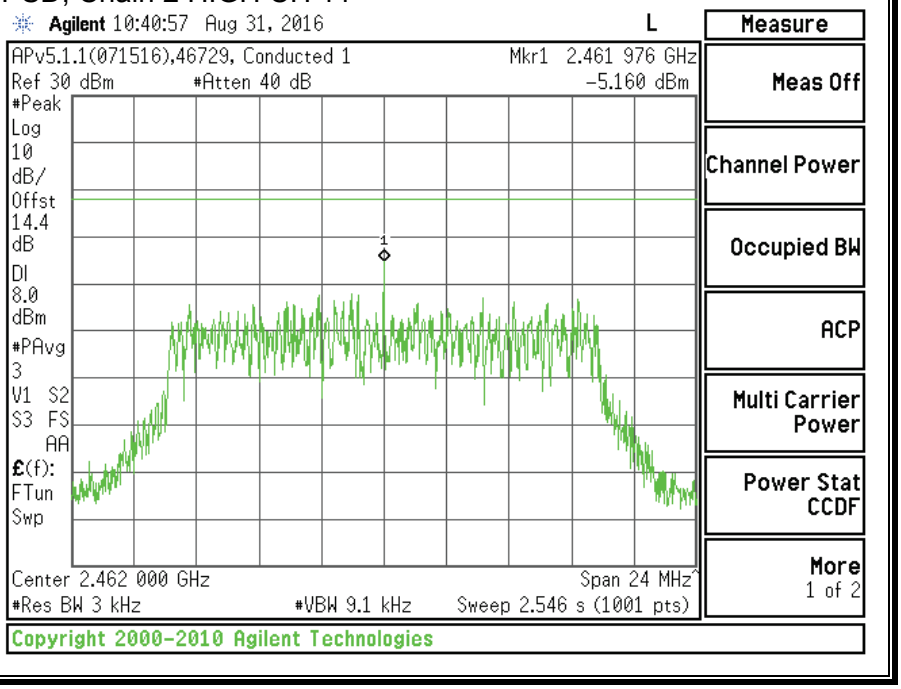
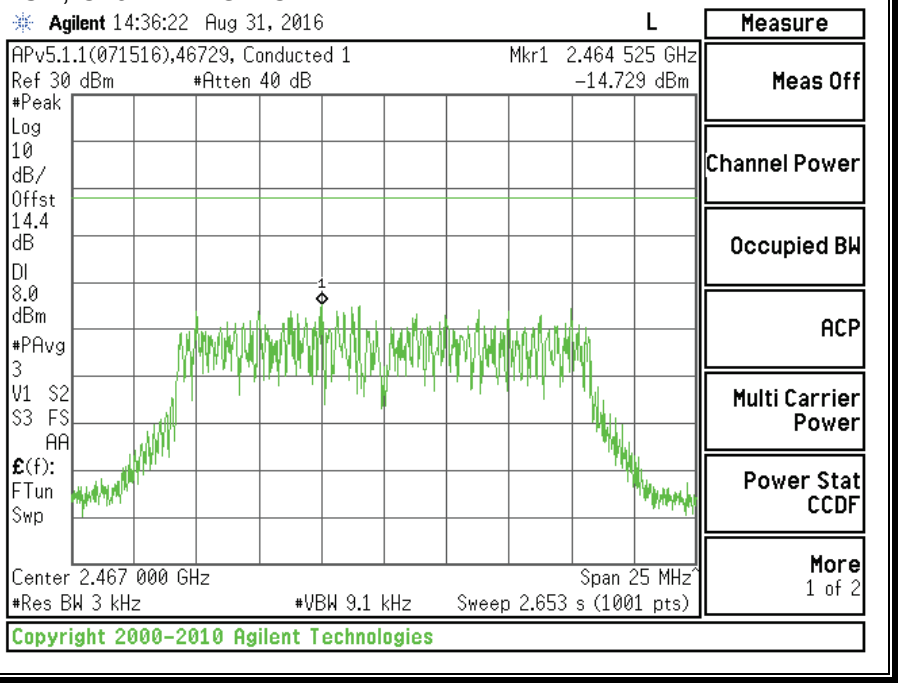


PSD, Chain 2 HIGH CH 12



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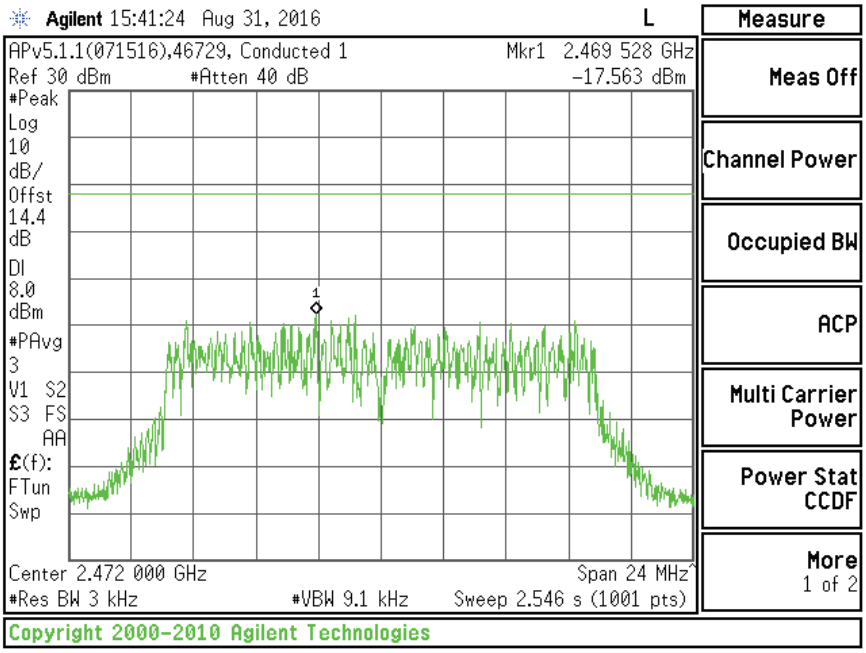
PSD, Chain 2 HIGH CH 13



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8.3.5. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-247 5.5

FCC - In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RSS - In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RESULTS

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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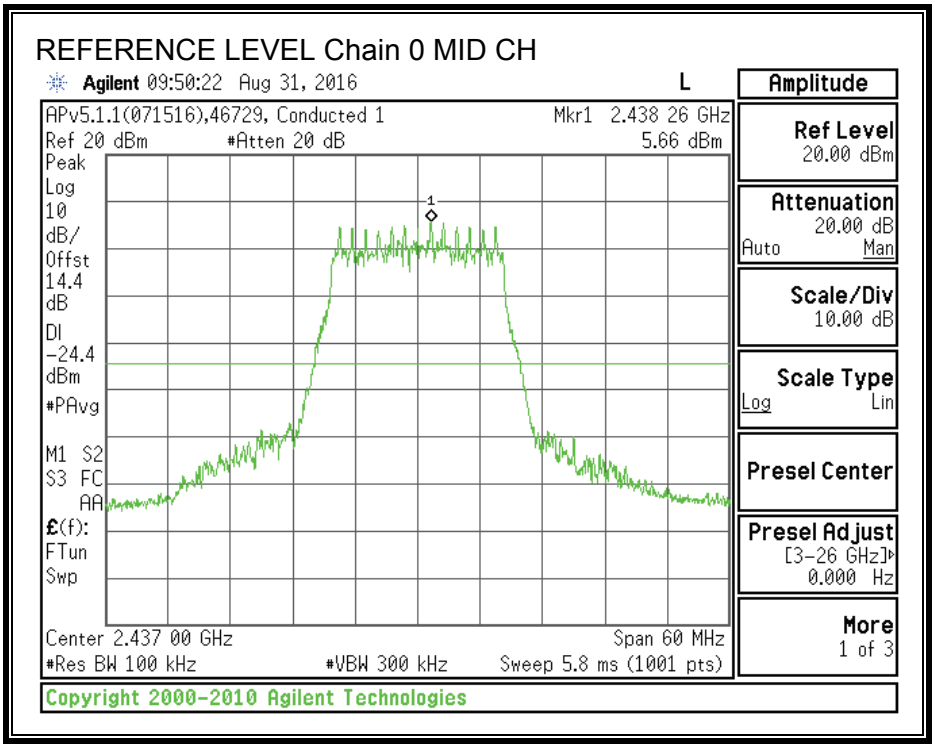
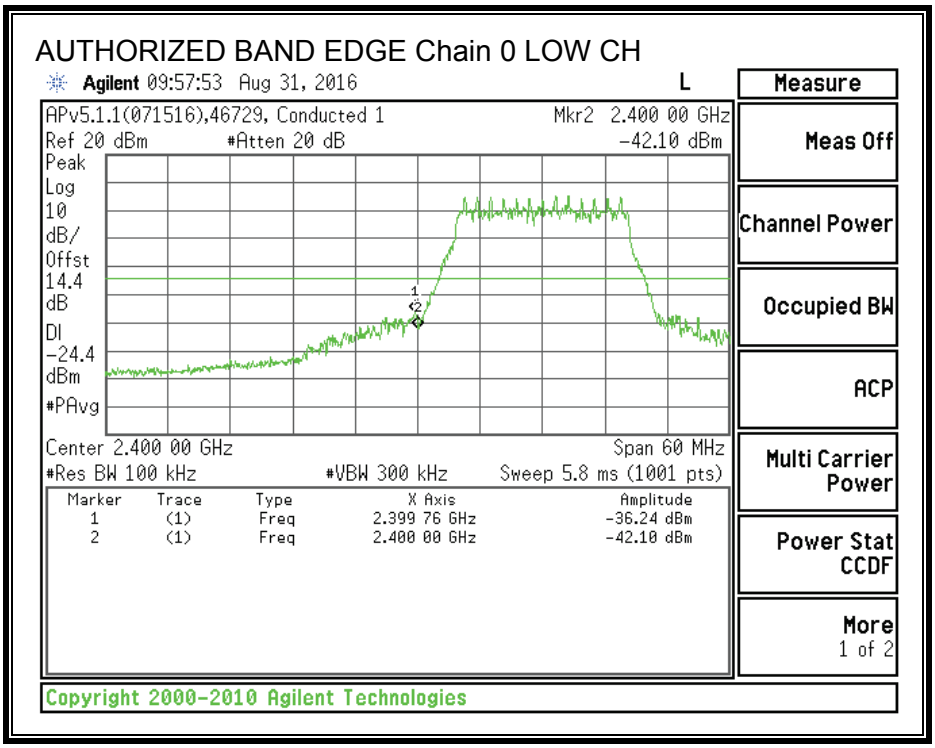
RESULTS

IN-BAND REFERENCE LEVEL, Chain 0



LOW CHANNEL BANDEDGE, Chain 0



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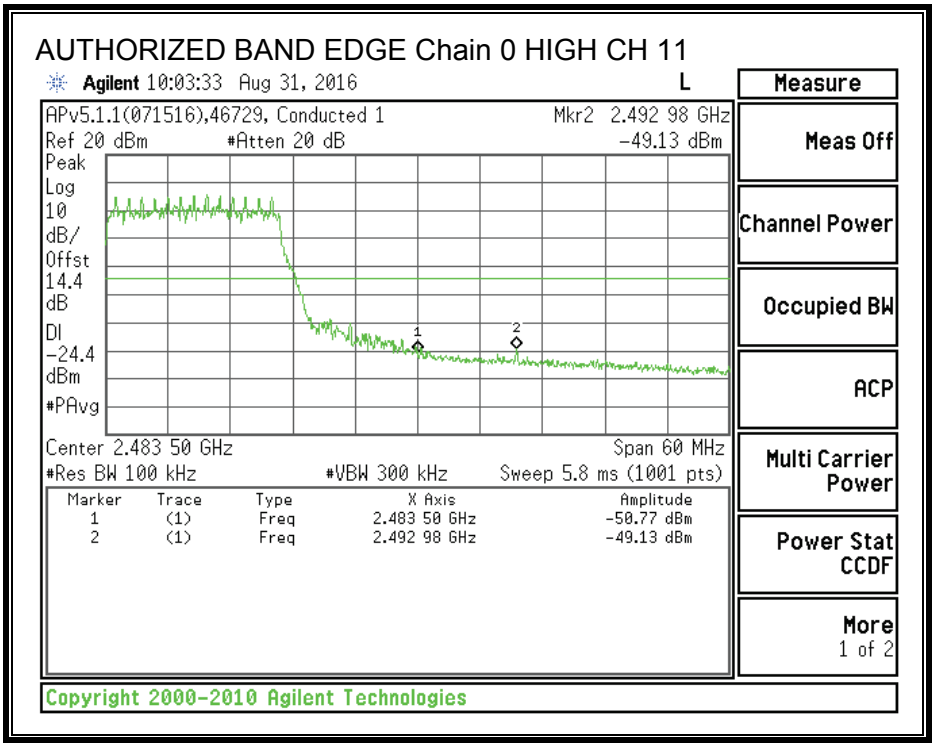
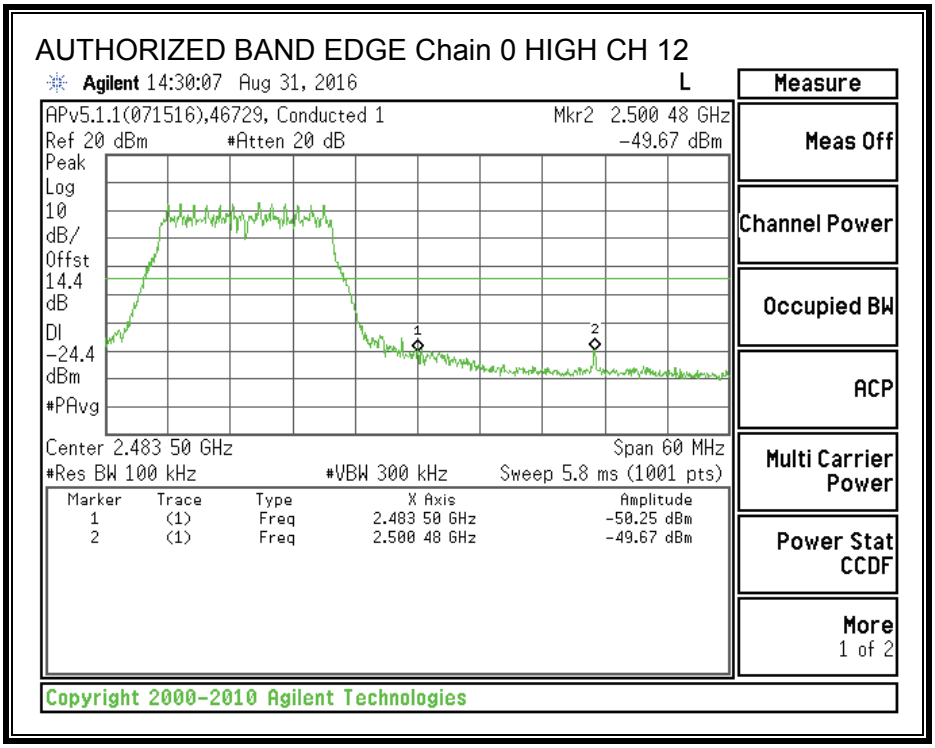
HIGH CHANNEL BANDEDGE, Chain 0





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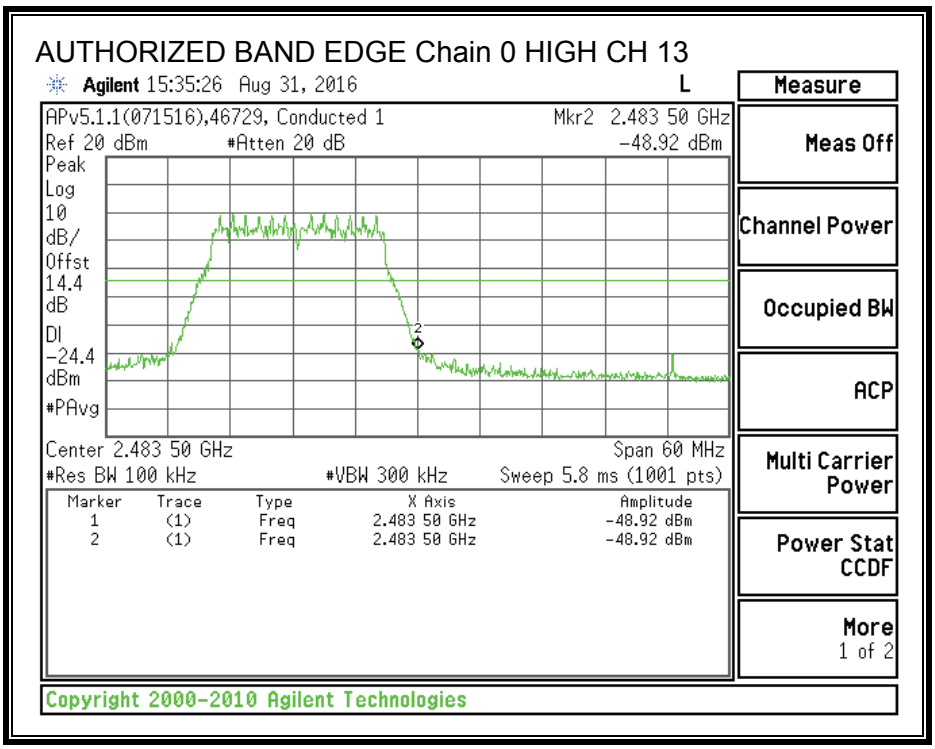
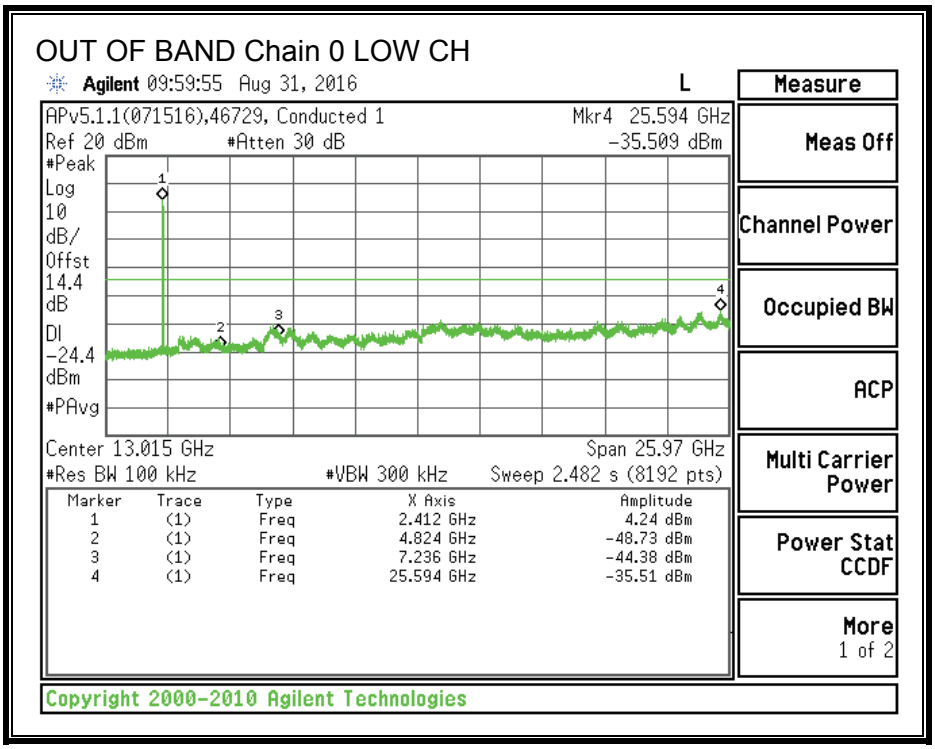


OUT-OF-BAND EMISSIONS, Chain 0



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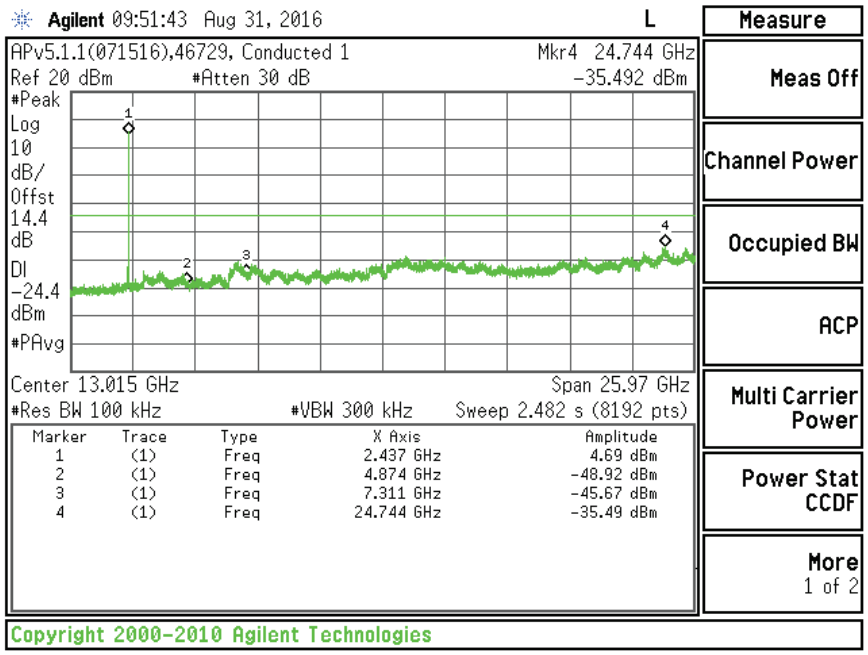
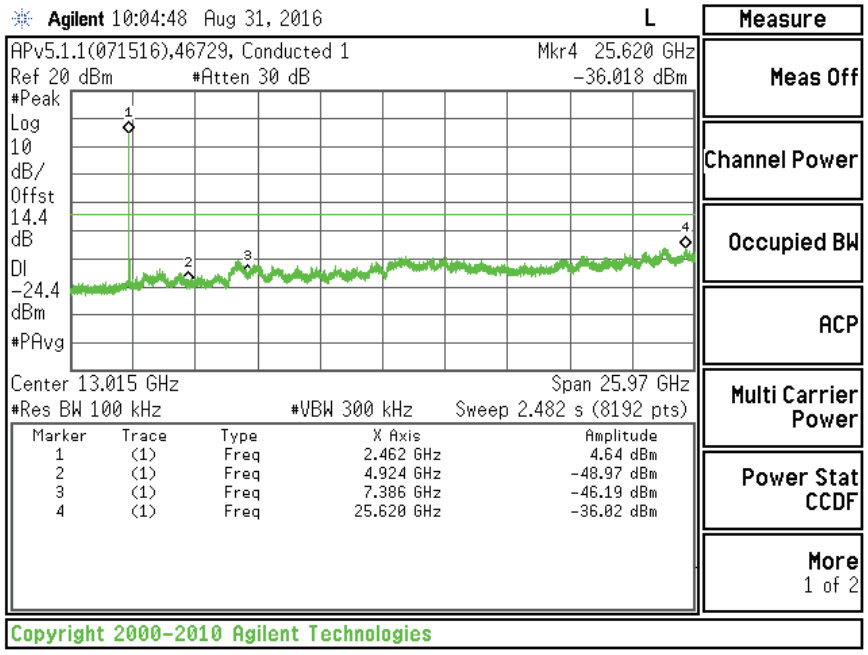
OUT OF BAND Chain 0 MID CH



OUT OF BAND Chain 0 HIGH CH 11



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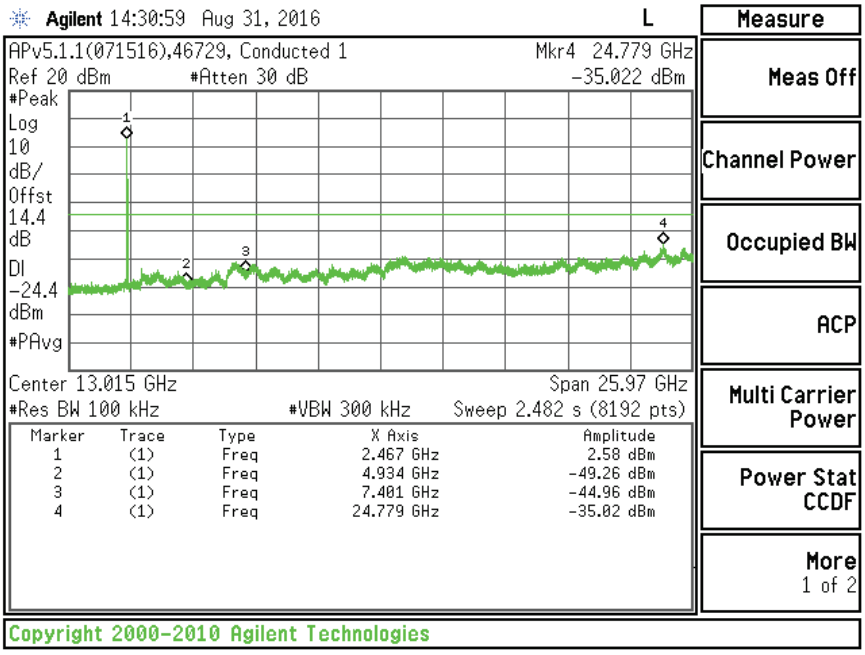
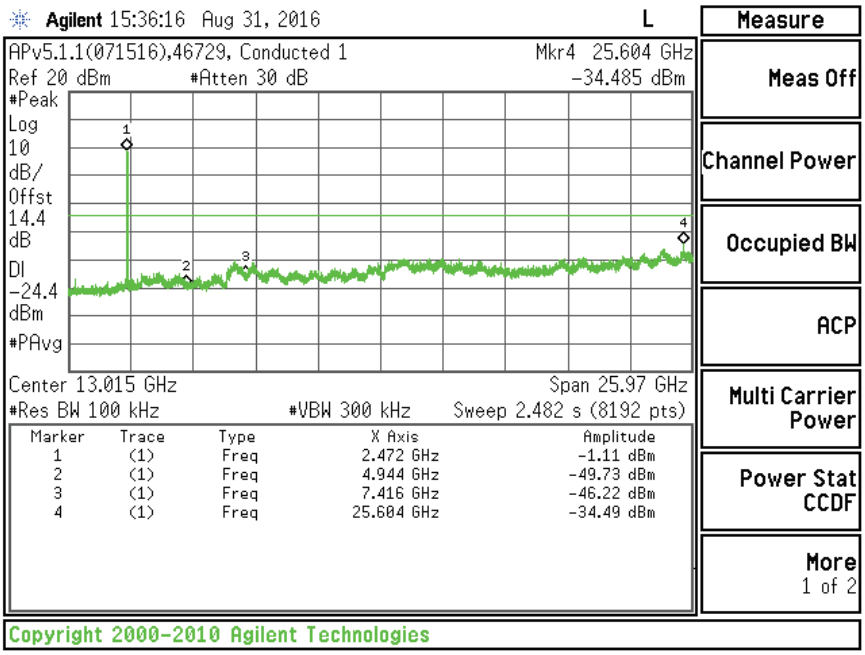
OUT OF BAND Chain 0 HIGH CH 12



OUT OF BAND Chain 0 HIGH CH 13



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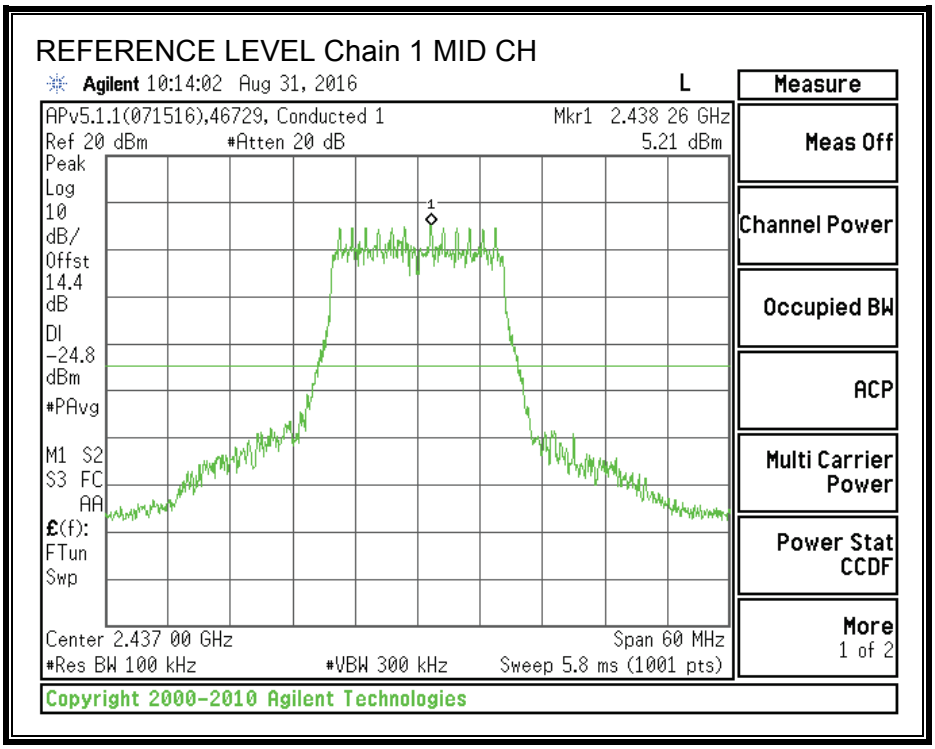
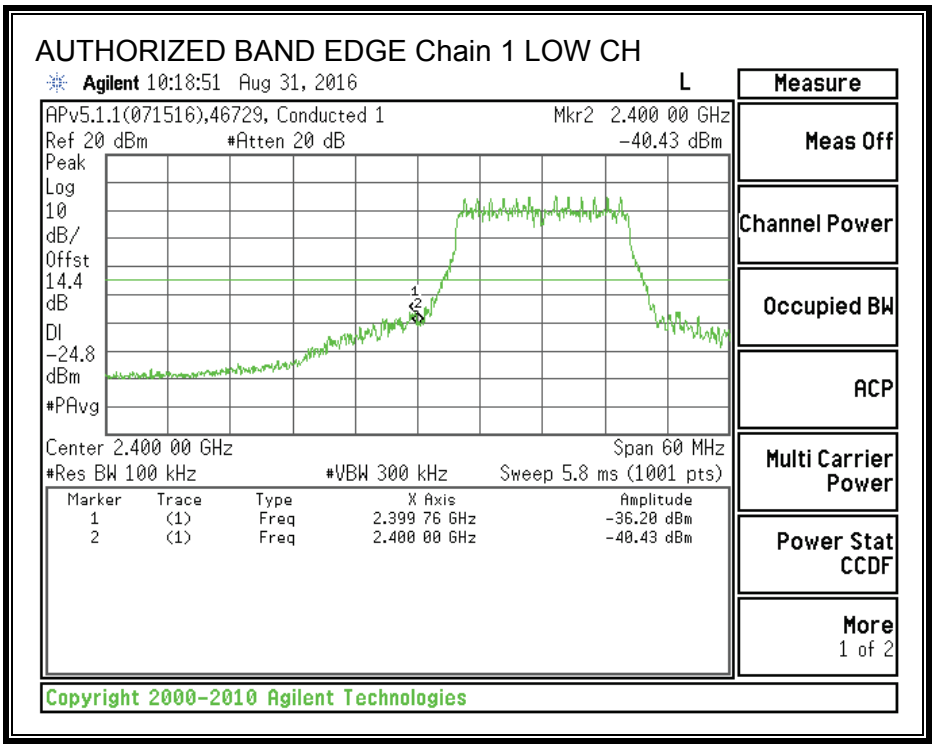
IN-BAND REFERENCE LEVEL, Chain 1



LOW CHANNEL BANDEDGE, Chain 1



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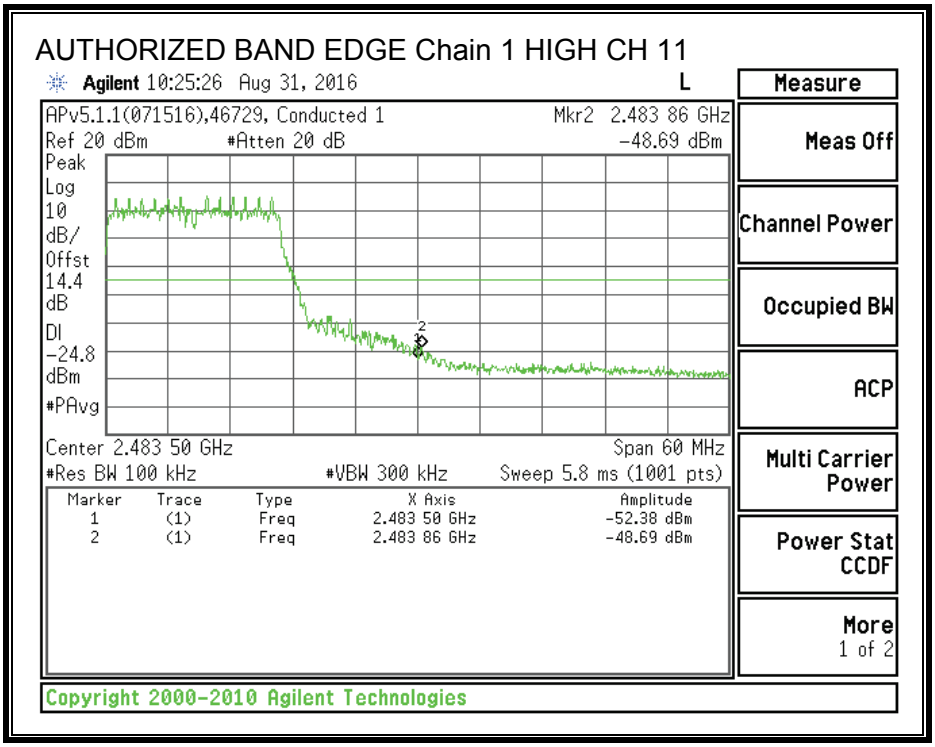
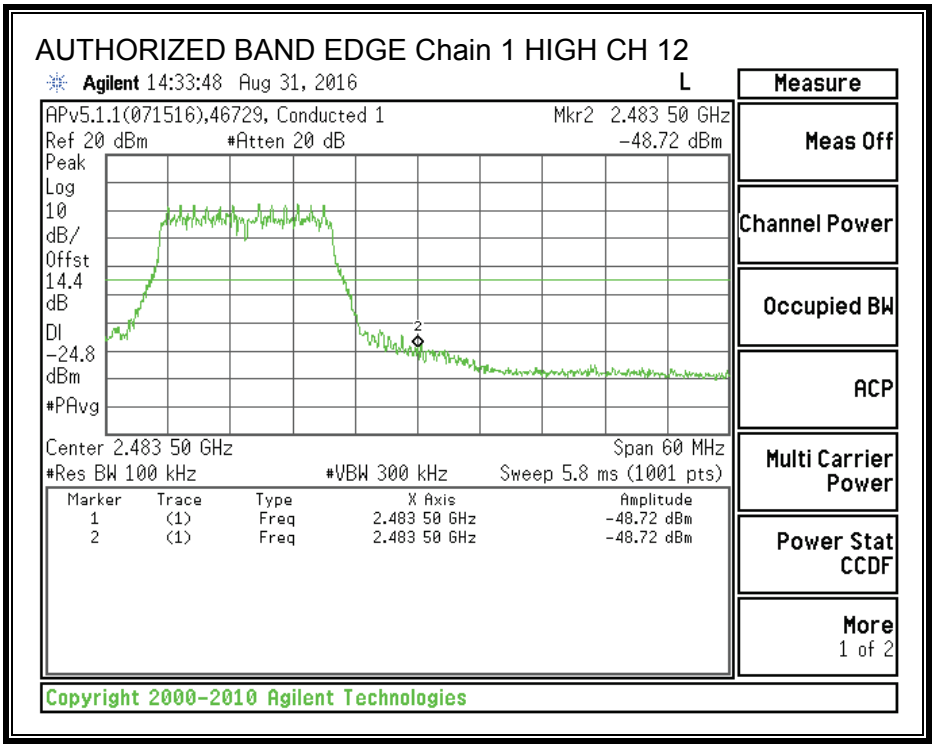
HIGH CHANNEL BANDEDGE, Chain 1





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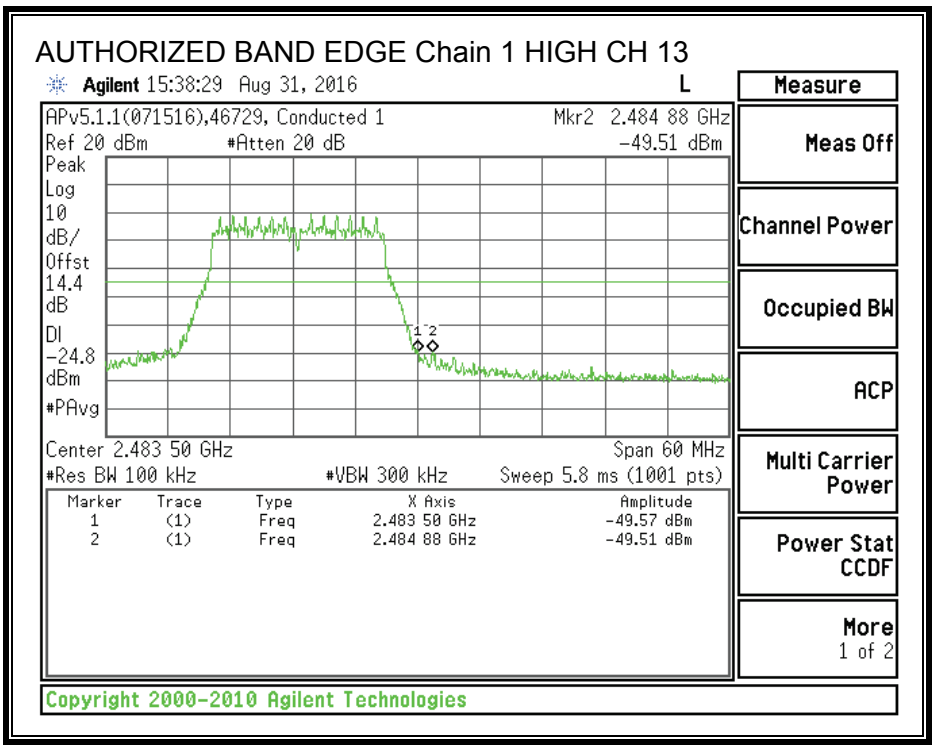
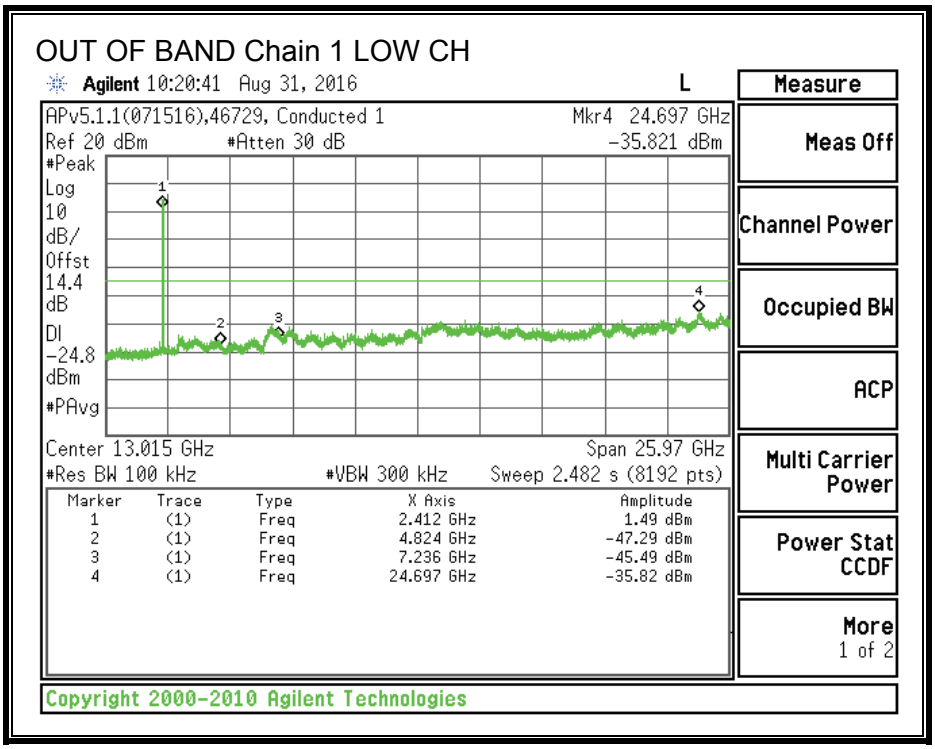


OUT-OF-BAND EMISSIONS, Chain 1



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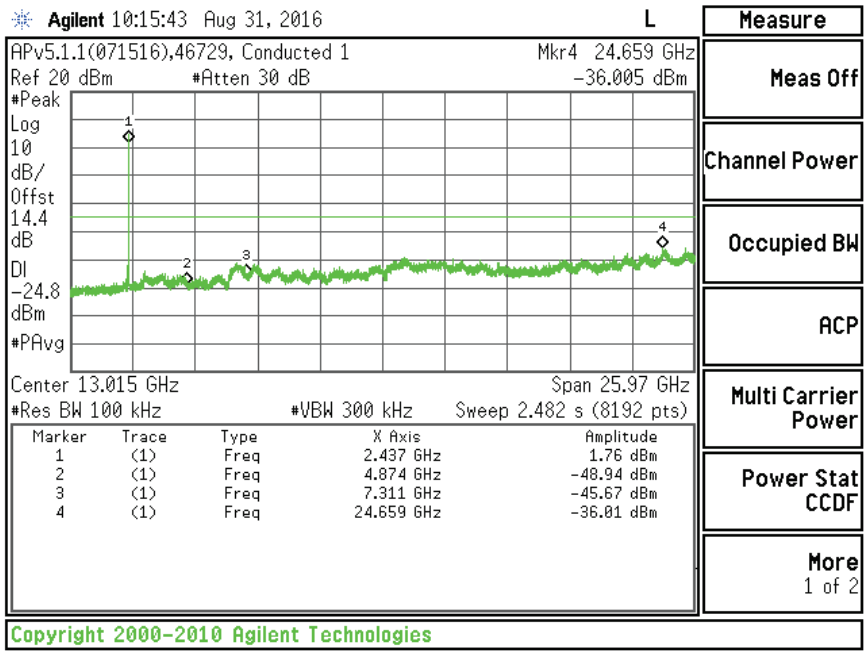
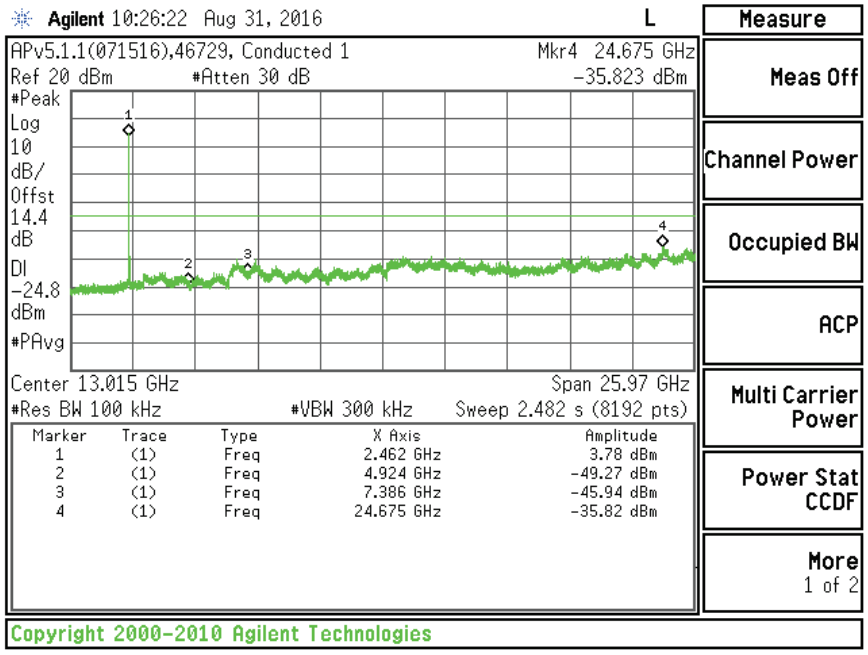
OUT OF BAND Chain 1 MID CH



OUT OF BAND Chain 1 HIGH CH 11



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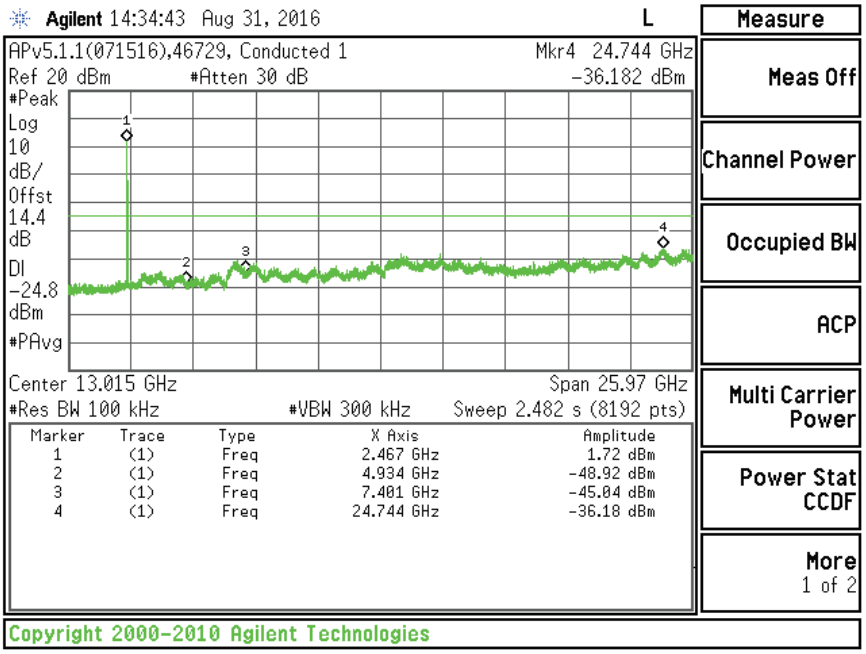
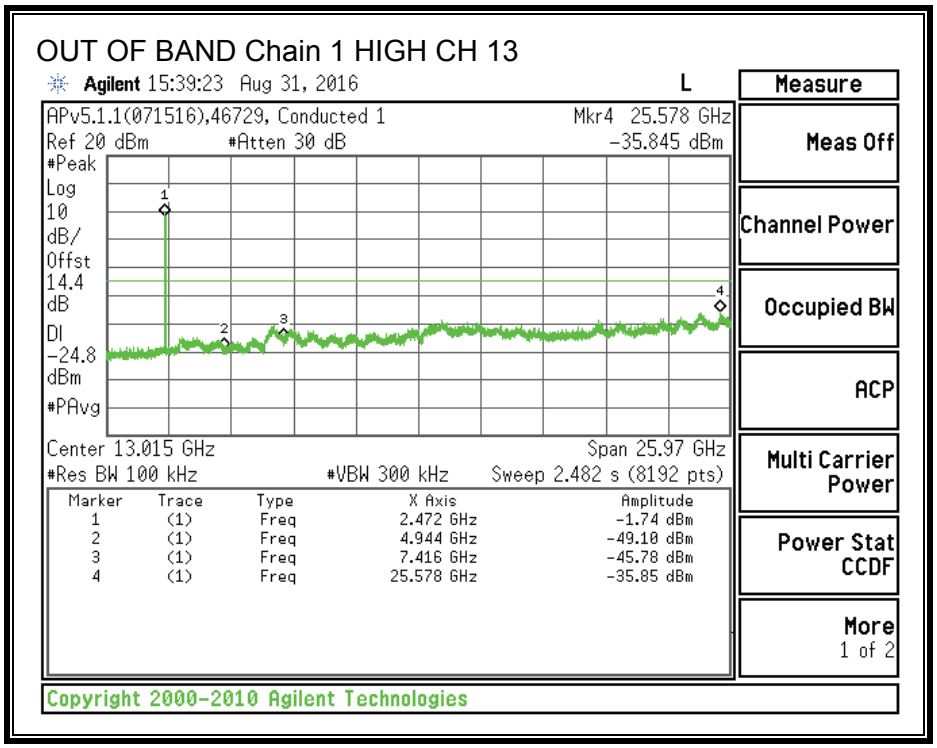
OUT OF BAND Chain 1 HIGH CH 12



OUT OF BAND Chain 1 HIGH CH 13



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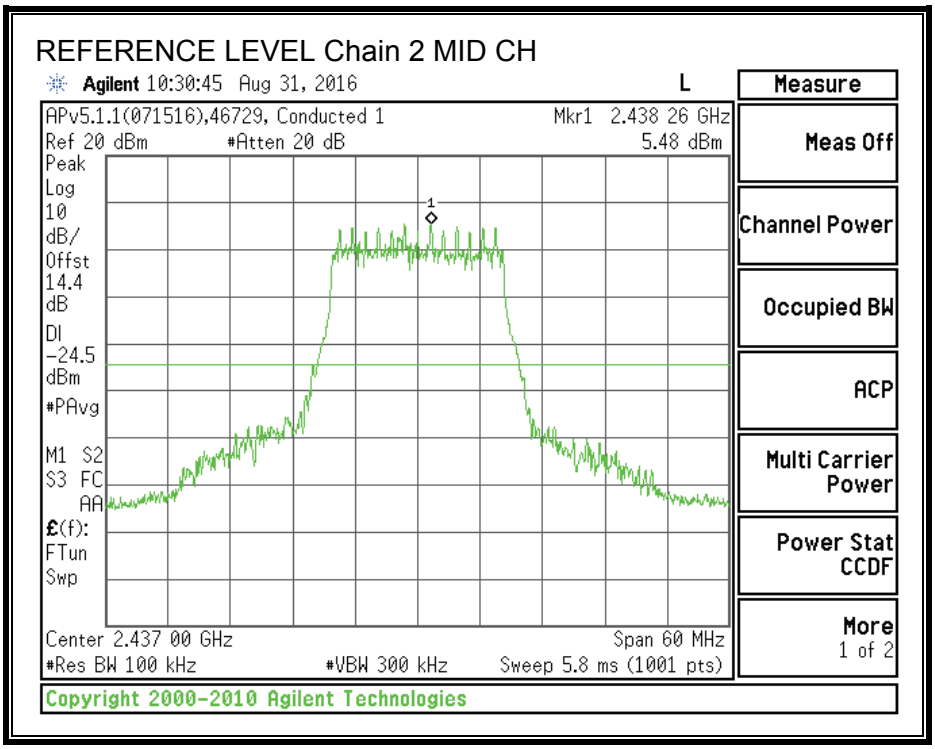
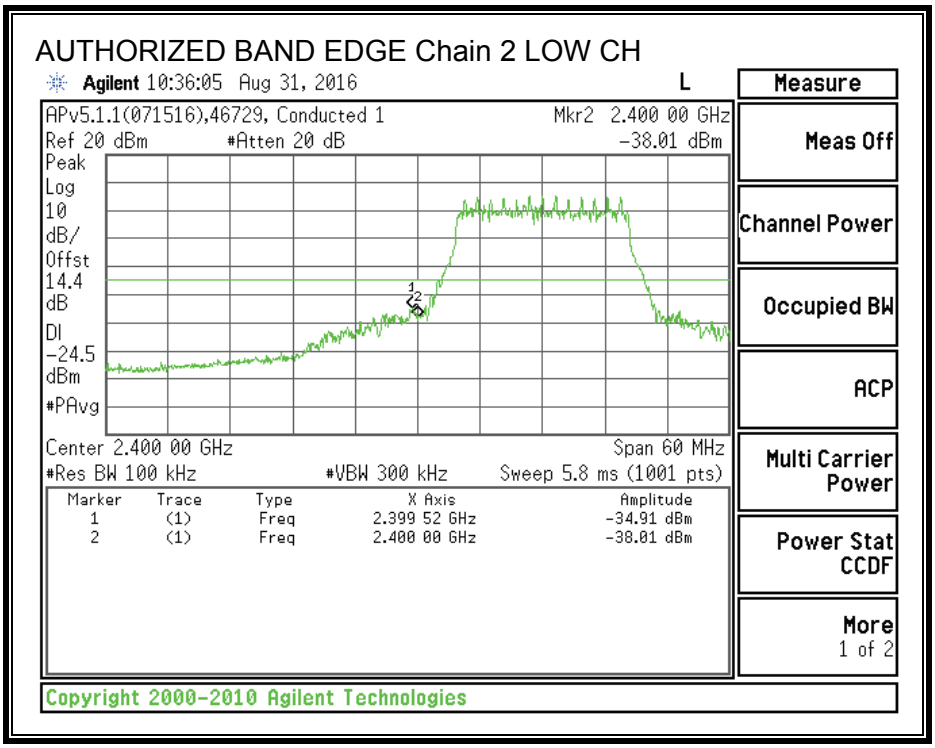
IN-BAND REFERENCE LEVEL, Chain 2



LOW CHANNEL BANDEDGE, Chain 2



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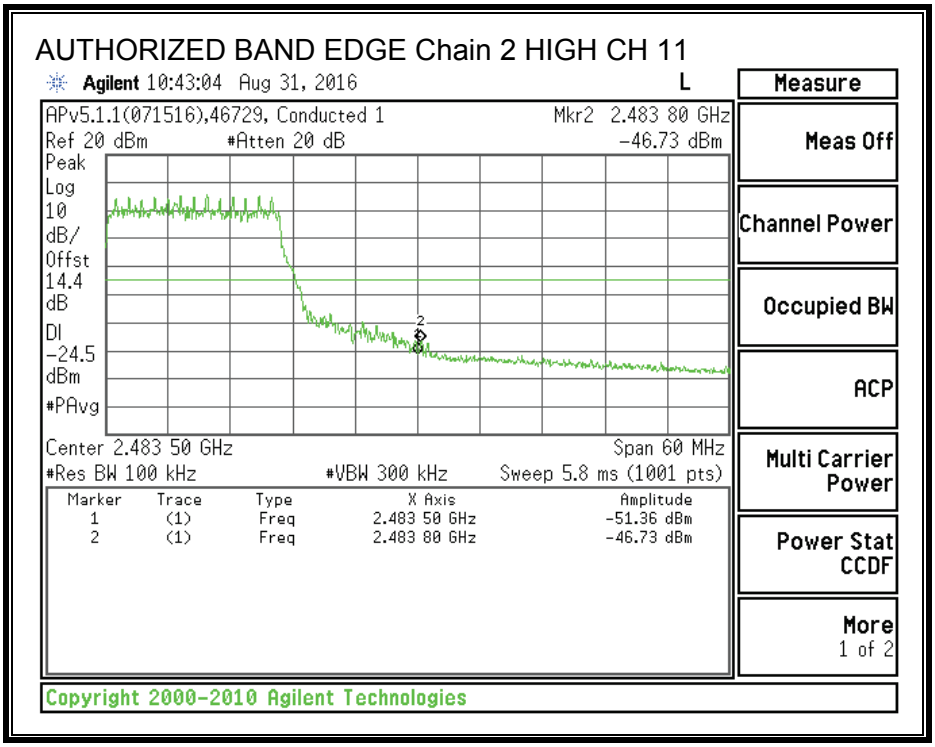
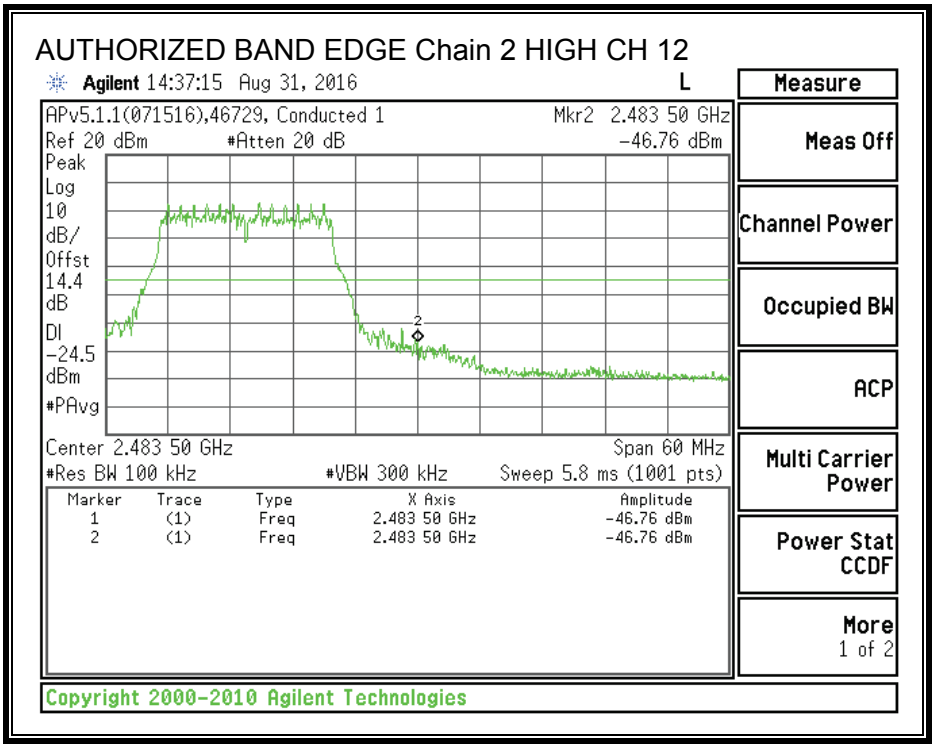
HIGH CHANNEL BANDEDGE, Chain 2





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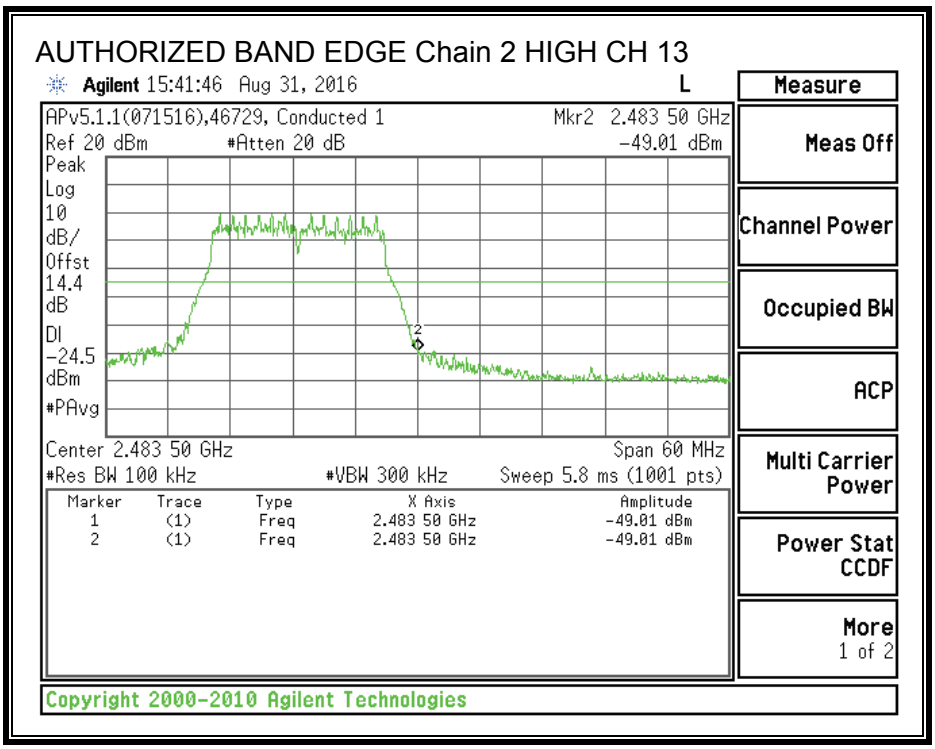
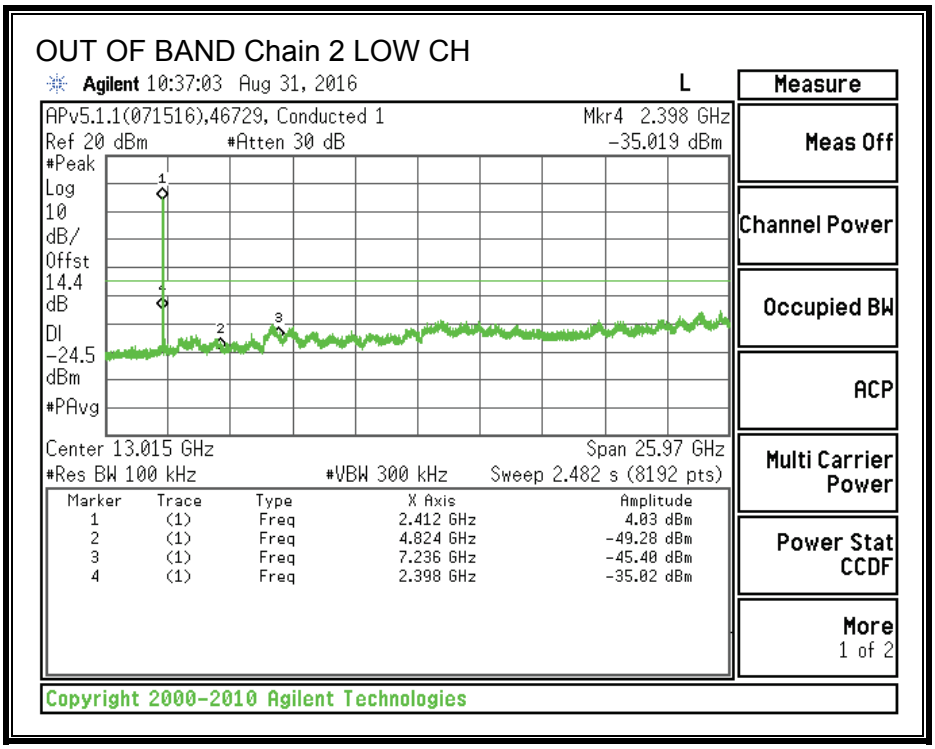


OUT-OF-BAND EMISSIONS, Chain 2



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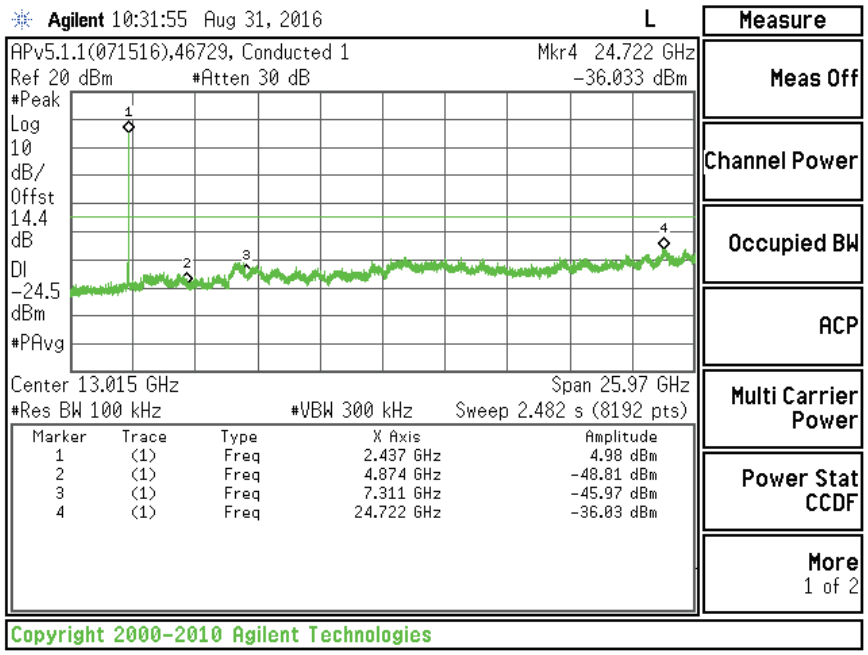
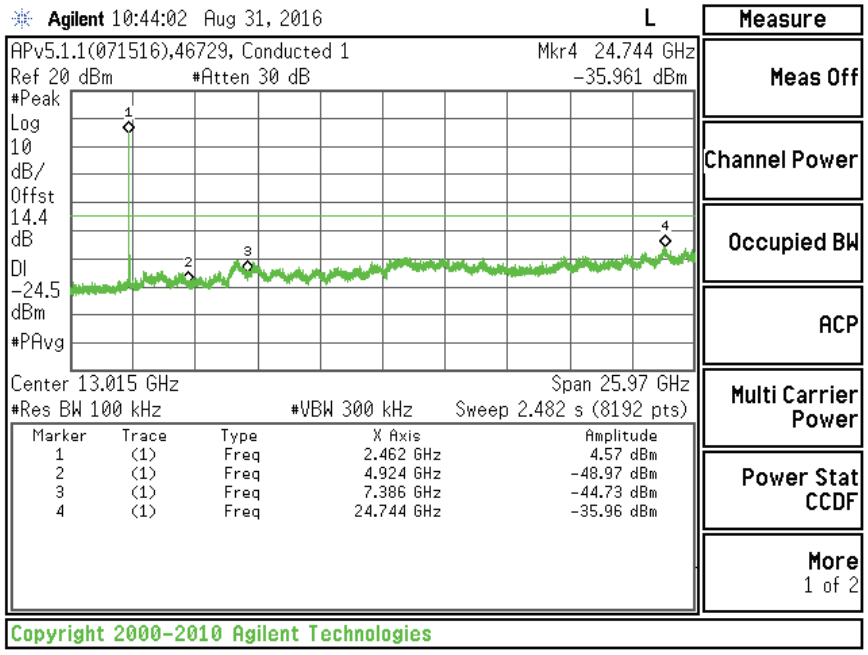
OUT OF BAND Chain 2 MID CH



OUT OF BAND Chain 2 HIGH CH 11



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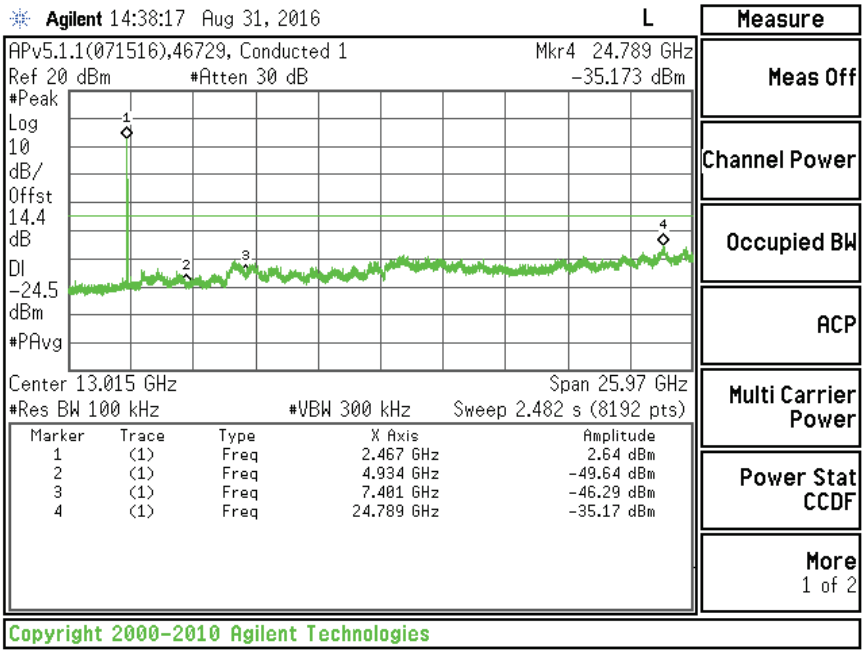
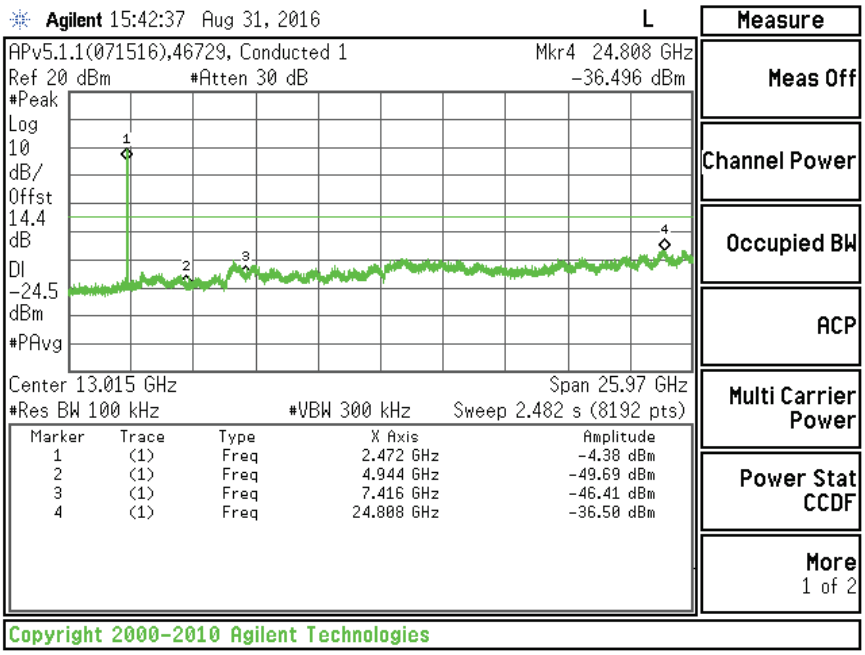
OUT OF BAND Chain 2 HIGH CH 12



OUT OF BAND Chain 2 HIGH CH 13



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8.4. 802.11n HT20 MODE IN THE 2.4 GHz BAND

8.4.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-247 5.2 (1)

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

802.11n HT20 SDM (MCS16)

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	2412	15.768	15.936	15.912	0.5
Mid	2437	15.912	15.744	15.360	0.5
High Ch 11	2462	15.768	15.936	15.576	0.5
High Ch 12	2467	15.768	15.888	15.744	0.5
High Ch 13	2472	15.528	15.408	15.720	0.5

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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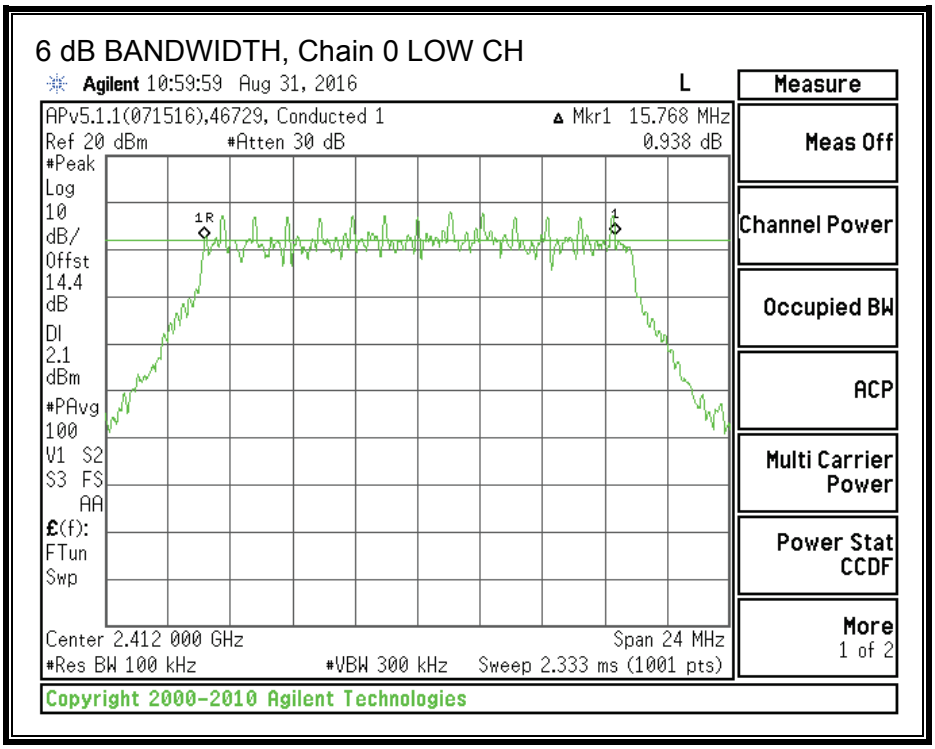
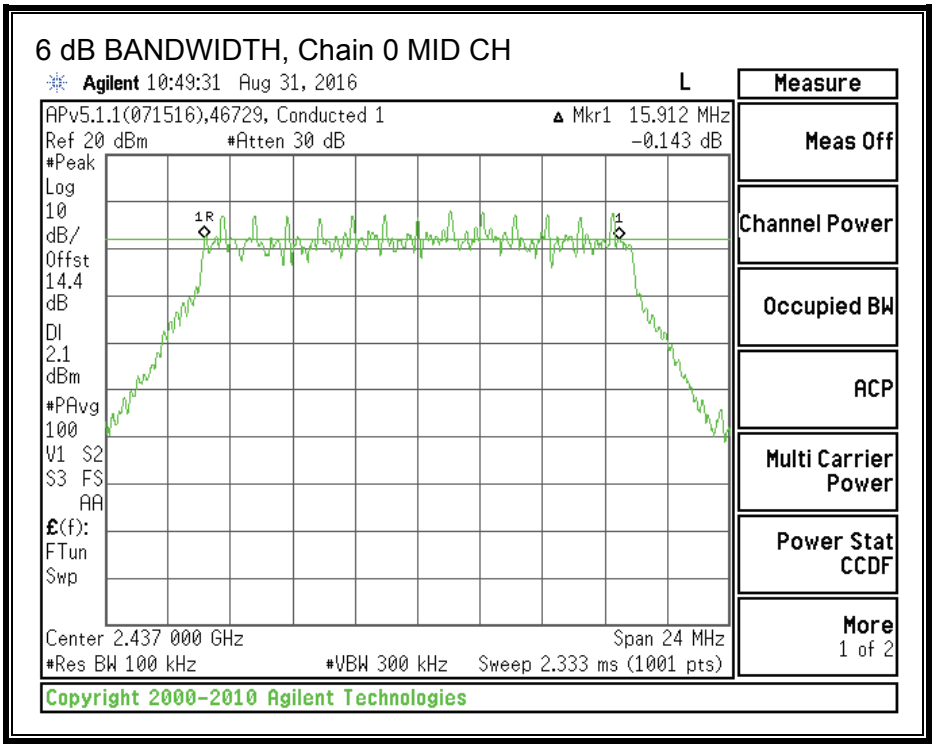
6 dB BANDWIDTH, Chain 0





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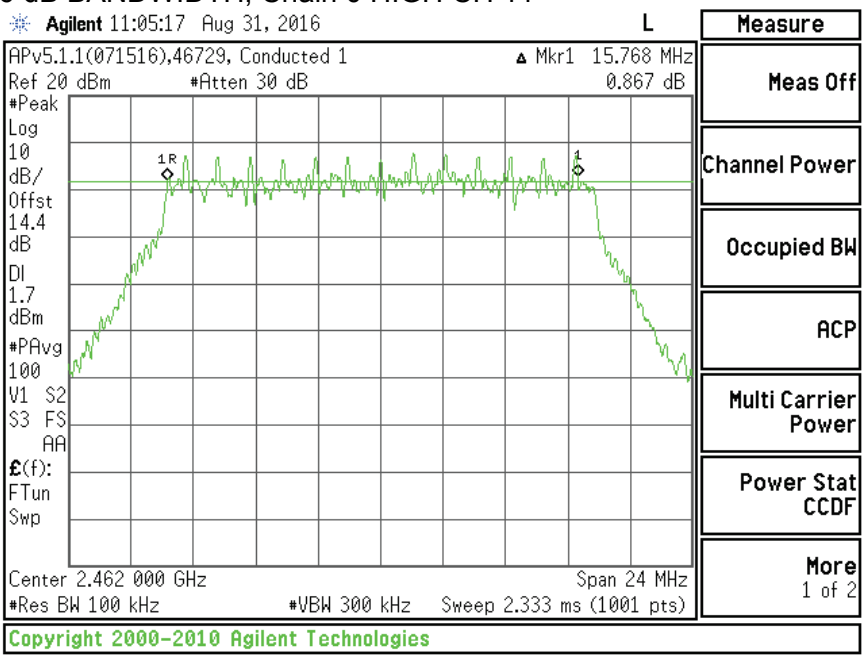
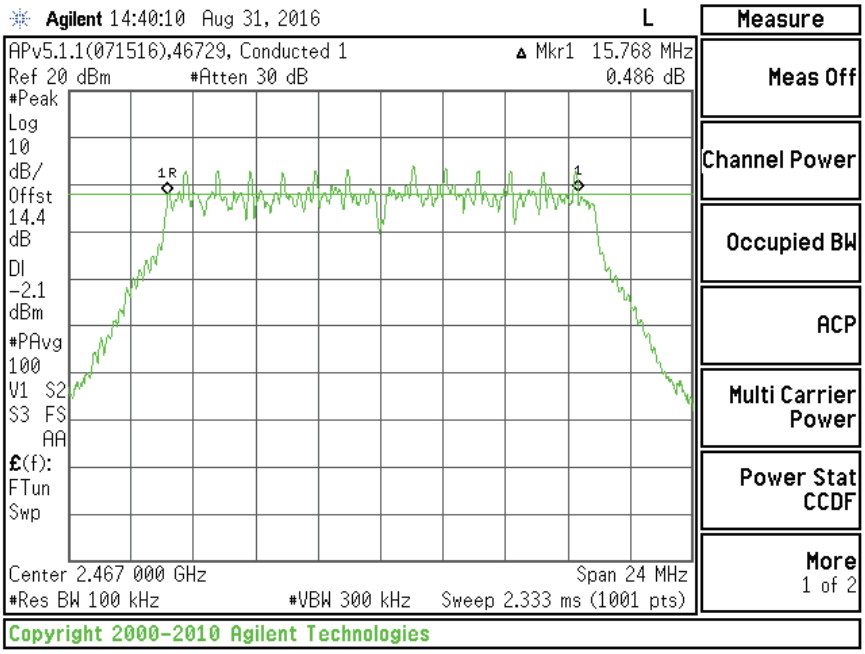
6 dB BANDWIDTH, Chain 0 HIGH CH 11



6 dB BANDWIDTH, Chain 0 HIGH CH 12



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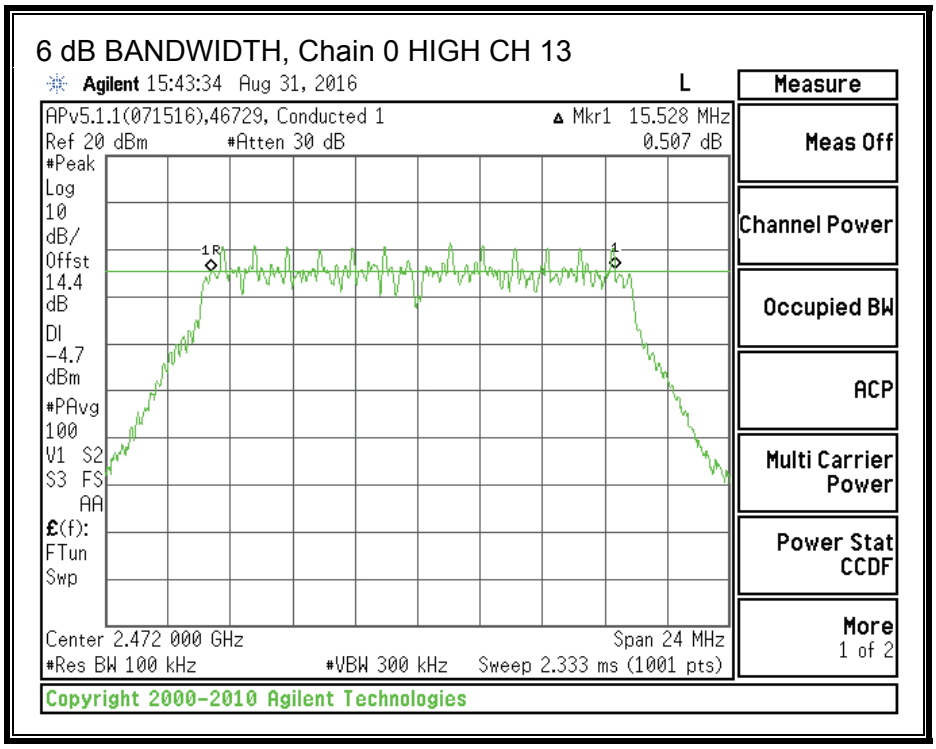
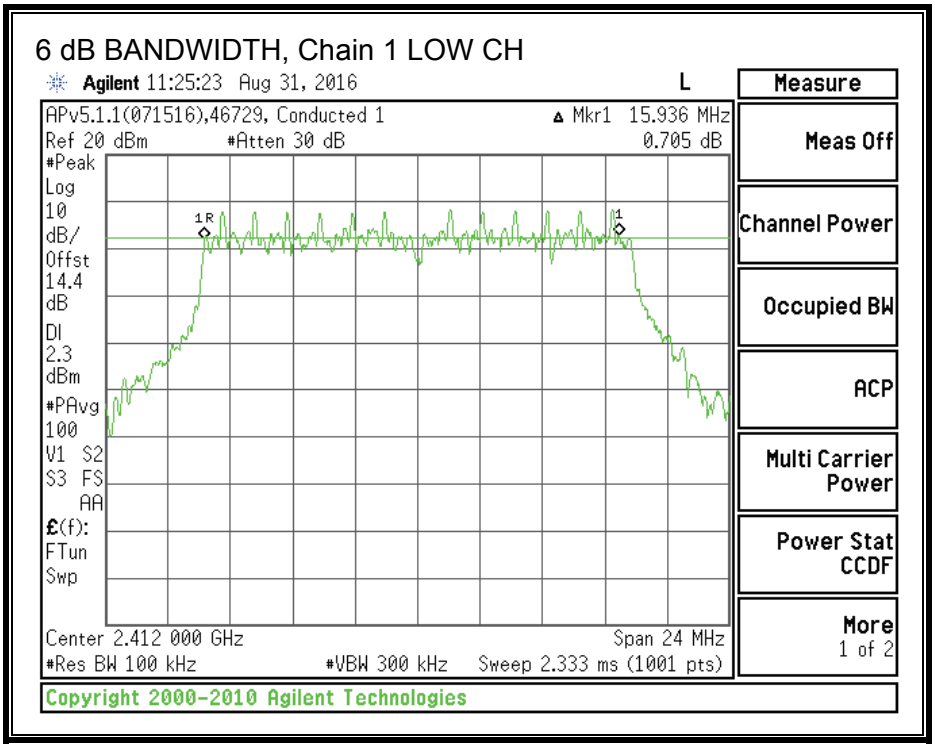


6 dB BANDWIDTH, Chain 1



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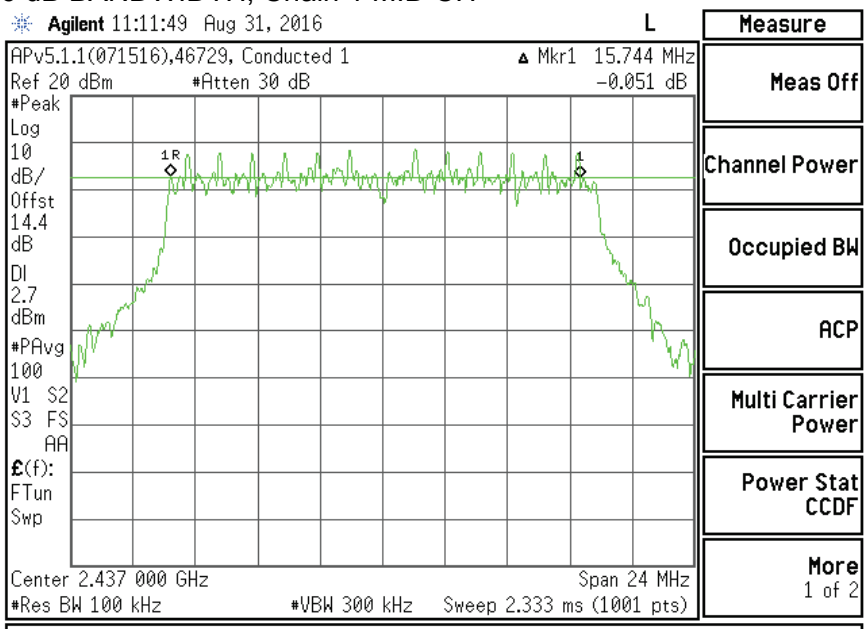
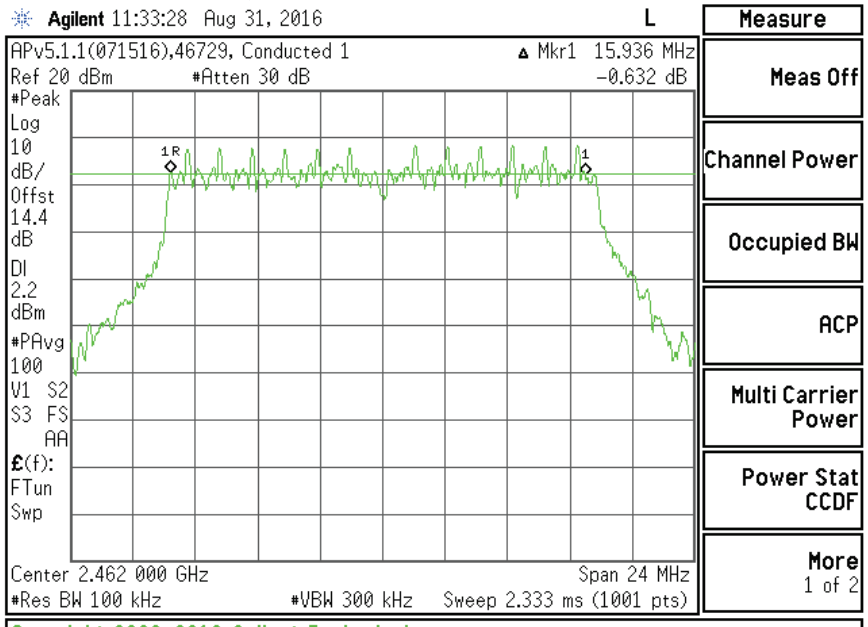
6 dB BANDWIDTH, Chain 1 MID CH



6 dB BANDWIDTH, Chain 1 HIGH CH 11



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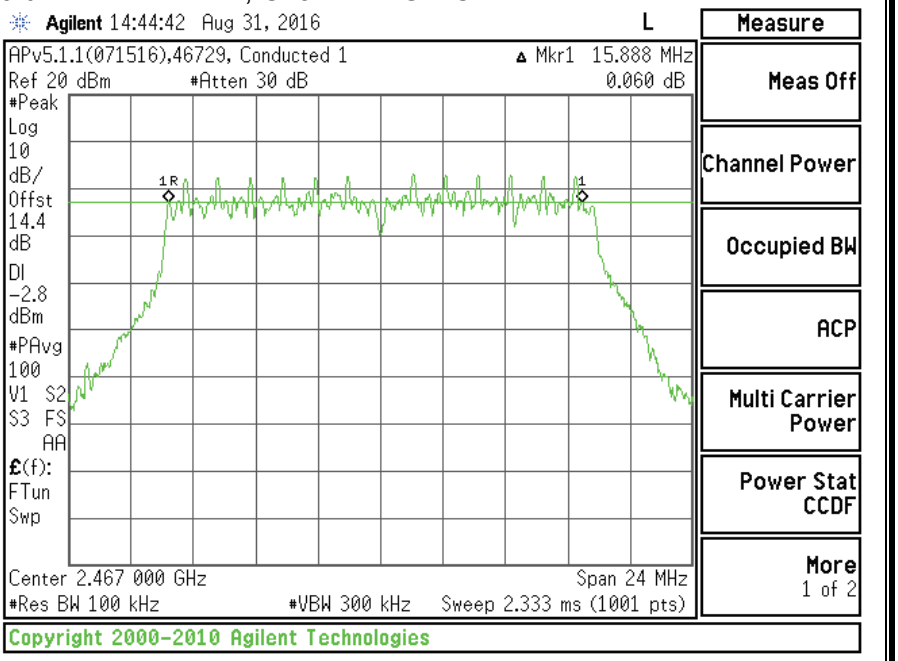
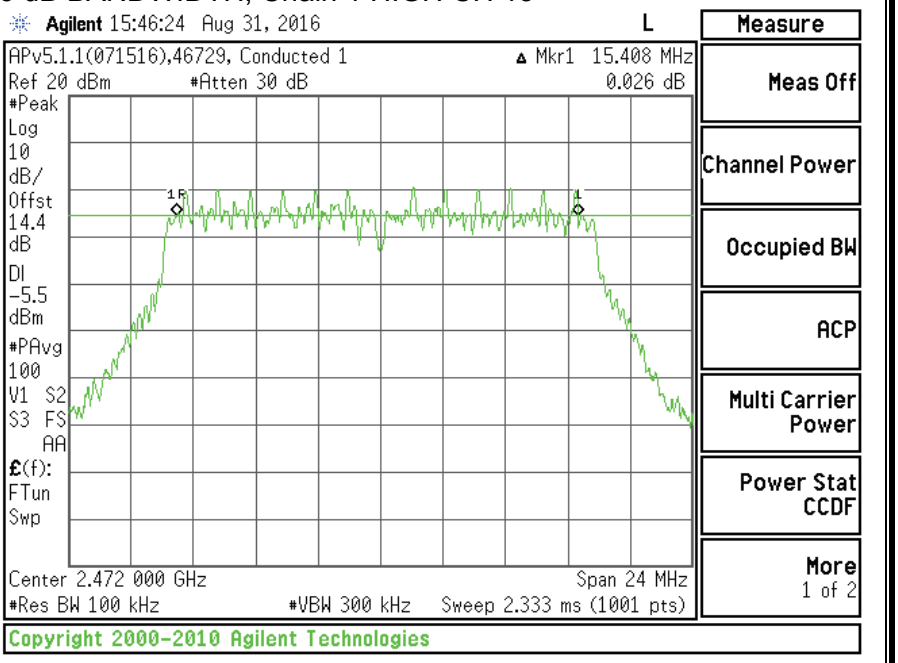
6 dB BANDWIDTH, Chain 1 HIGH CH 12



6 dB BANDWIDTH, Chain 1 HIGH CH 13



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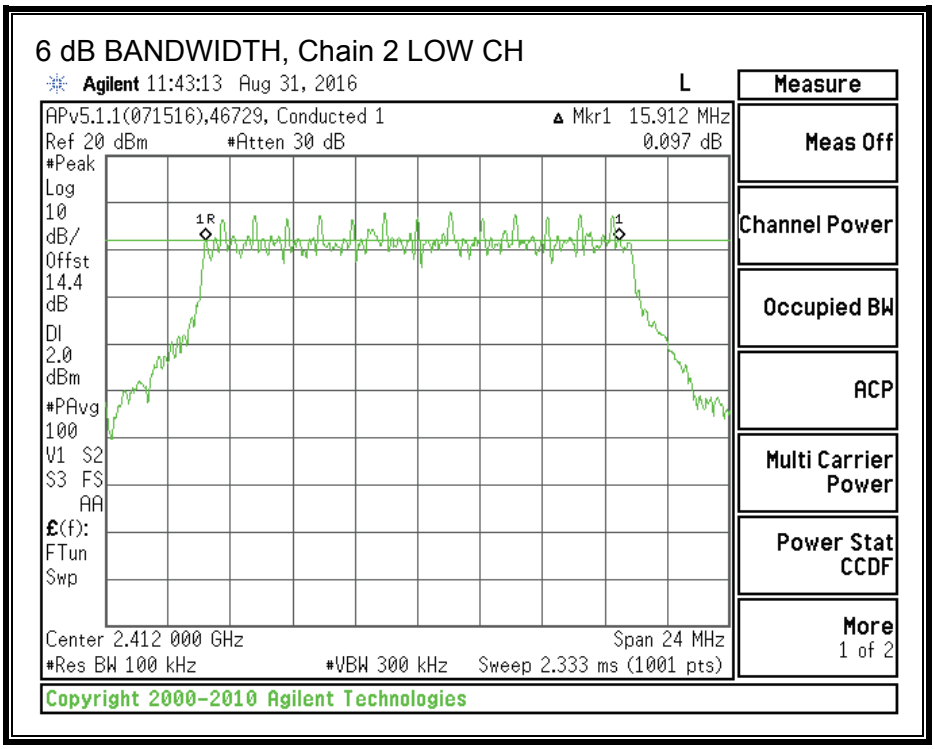
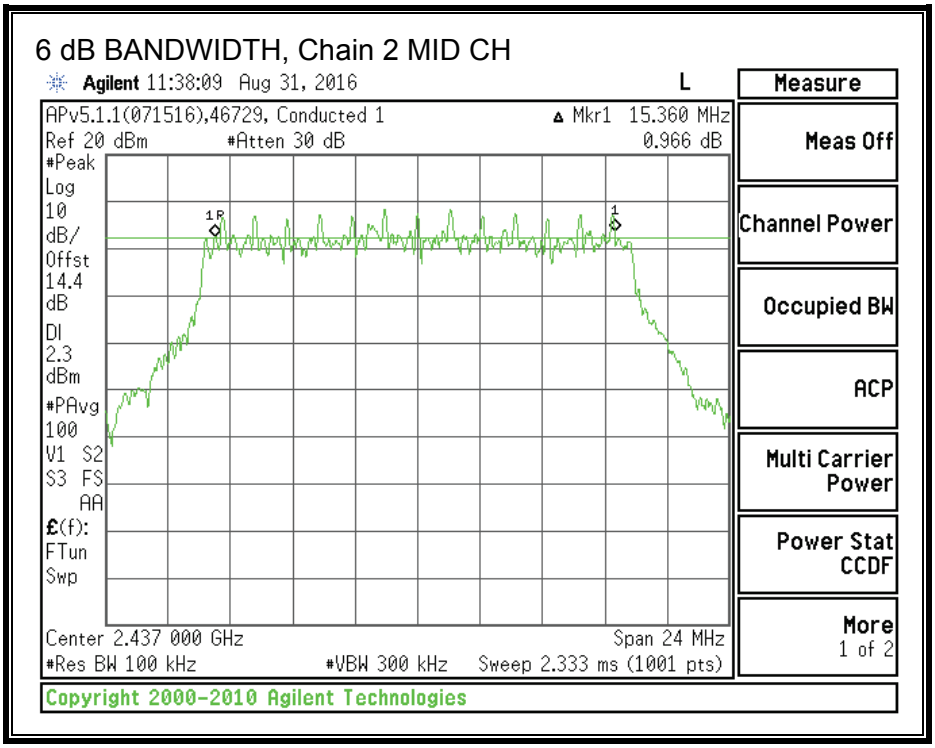
6 dB BANDWIDTH, Chain 2





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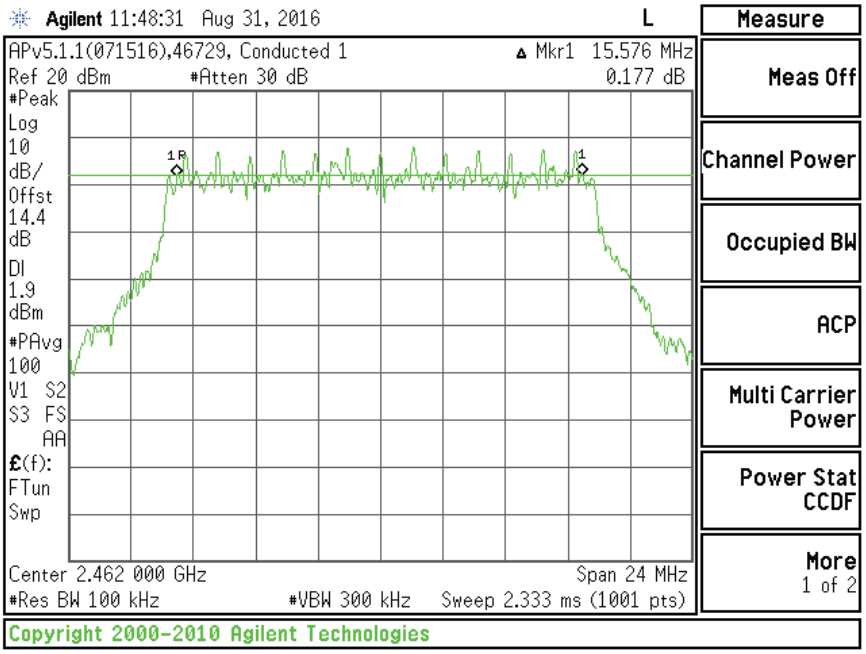
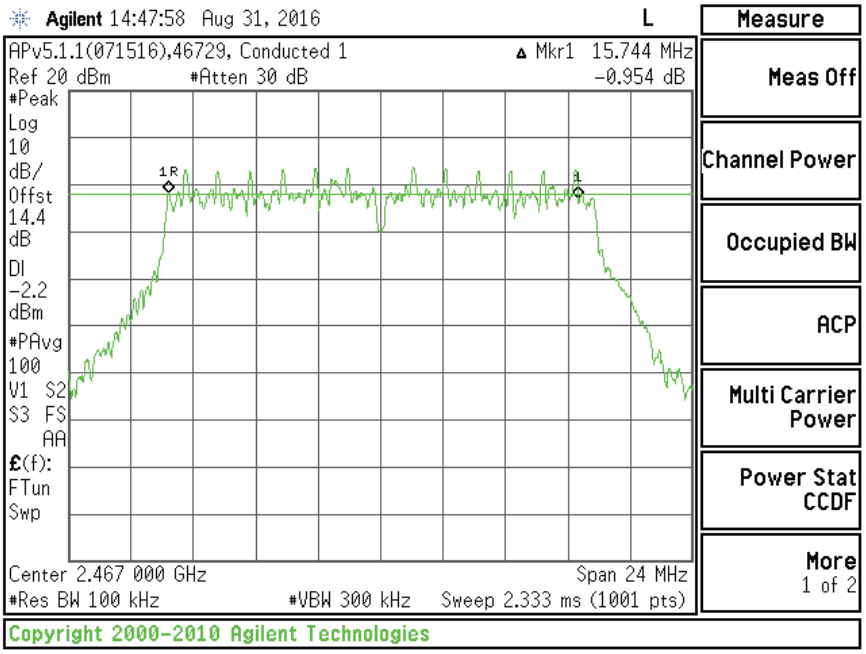
6 dB BANDWIDTH, Chain 2 HIGH CH 11



6 dB BANDWIDTH, Chain 2 HIGH CH 12



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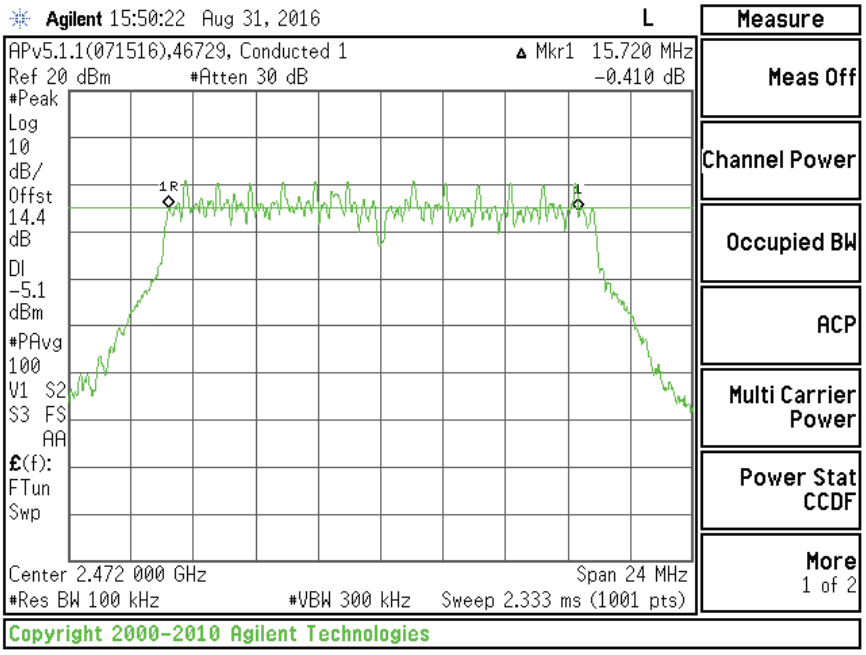
6 dB BANDWIDTH, Chain 2 HIGH CH 13



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8.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only. Testing per RSS-Gen Clause 6.6.

RESULTS

802.11n HT20 SDM (MCS16)

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	2412	16.7525	16.5643	16.5233
Mid	2437	16.7744	16.5299	16.5442
High Ch 11	2462	16.6618	16.5813	16.5481
High Ch 12	2467	16.6095	16.4224	16.5461
High Ch 13	2472	16.6939	16.4655	16.4767

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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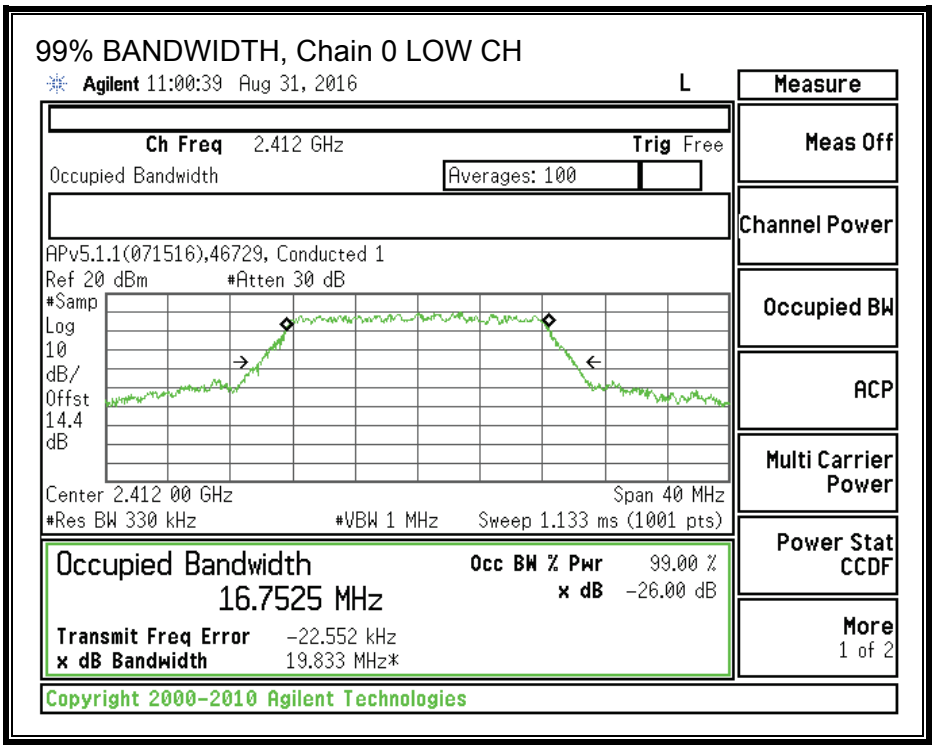
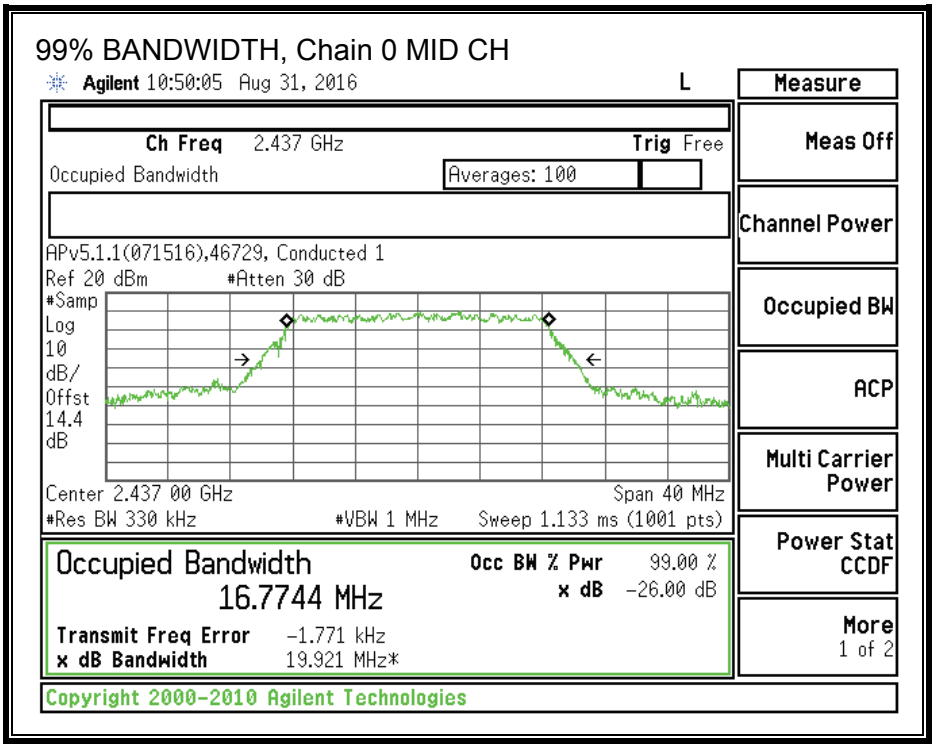
99% BANDWIDTH, Chain 0





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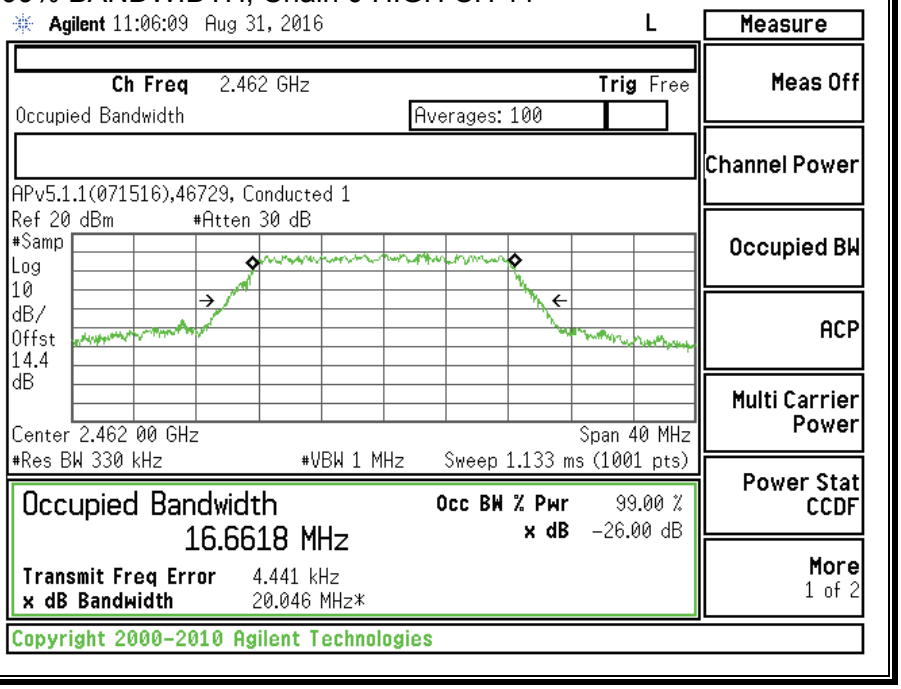
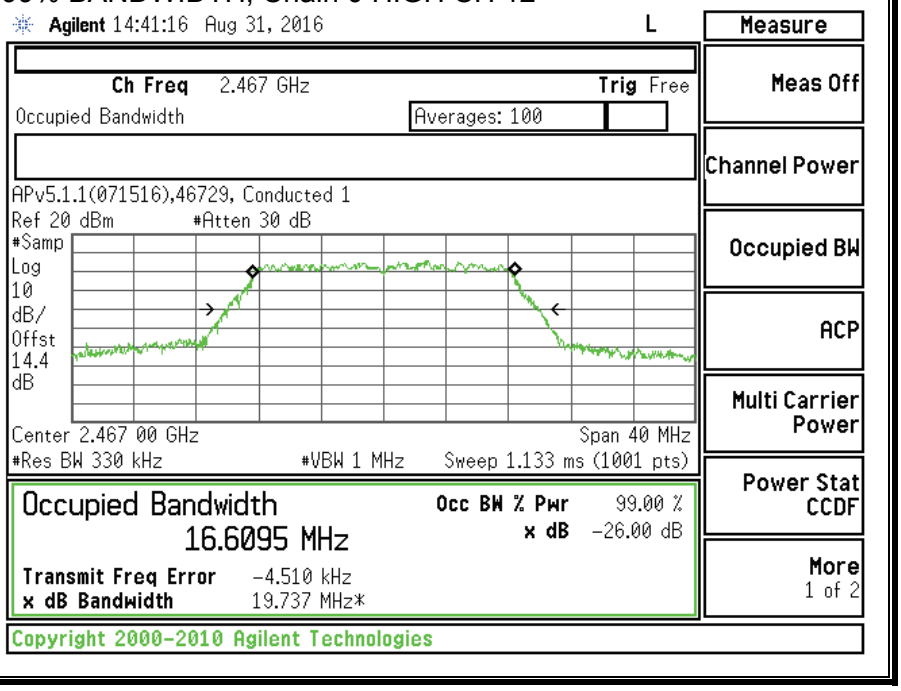
99% BANDWIDTH, Chain 0 HIGH CH 11



99% BANDWIDTH, Chain 0 HIGH CH 12



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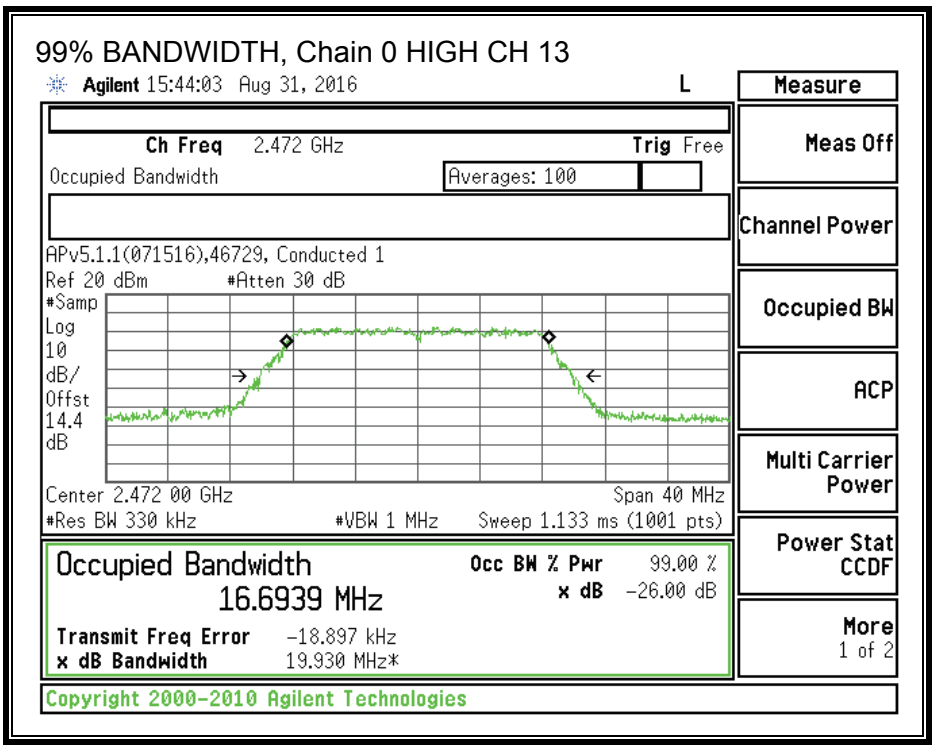
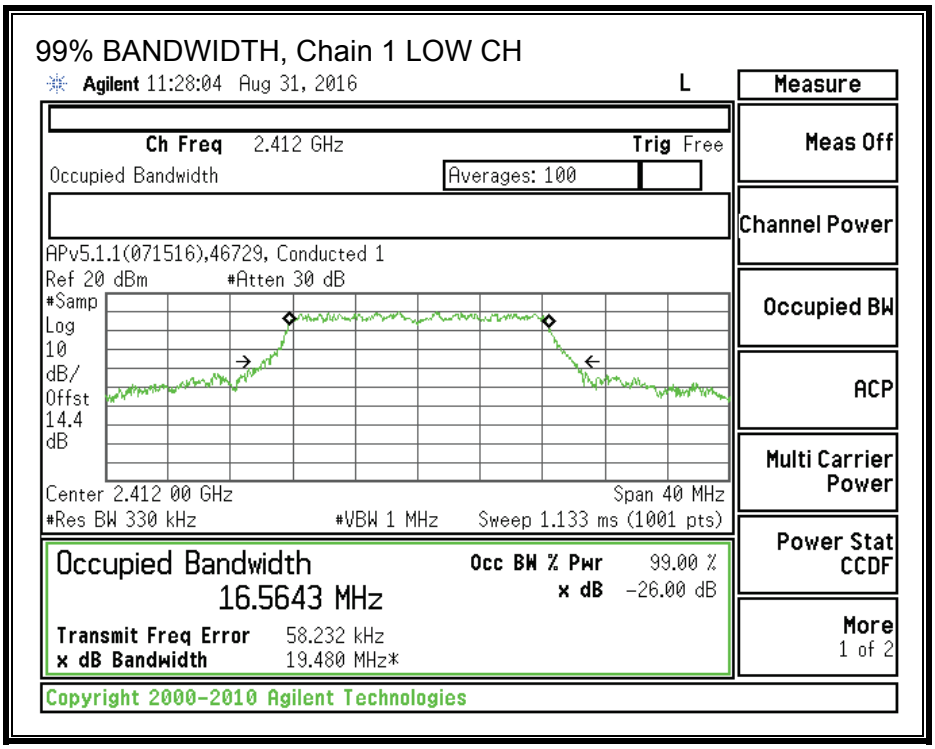


99% BANDWIDTH, Chain 1



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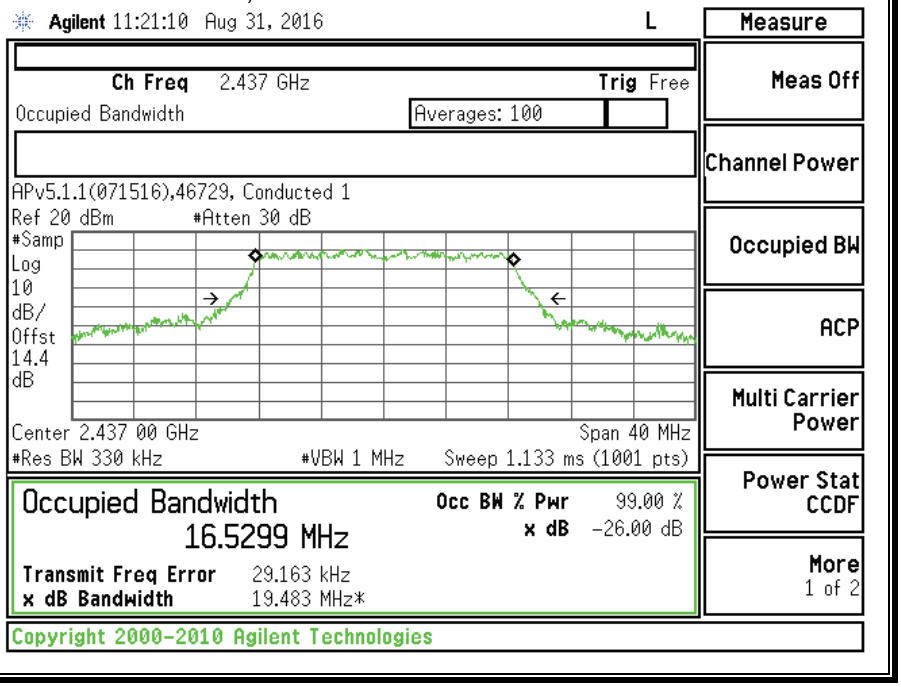
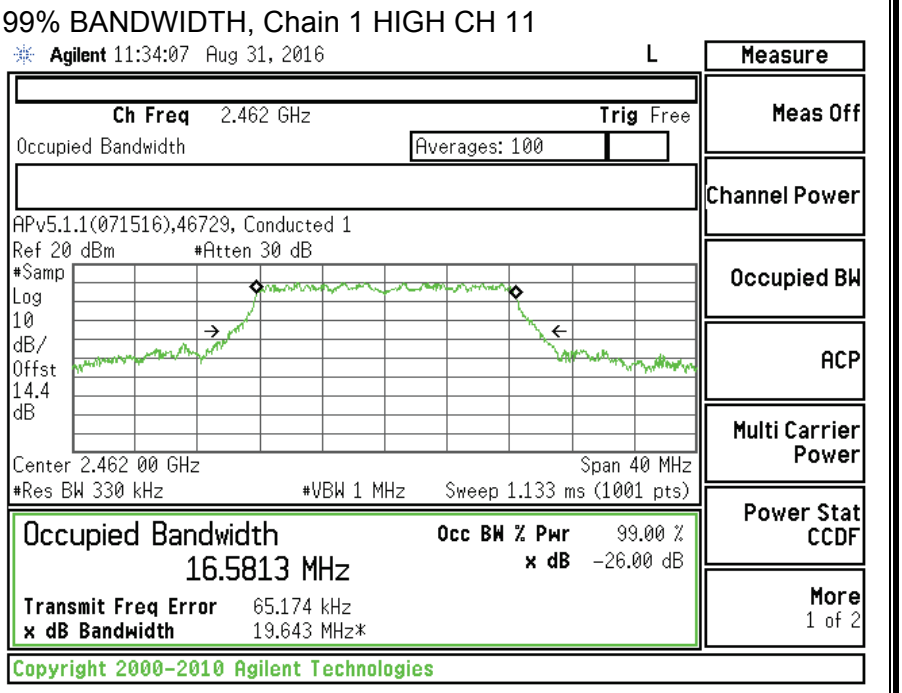
99% BANDWIDTH, Chain 1 MID CH



99% BANDWIDTH, Chain 1 HIGH CH 11



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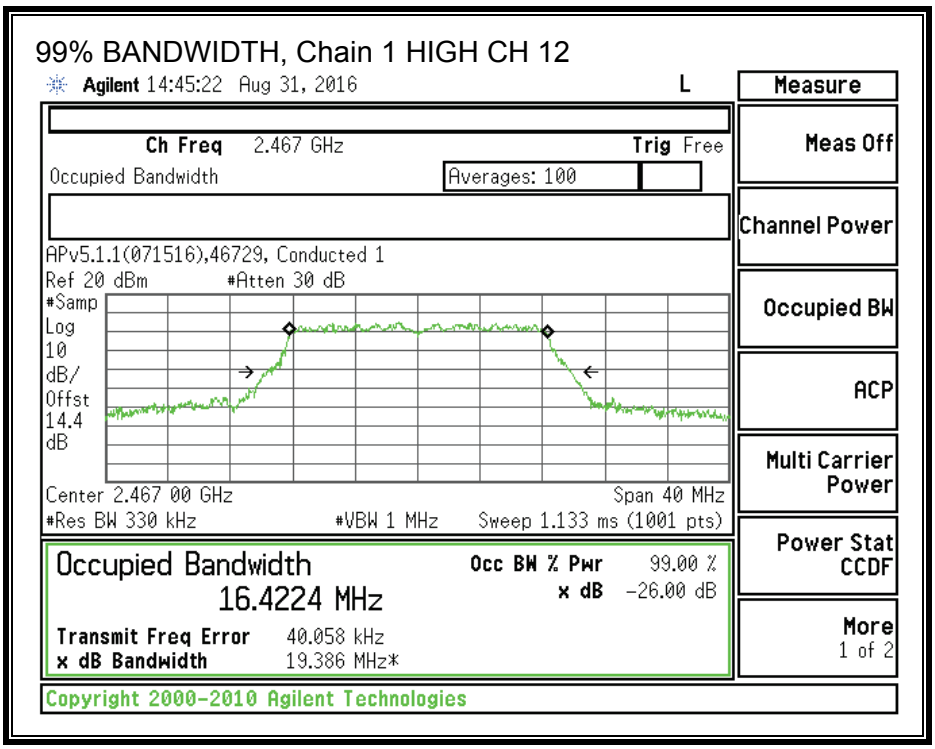

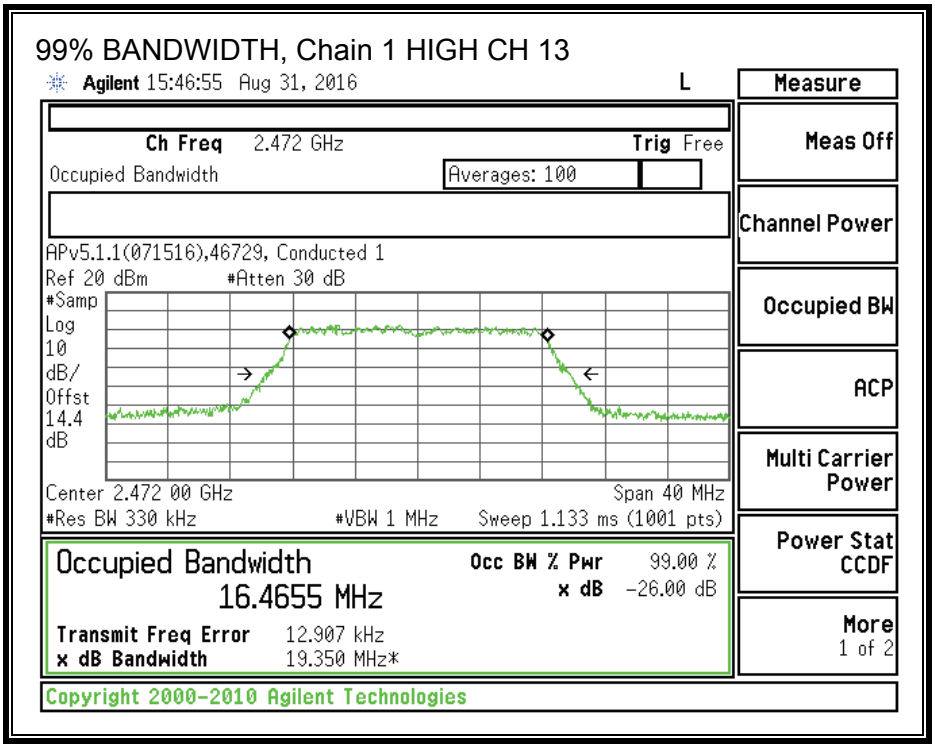

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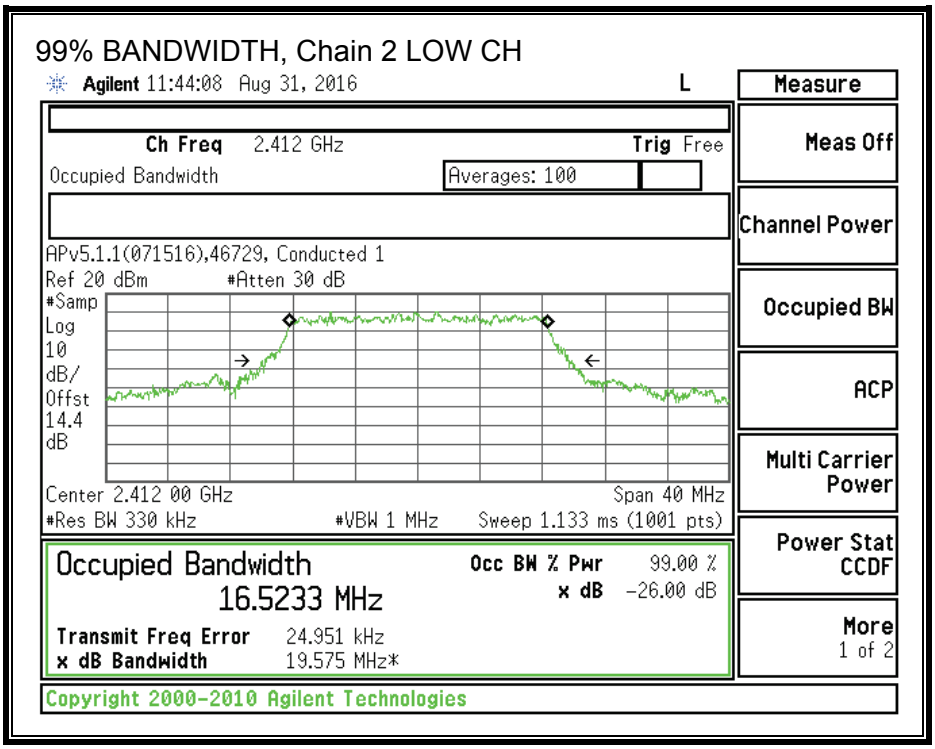
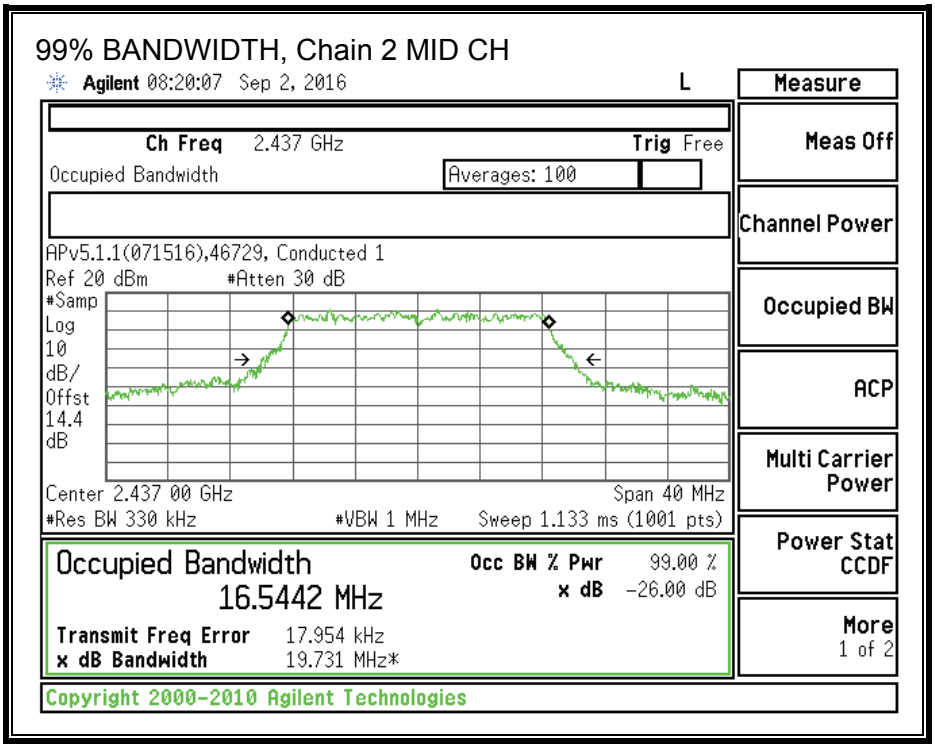
99% BANDWIDTH, Chain 2





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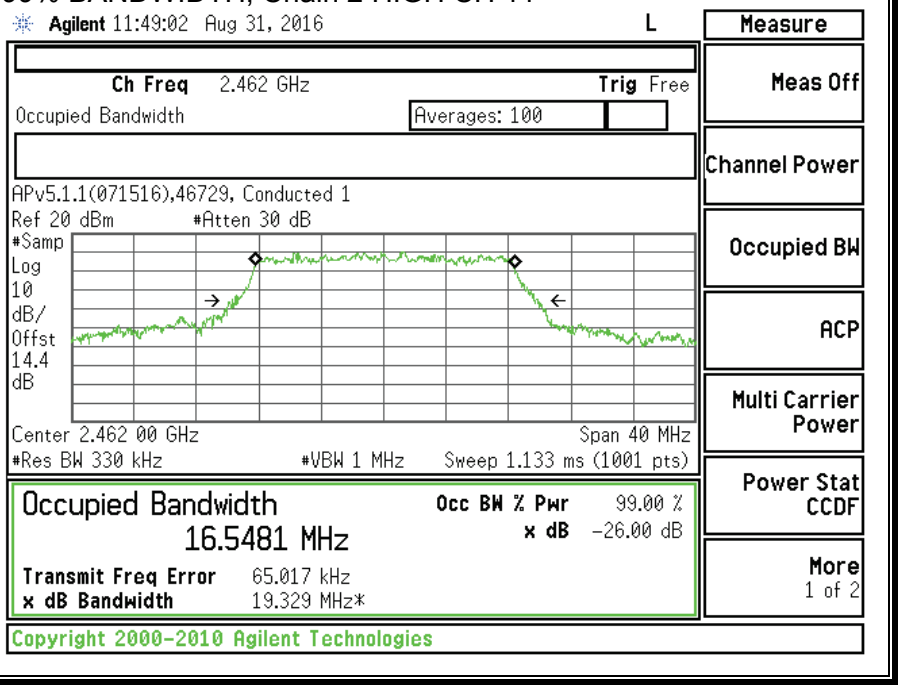
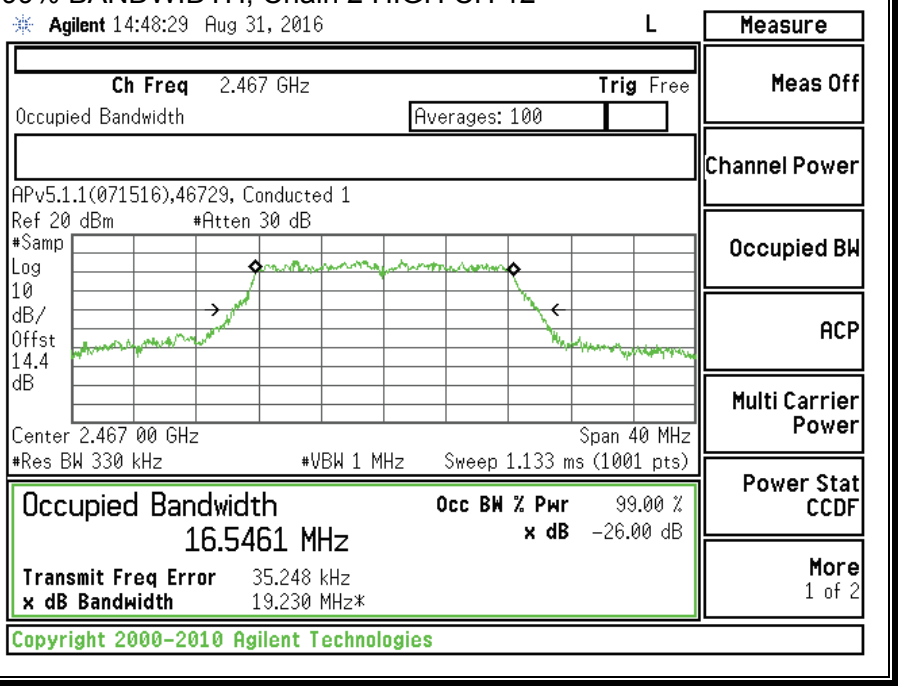
99% BANDWIDTH, Chain 2 HIGH CH 11



99% BANDWIDTH, Chain 2 HIGH CH 12



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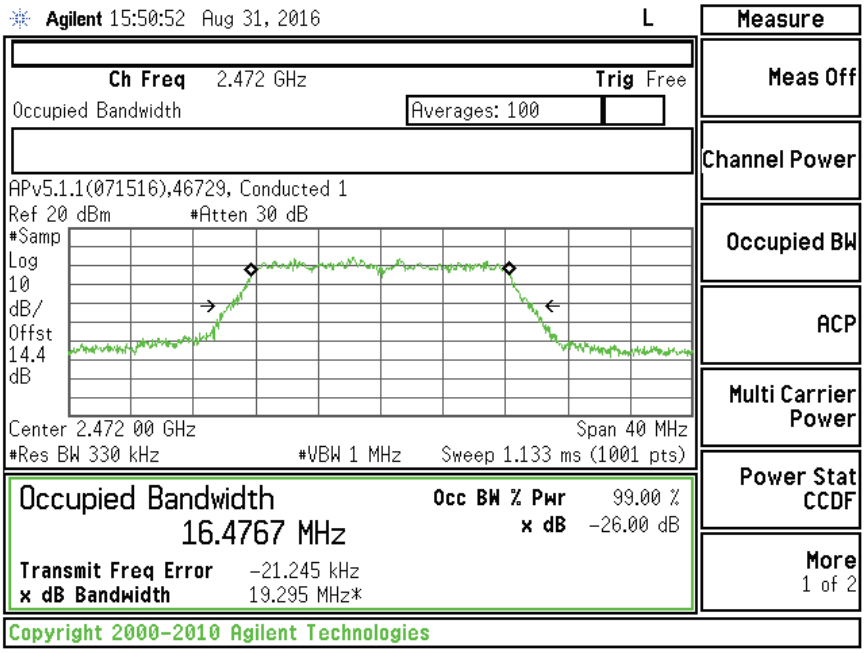
99% BANDWIDTH, Chain 2 HIGH CH 13



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8.4.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

IC RSS-247 5.4 (4)

FCC - For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS - For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11n. Per KDB 662911, no array gain is added for power when N_{ANT} </= 4. Therefore, the directional gain is as follows:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
6.00	6.00	6.00	6.00

Test Performed: Niklas Haydon / Jeff Cabrera
Test Date: 2016-10-03, 2016-10-18 to 2016-10-19

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RESULTS

802.11n HT20 CDD (MCS0)

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	6.00	30.00	30	36	30.00
Mid	2437	6.00	30.00	30	36	30.00
High Ch 11	2462	6.00	30.00	30	36	30.00
High Ch 12	2467	6.00	30.00	30	36	30.00
High Ch 13	2472	6.00	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	15.21	14.95	14.98	19.82	30.00	-10.18
Mid	2437	15.11	14.84	15.23	19.83	30.00	-10.17
High Ch 11	2462	15.49	14.92	15.34	20.03	30.00	-9.97
High Ch 12	2467	12.11	11.47	12.27	16.73	30.00	-13.27
High Ch 13	2472	9.72	9.45	9.77	14.42	30.00	-15.58

Note – The above are gated average power measurements.

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802.11n HT20 SDM (MCS16)

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	6.00	30.00	30	36	30.00
Mid	2437	6.00	30.00	30	36	30.00
High Ch 11	2462	6.00	30.00	30	36	30.00
High Ch 12	2467	6.00	30.00	30	36	30.00
High Ch 13	2472	6.00	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	14.90	14.99	14.93	19.71	30.00	-10.29
Mid	2437	14.99	14.55	14.90	19.59	30.00	-10.41
High Ch 11	2462	14.68	14.69	14.97	19.55	30.00	-10.45
High Ch 12	2467	12.37	12.03	12.70	17.15	30.00	-12.85
High Ch 13	2472	9.53	9.44	9.76	14.35	30.00	-15.65

Note – The above are gated average power measurements.

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8.4.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-247 5.2 (2)

RESULTS

802.11n HT20 (SDM) MCS16

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-3.89	-9.10	-3.07	0.11	8.0	-7.9
Mid	2437	-4.40	-8.78	-2.37	0.32	8.0	-7.7
High Ch 11	2462	-4.40	-8.83	-3.07	-0.06	8.0	-8.1
High Ch 12	2467	-13.39	-14.38	-12.68	-8.66	8.0	-16.7
High Ch 13	2472	-16.77	-16.41	-16.48	-11.78	8.0	-19.8

Note – Peak method used, therefore duty cycle correction not included.

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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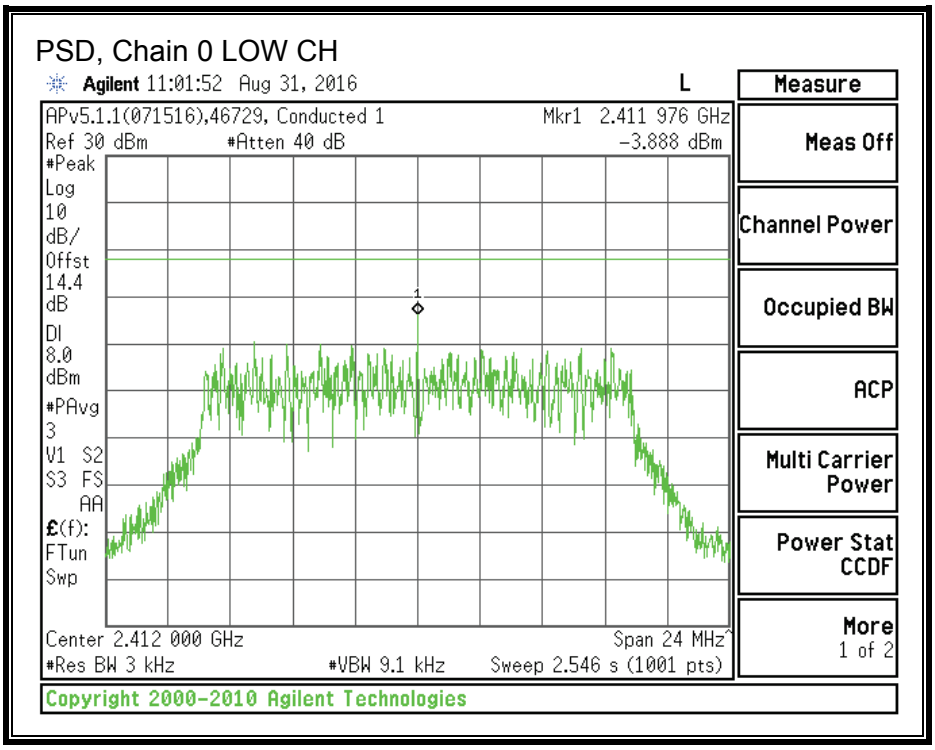
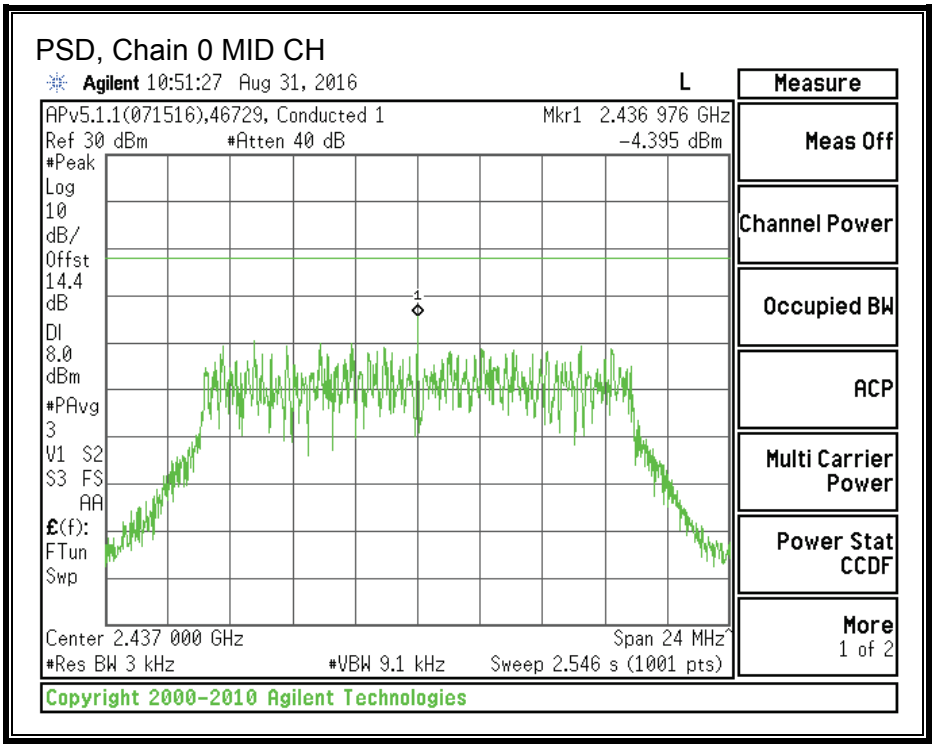
PSD, Chain 0





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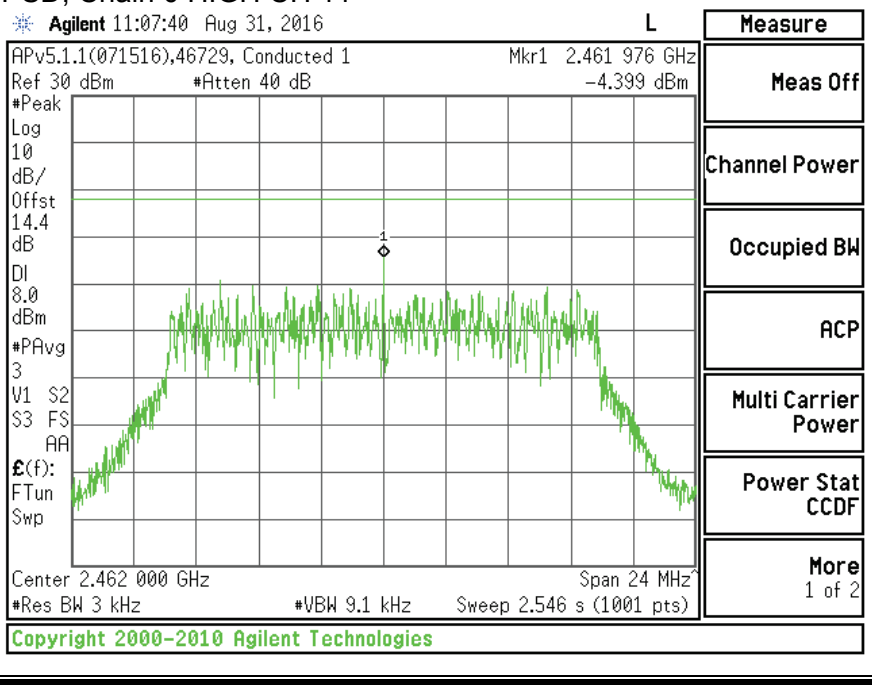
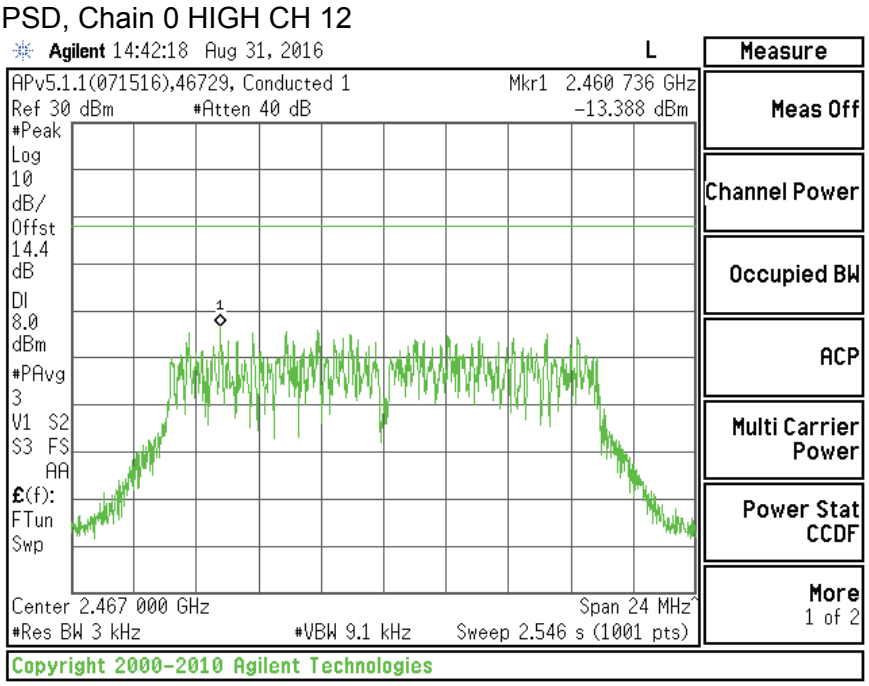
PSD, Chain 0 HIGH CH 11



PSD, Chain 0 HIGH CH 12



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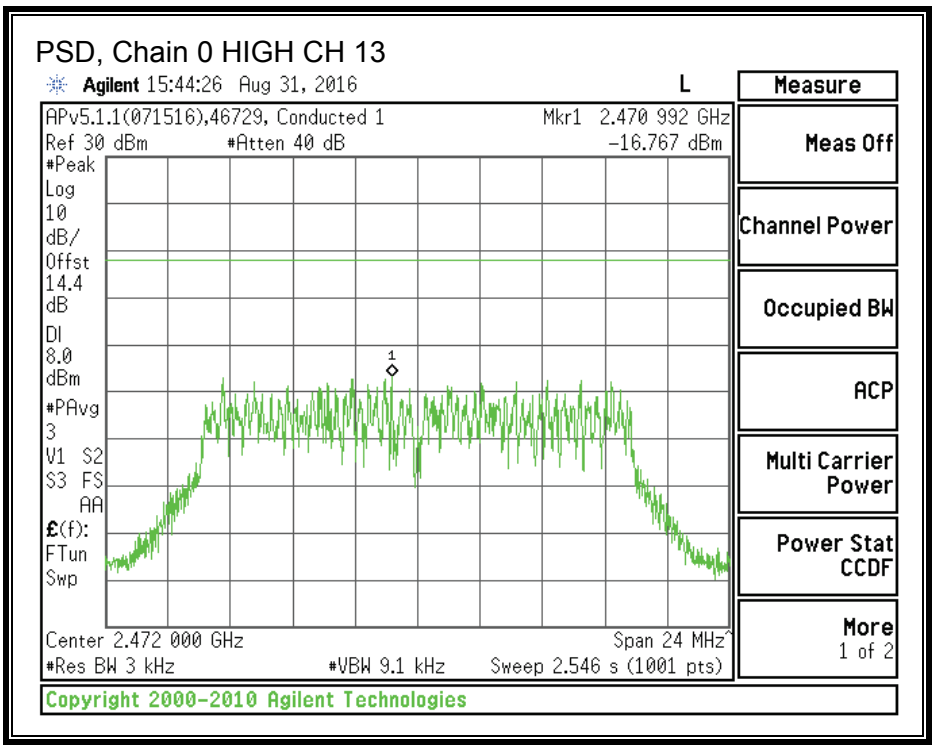
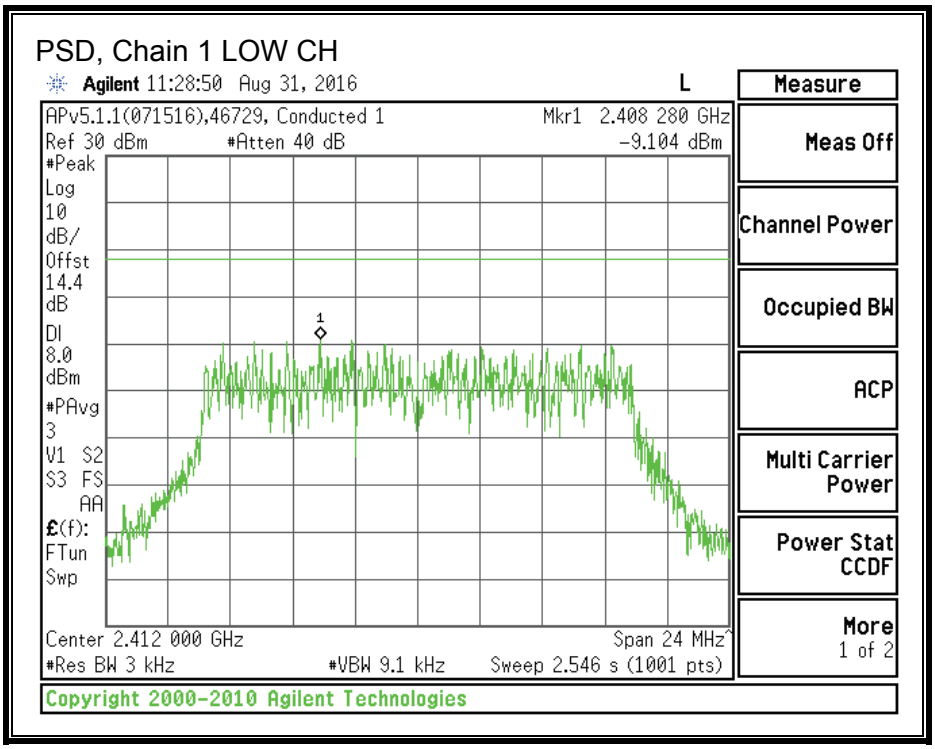


PSD, Chain 1



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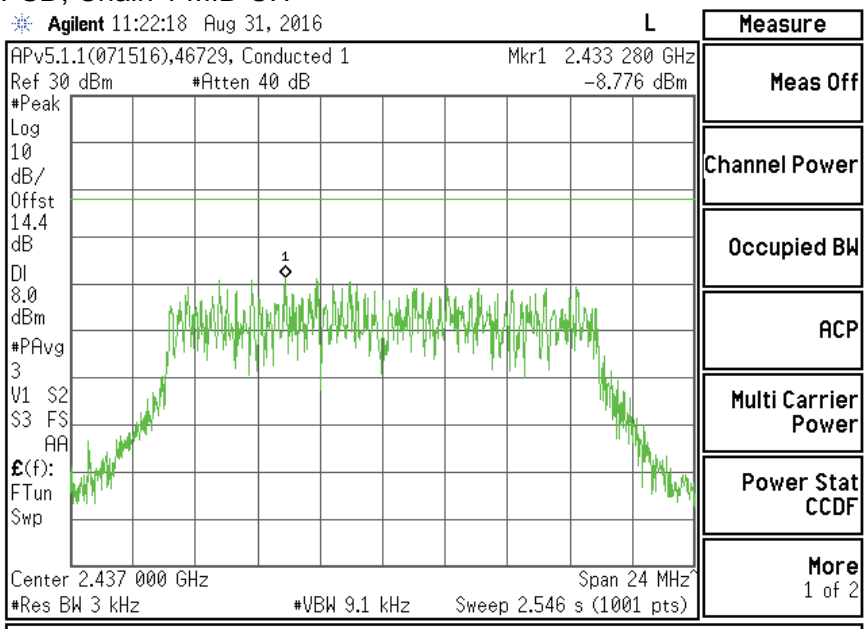
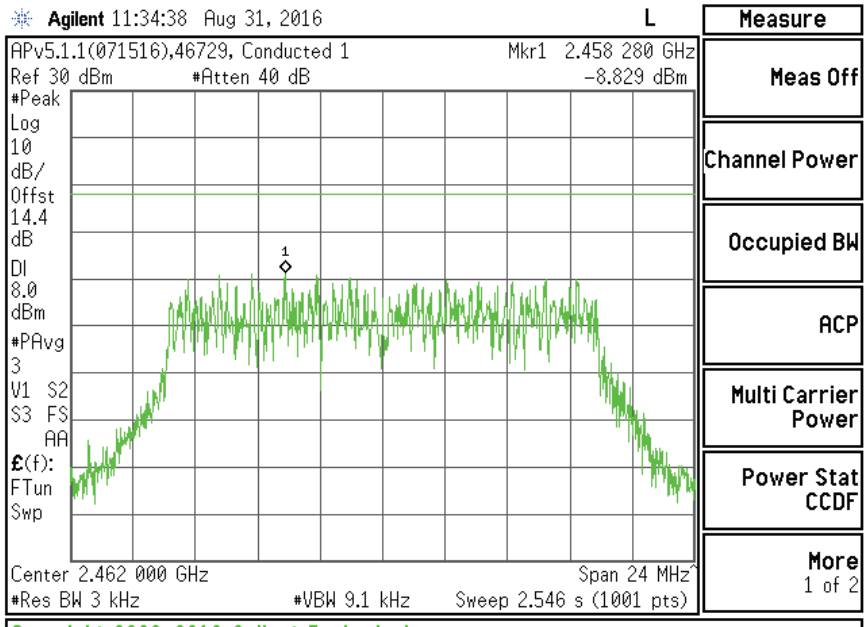
PSD, Chain 1 MID CH



PSD, Chain 1 HIGH CH 11



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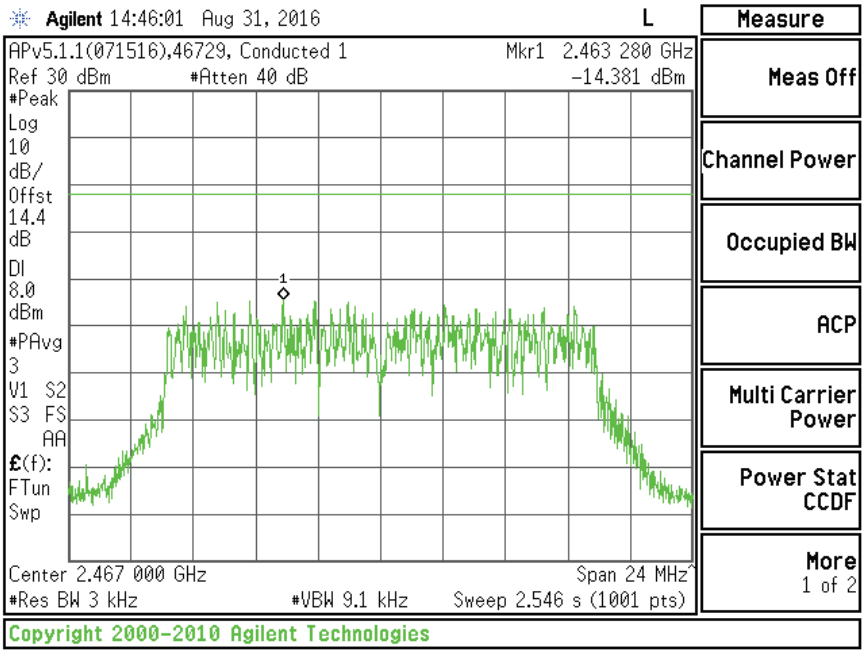
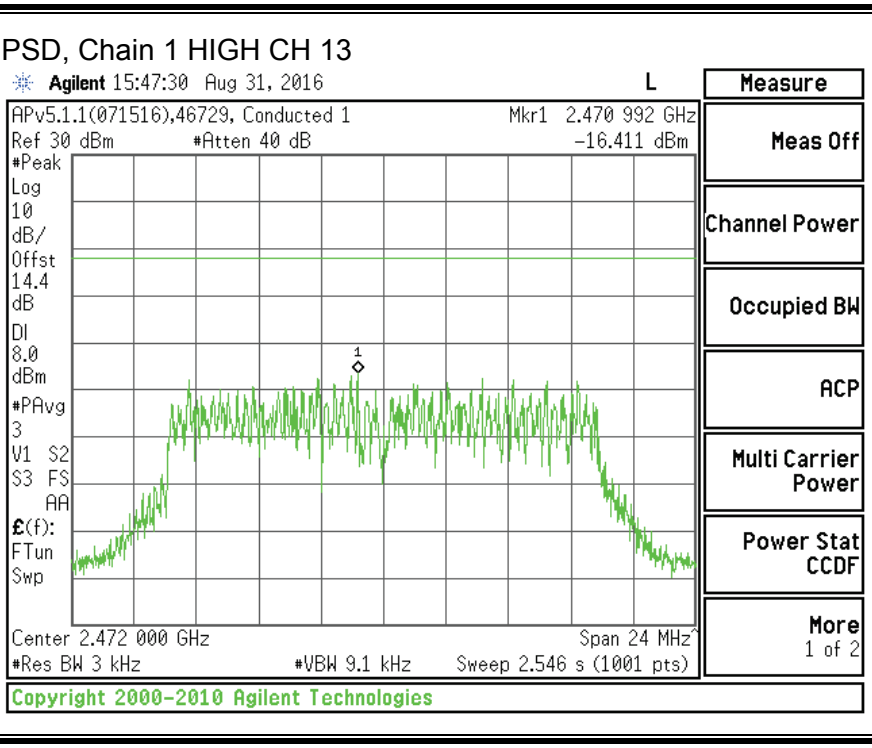
PSD, Chain 1 HIGH CH 12



PSD, Chain 1 HIGH CH 13



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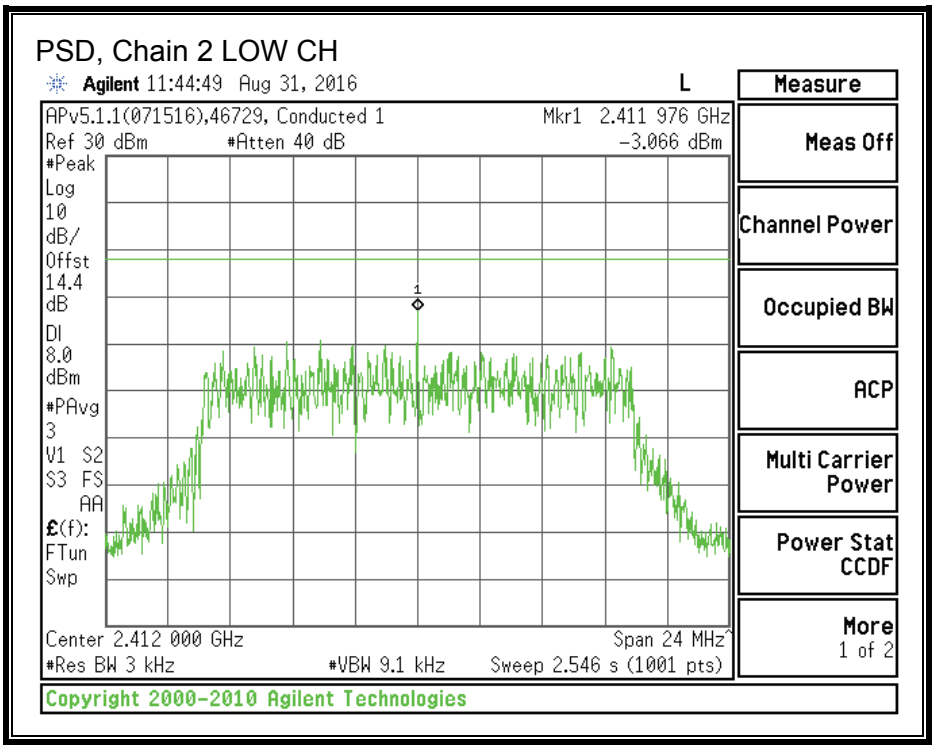
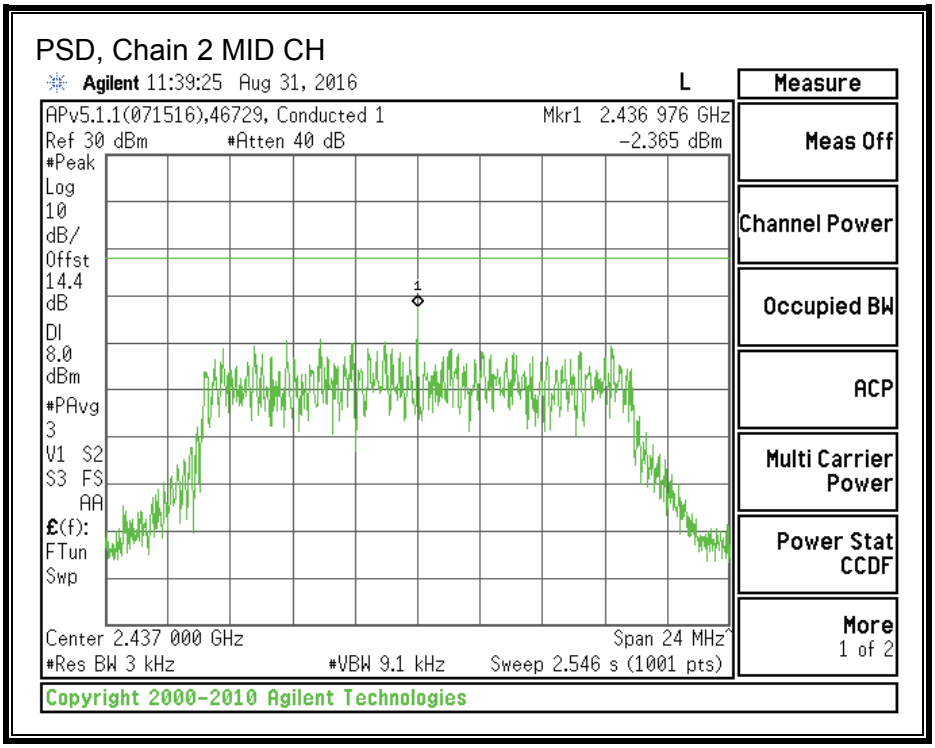
PSD, Chain 2





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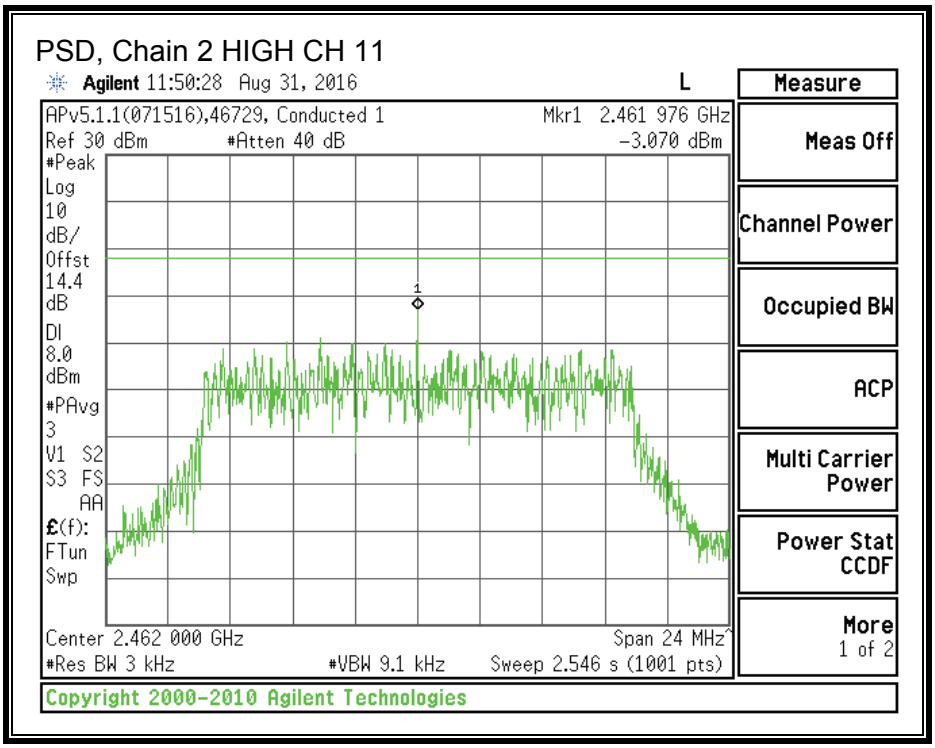

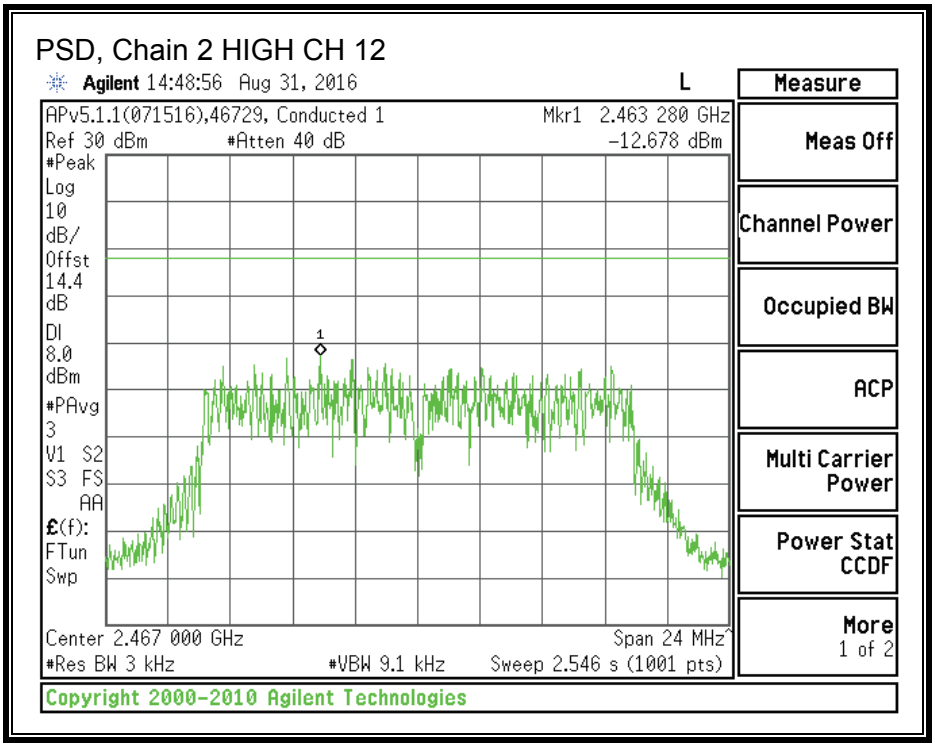

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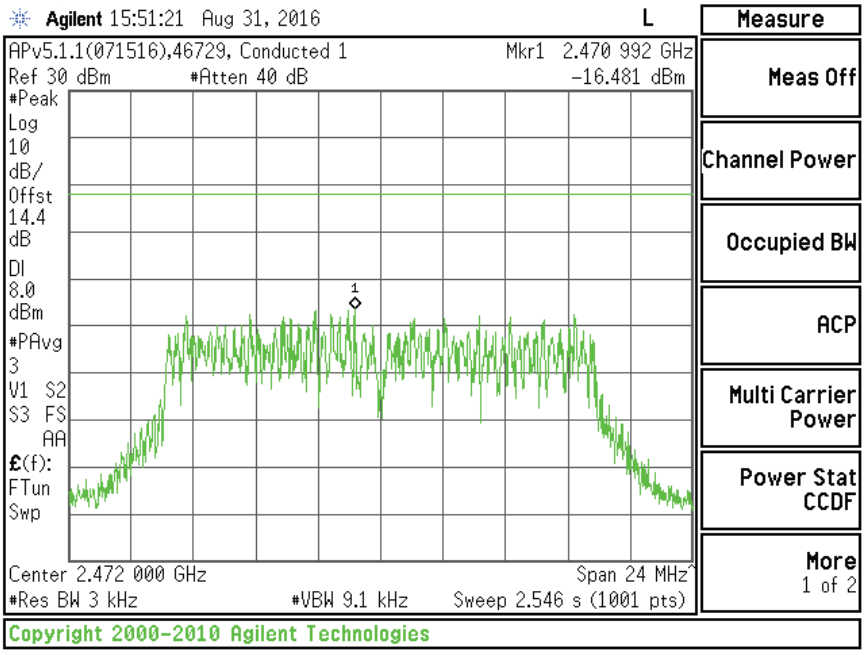
PSD, Chain 2 HIGH CH 13



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8.4.5. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-247 5.5

FCC - In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RSS - In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RESULTS

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

Mode - 802.11n HT20 SDM (MCS16)

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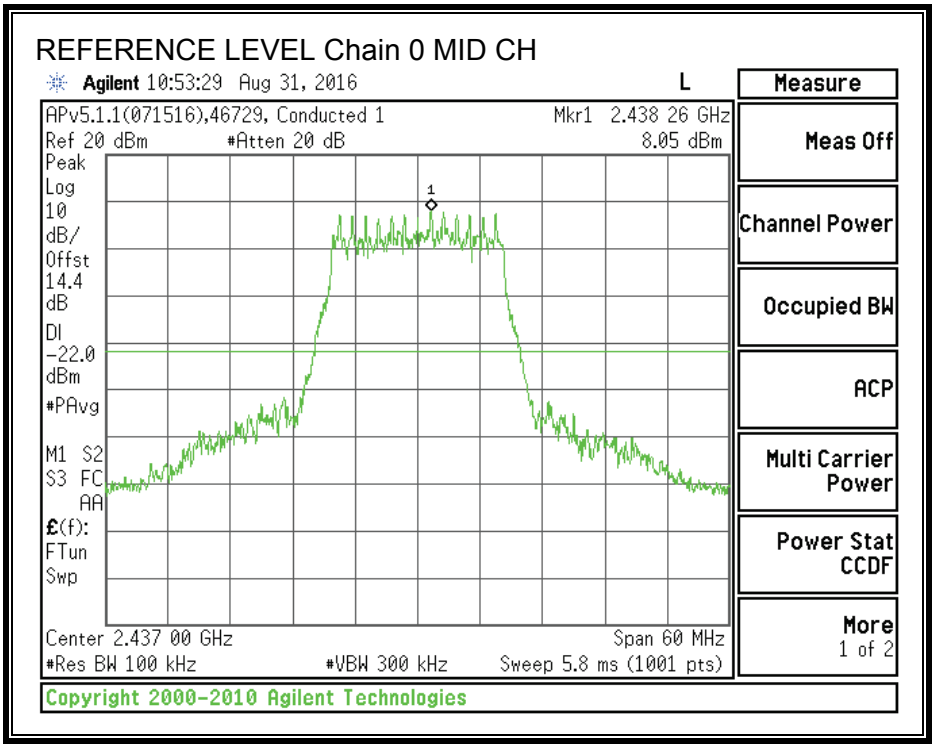
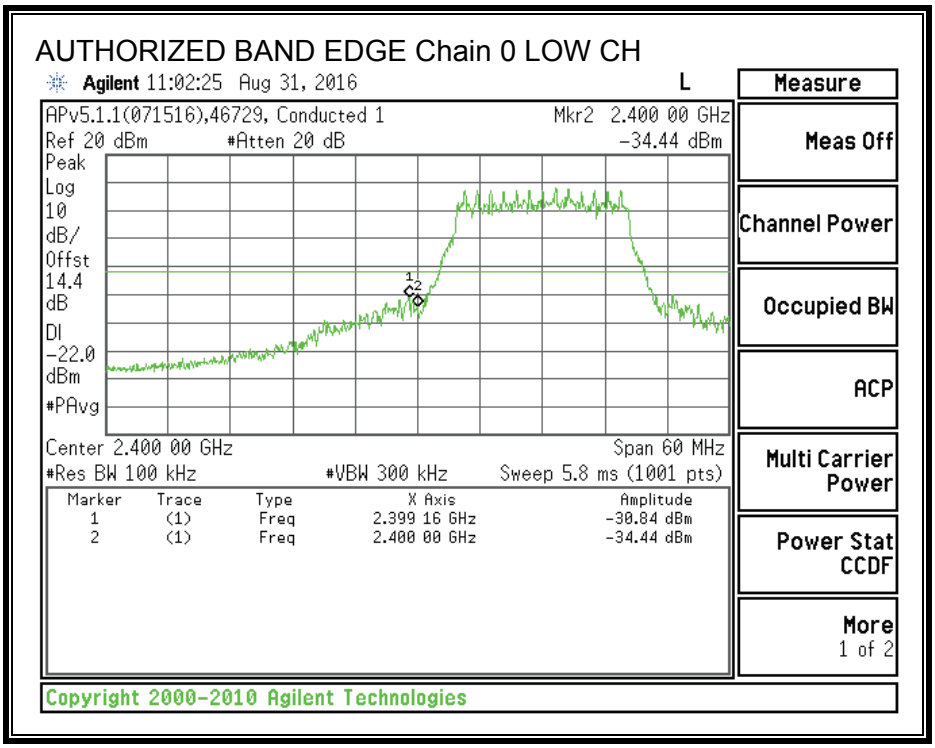
RESULTS

IN-BAND REFERENCE LEVEL, Chain 0



LOW CHANNEL BANDEDGE, Chain 0



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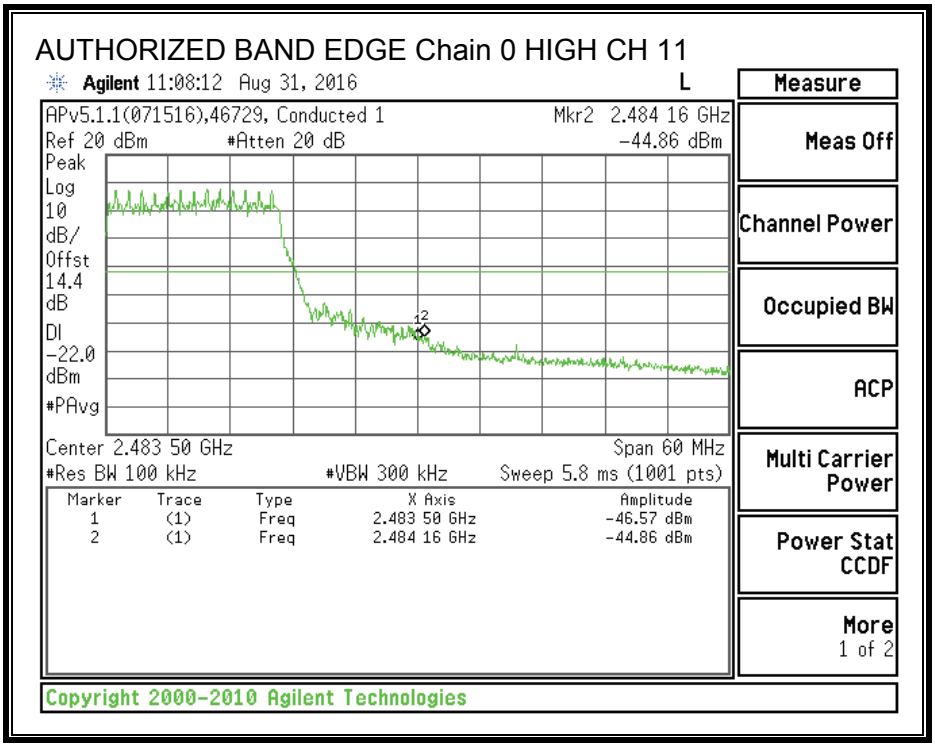
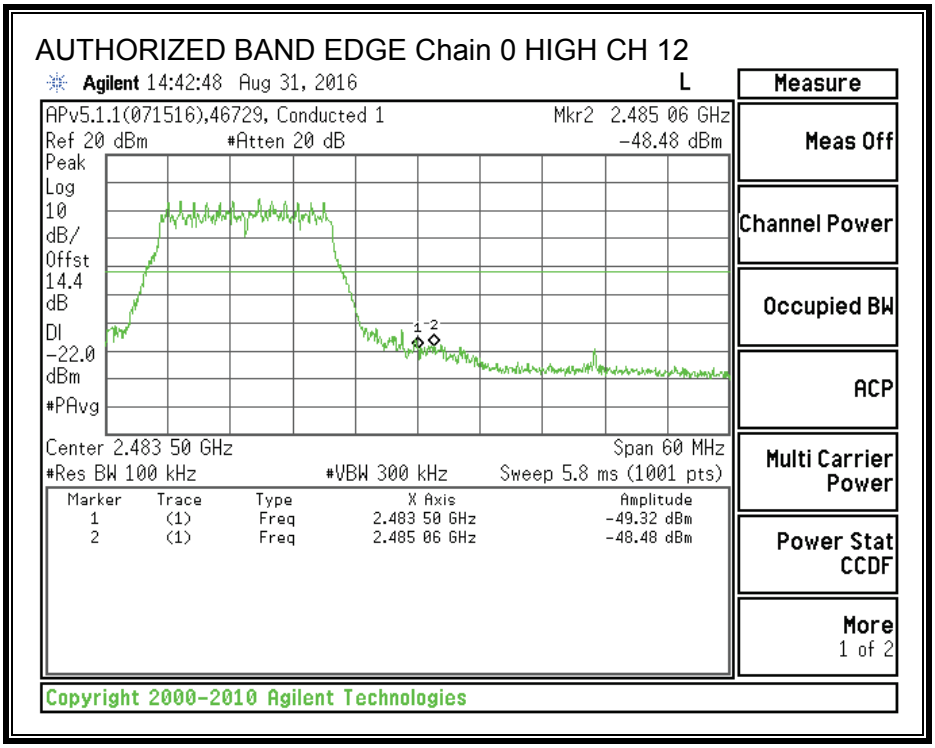
HIGH CHANNEL BANDEDGE, Chain 0





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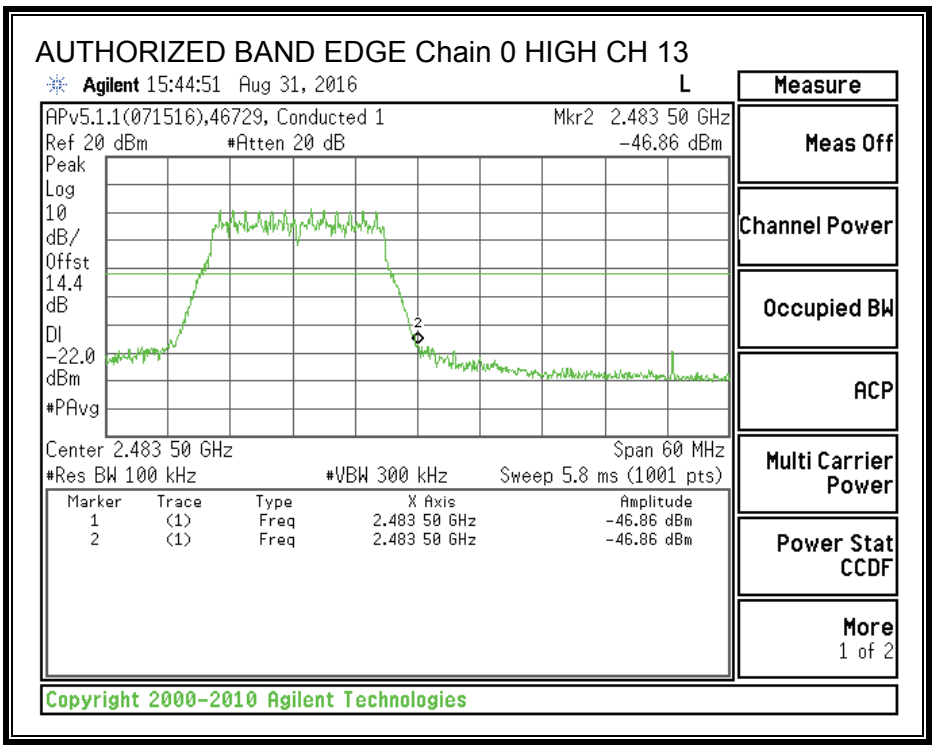
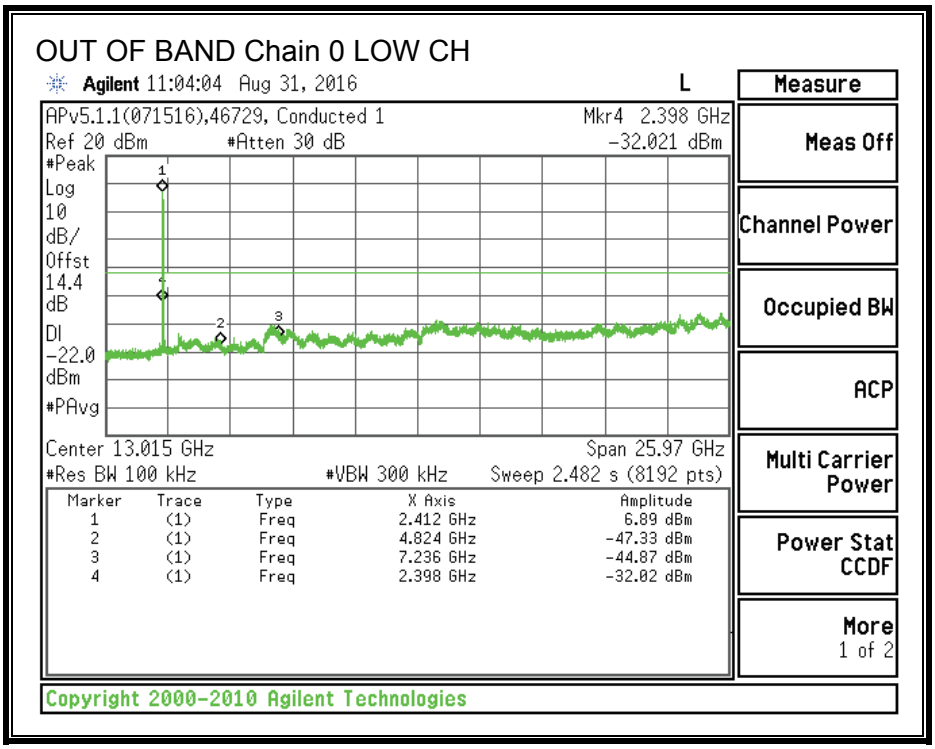


OUT-OF-BAND EMISSIONS, Chain 0



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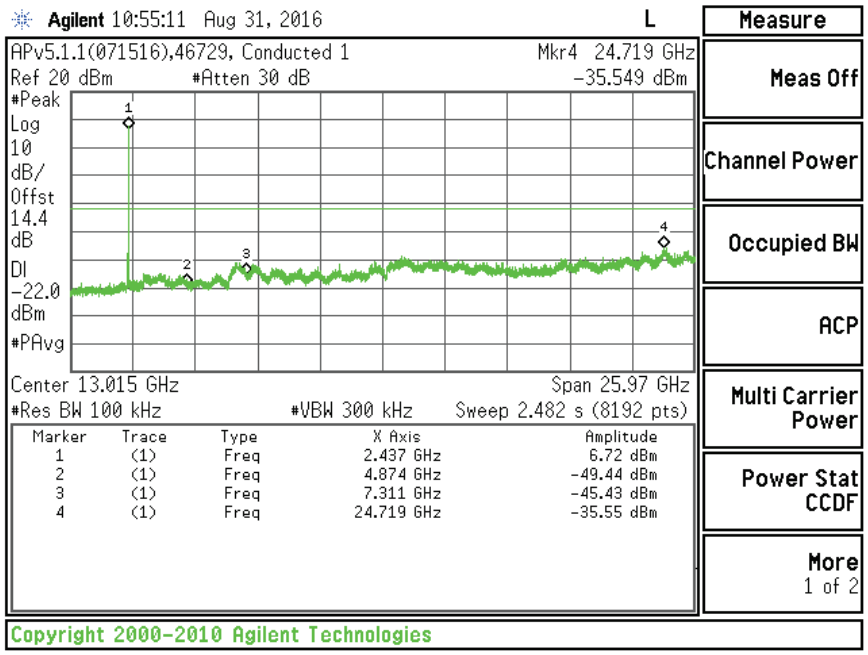
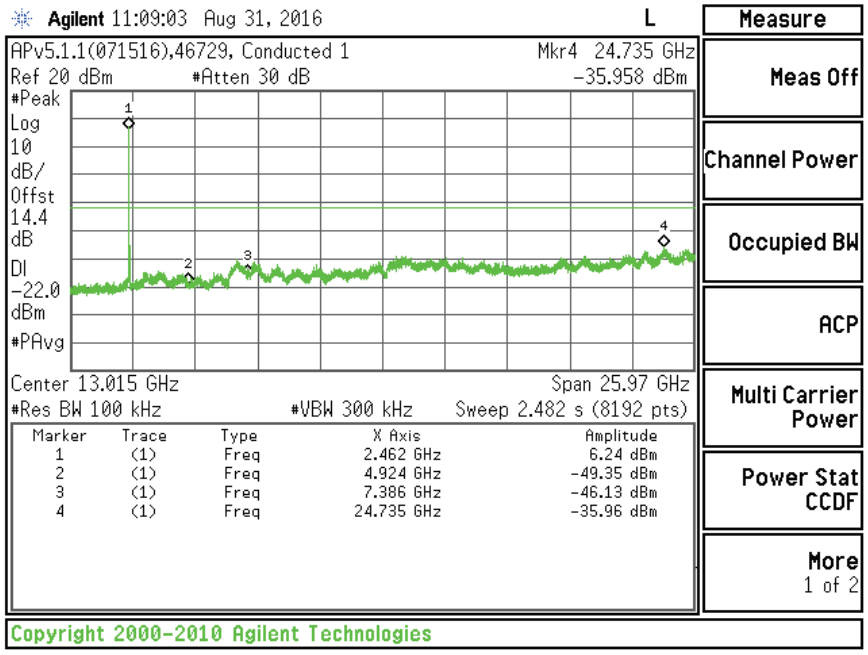
OUT OF BAND Chain 0 MID CH



OUT OF BAND Chain 0 HIGH CH 11



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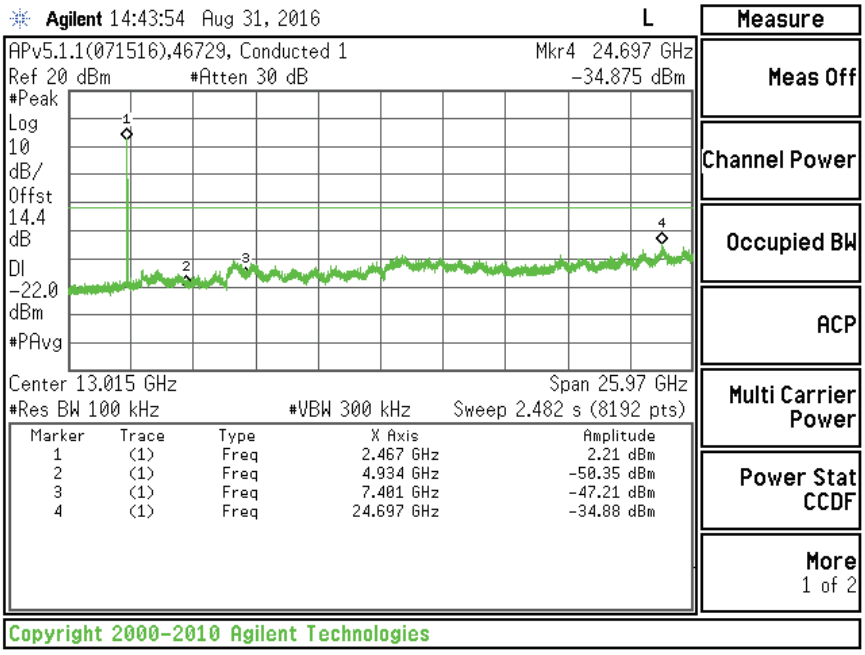
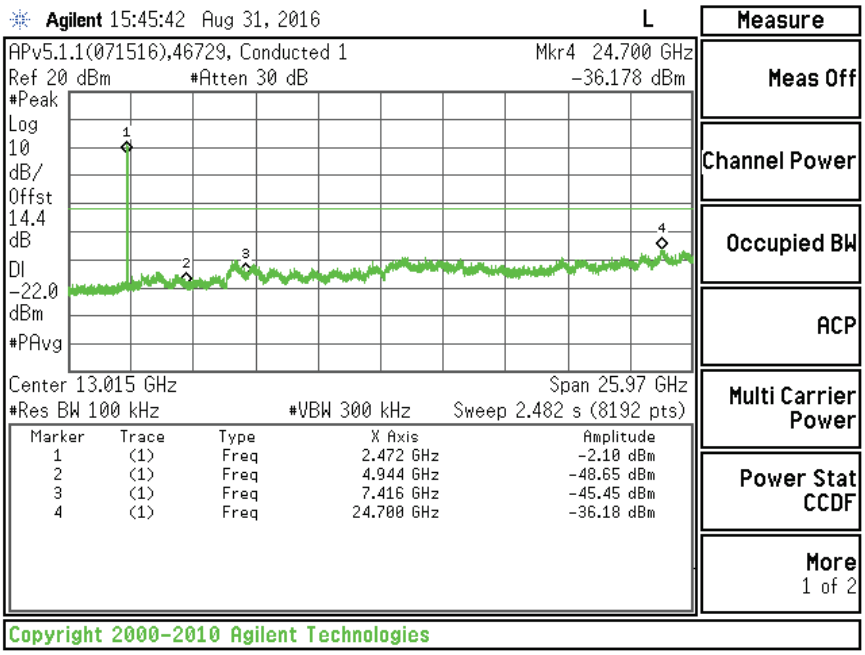
OUT OF BAND Chain 0 HIGH CH 12



OUT OF BAND Chain 0 HIGH CH 13



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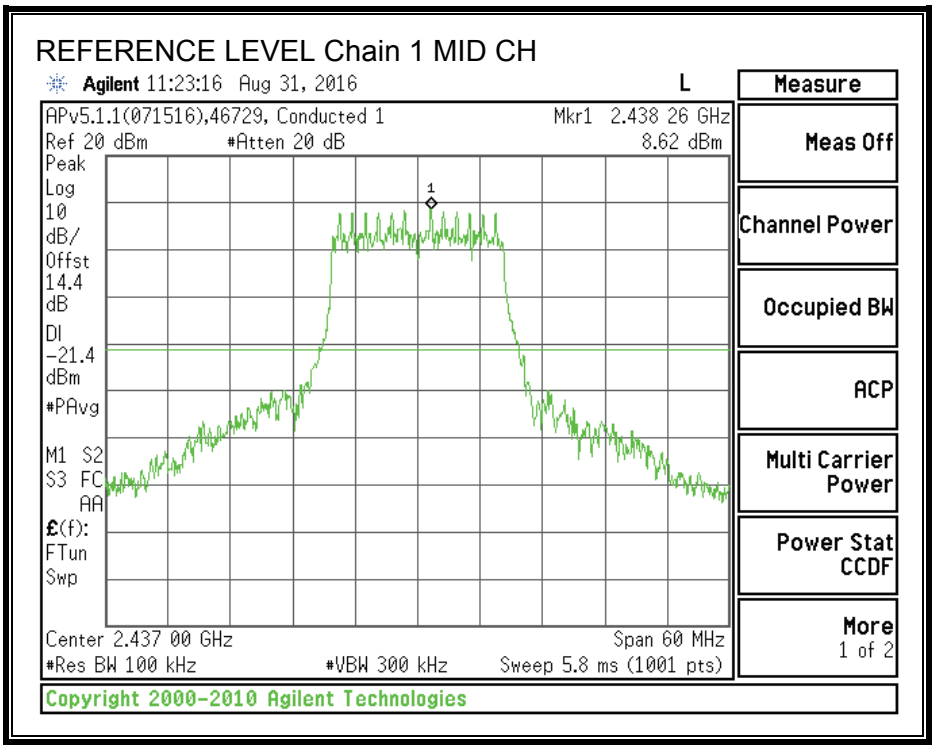
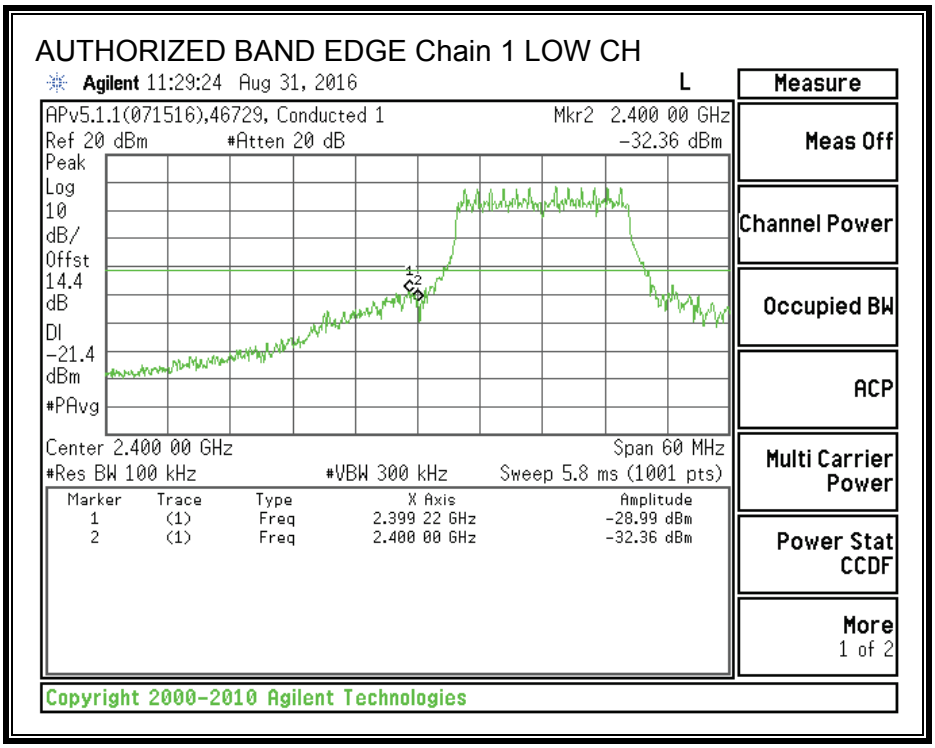
IN-BAND REFERENCE LEVEL, Chain 1



LOW CHANNEL BANDEDGE, Chain 1



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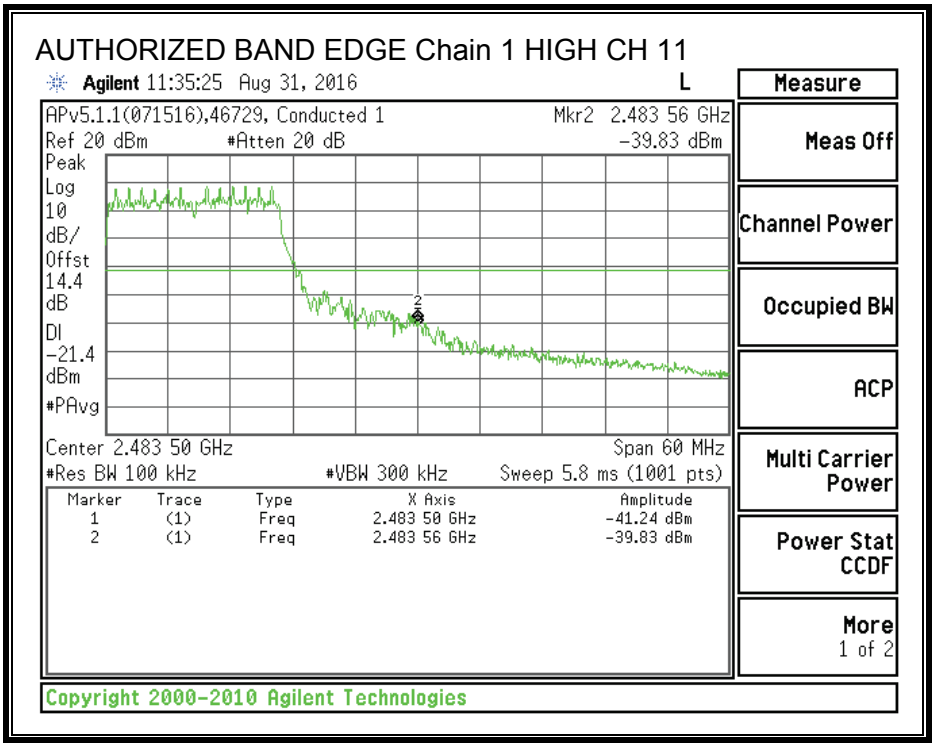
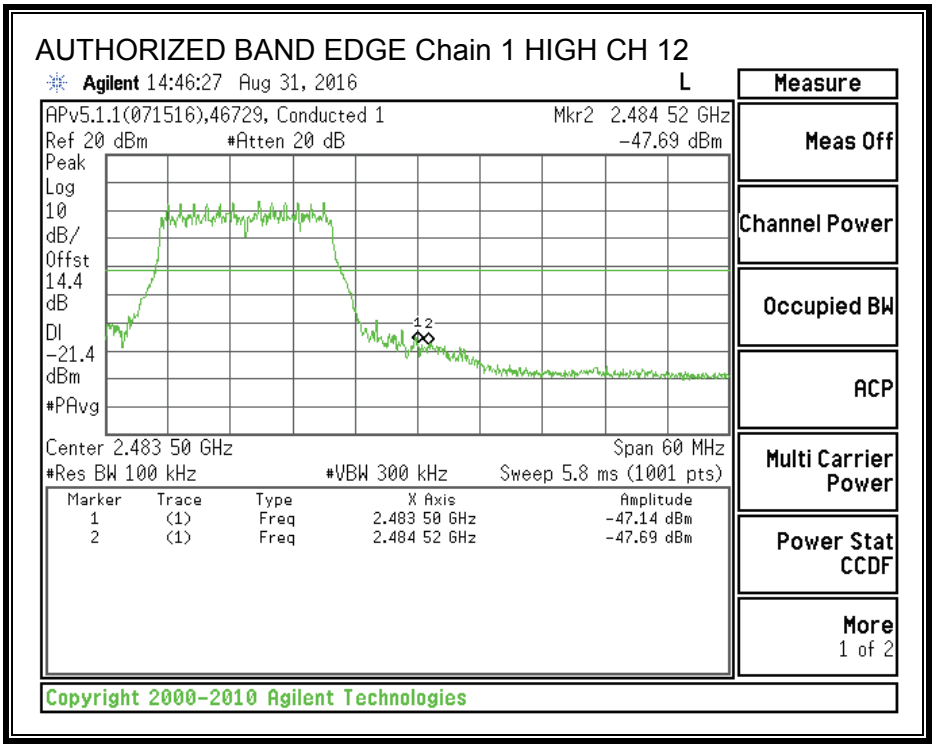
HIGH CHANNEL BANDEDGE, Chain 1





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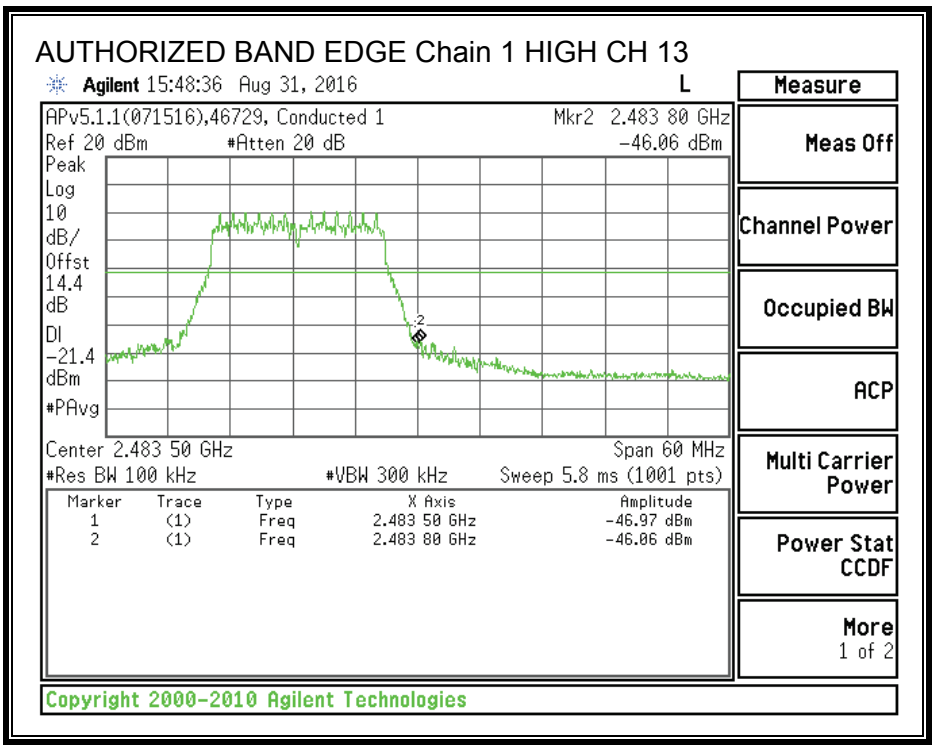
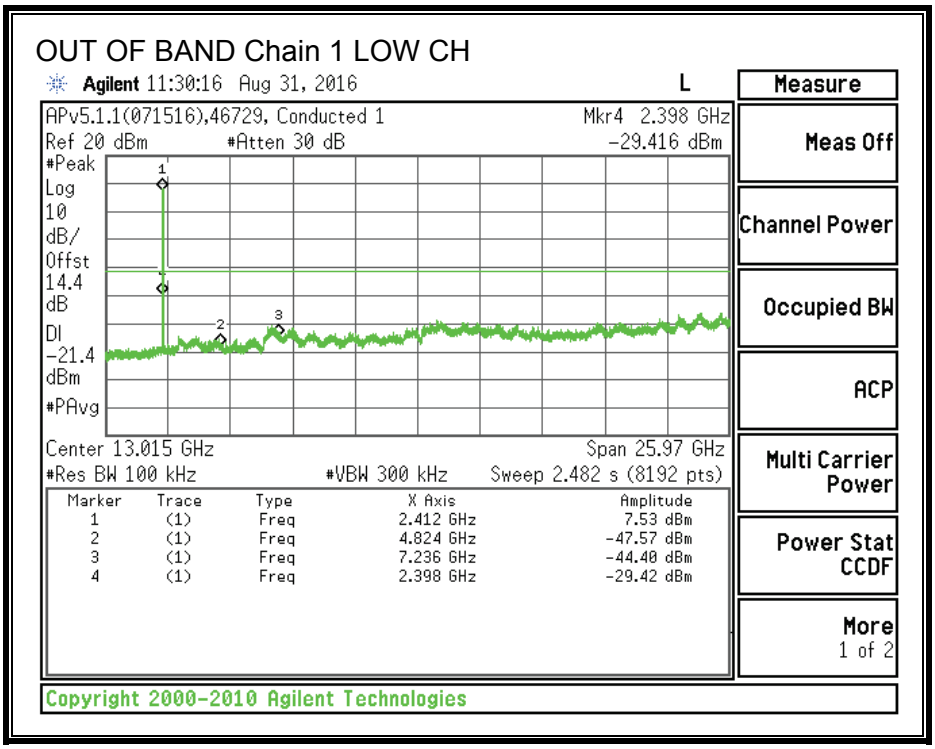


OUT-OF-BAND EMISSIONS, Chain 1



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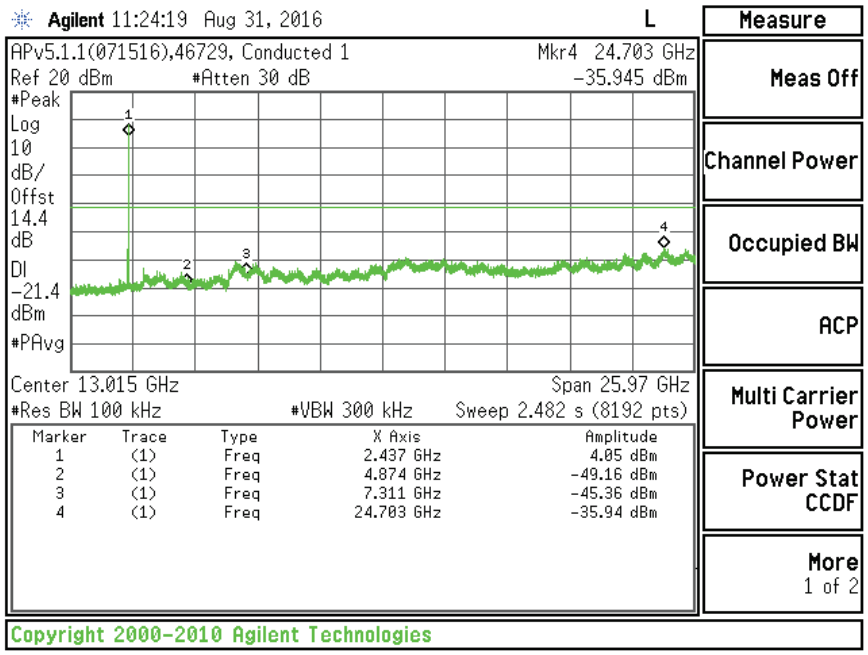
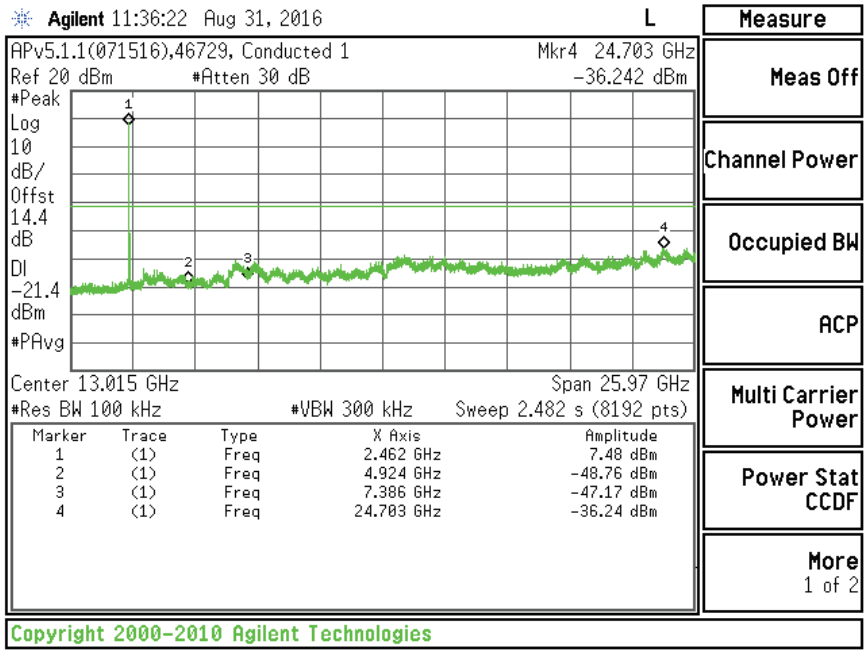
OUT OF BAND Chain 1 MID CH



OUT OF BAND Chain 1 HIGH CH 11



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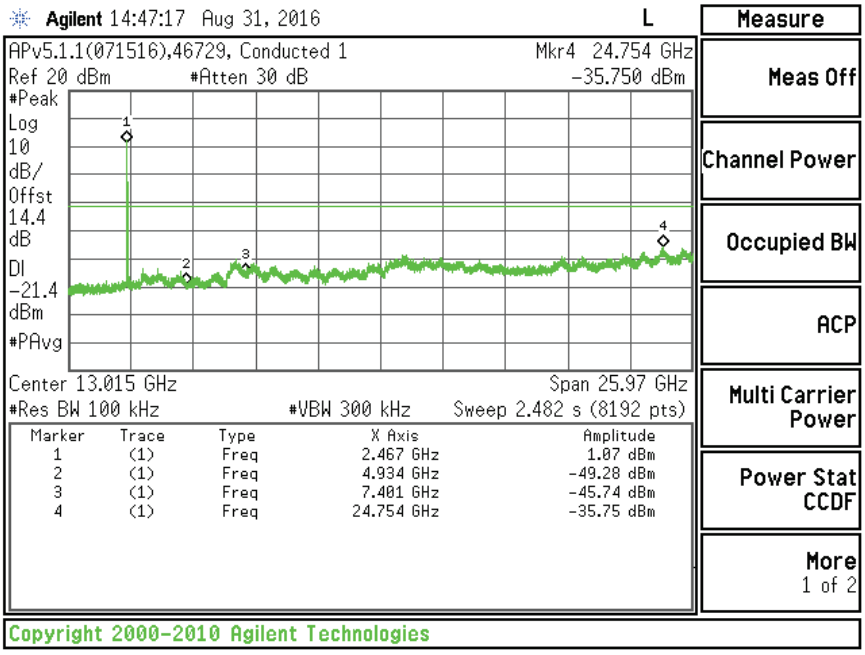
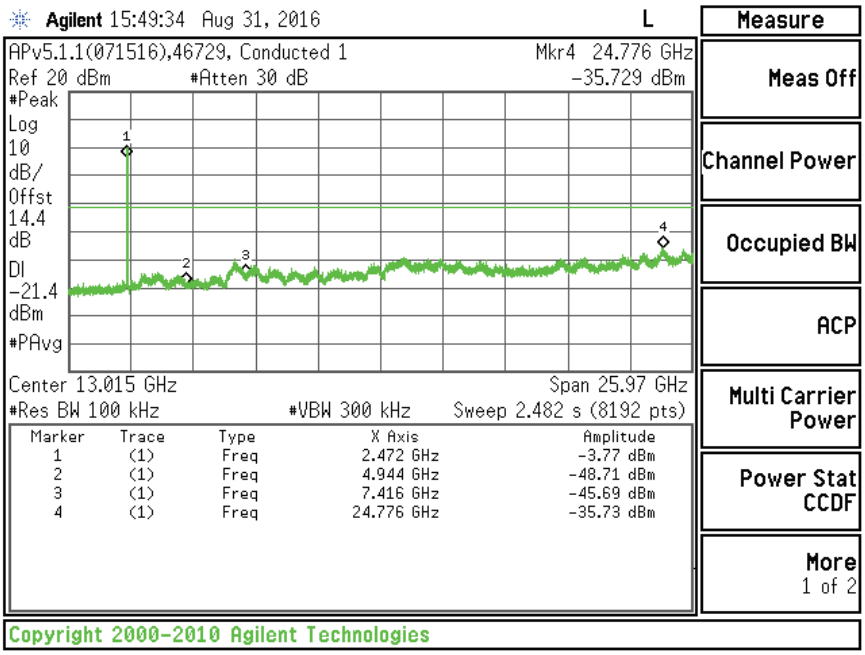
OUT OF BAND Chain 1 HIGH CH 12



OUT OF BAND Chain 1 HIGH CH 13



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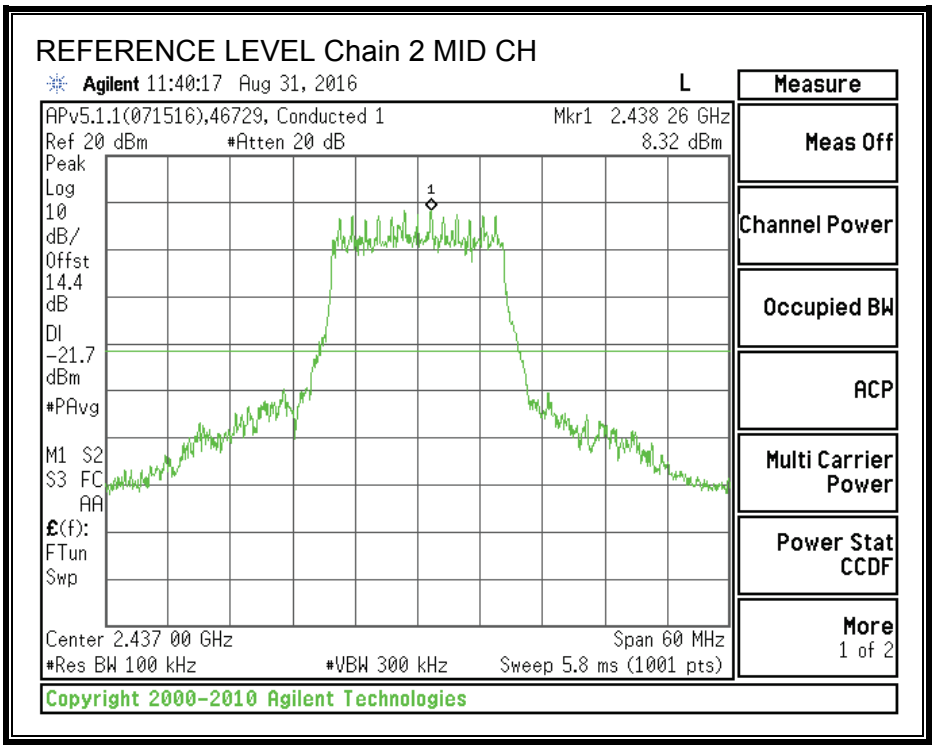
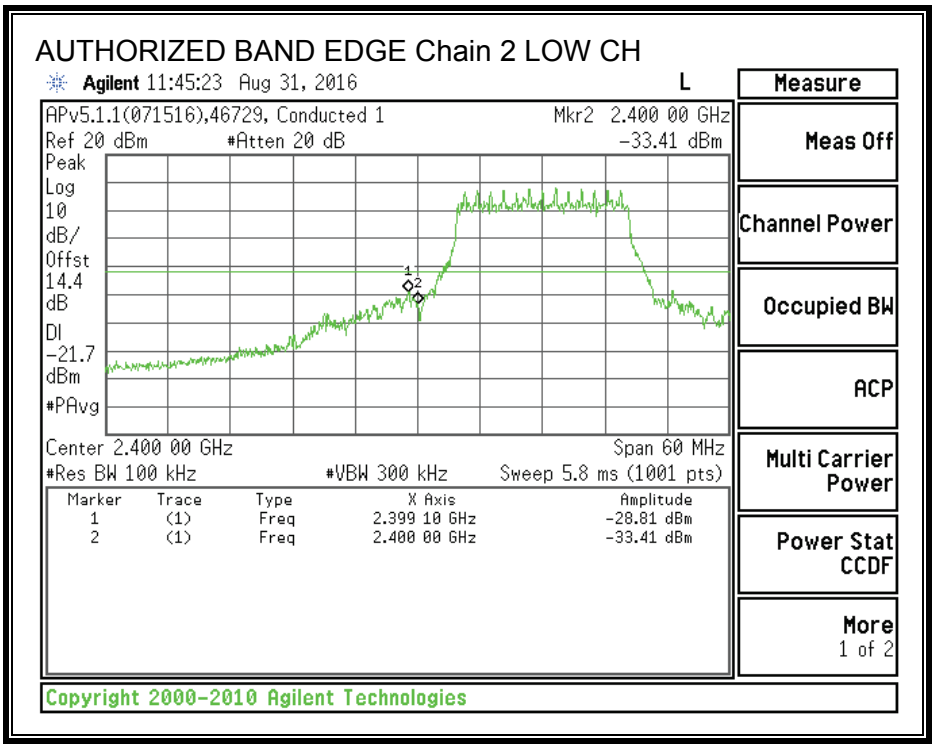
IN-BAND REFERENCE LEVEL, Chain 2



LOW CHANNEL BANDEDGE, Chain 2



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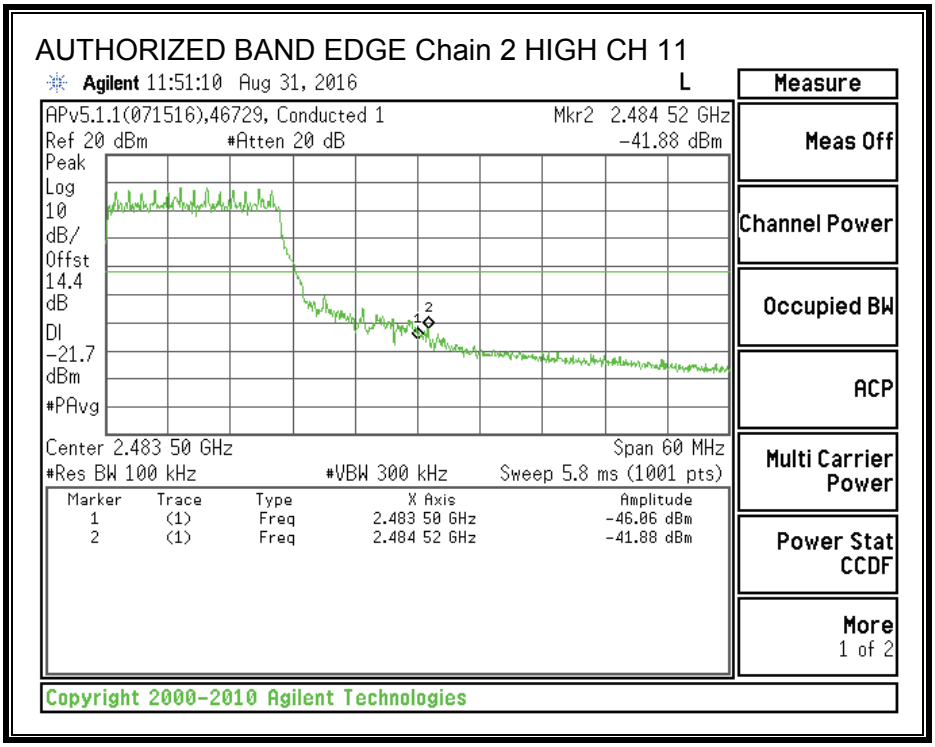
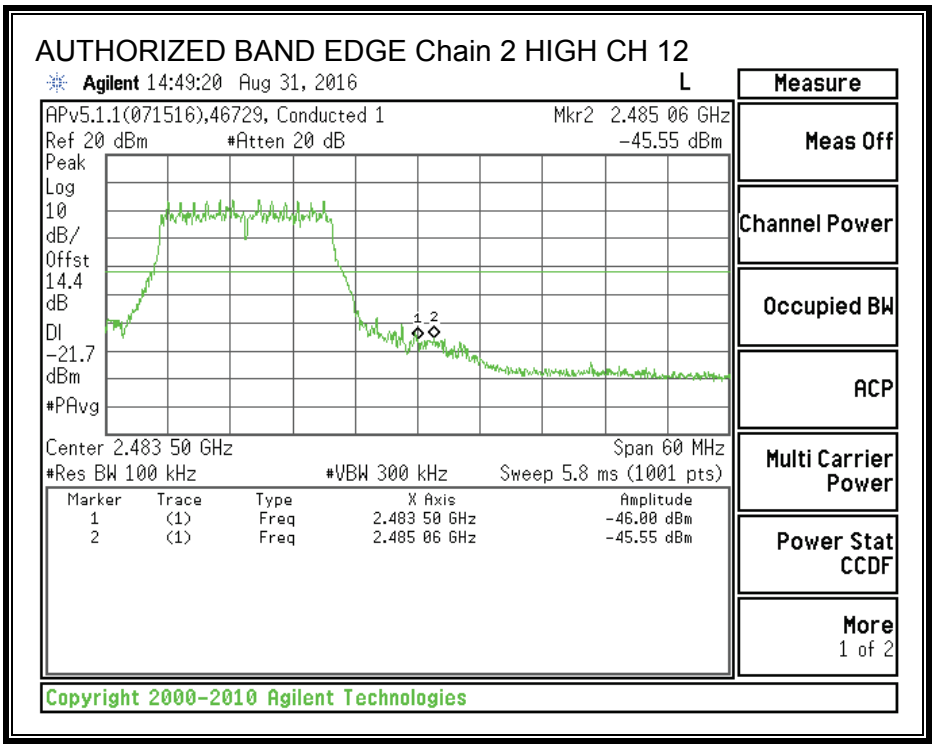
HIGH CHANNEL BANDEDGE, Chain 2





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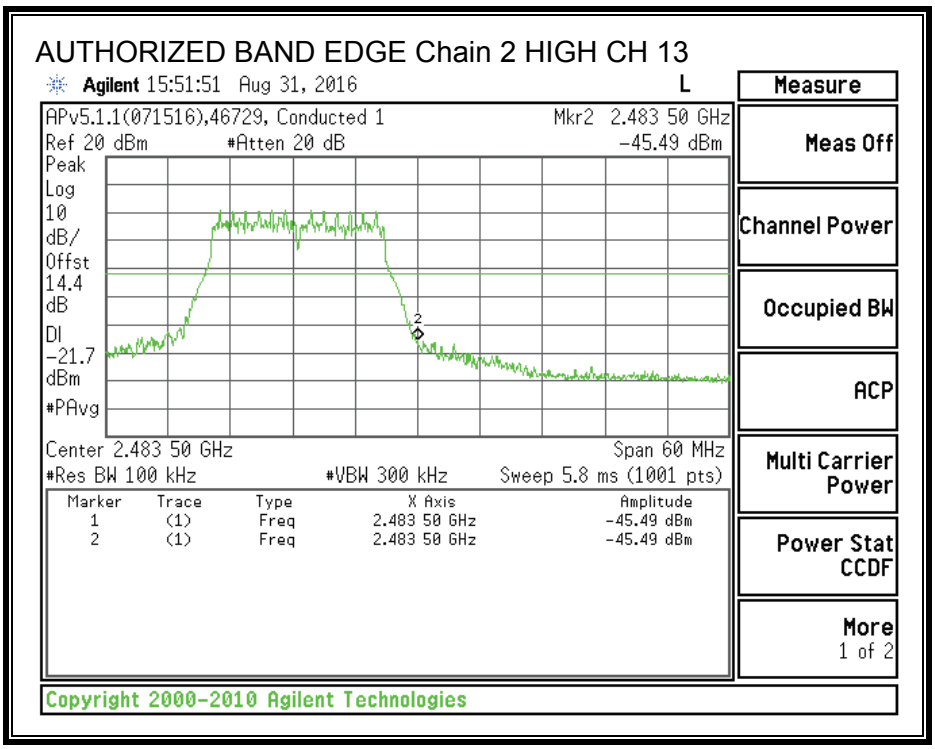
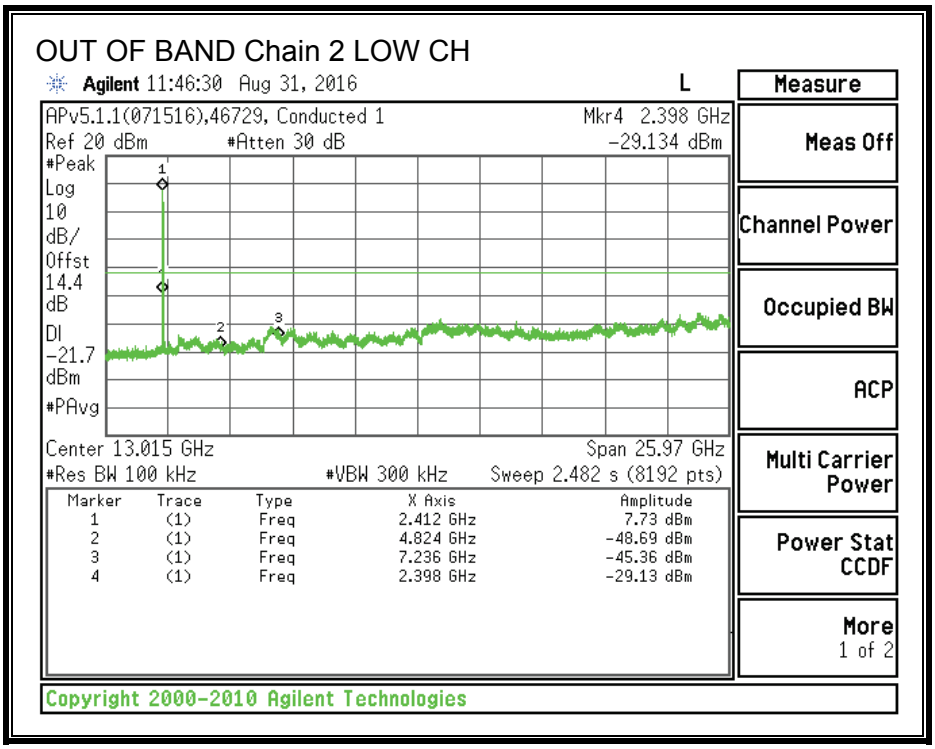


OUT-OF-BAND EMISSIONS, Chain 2



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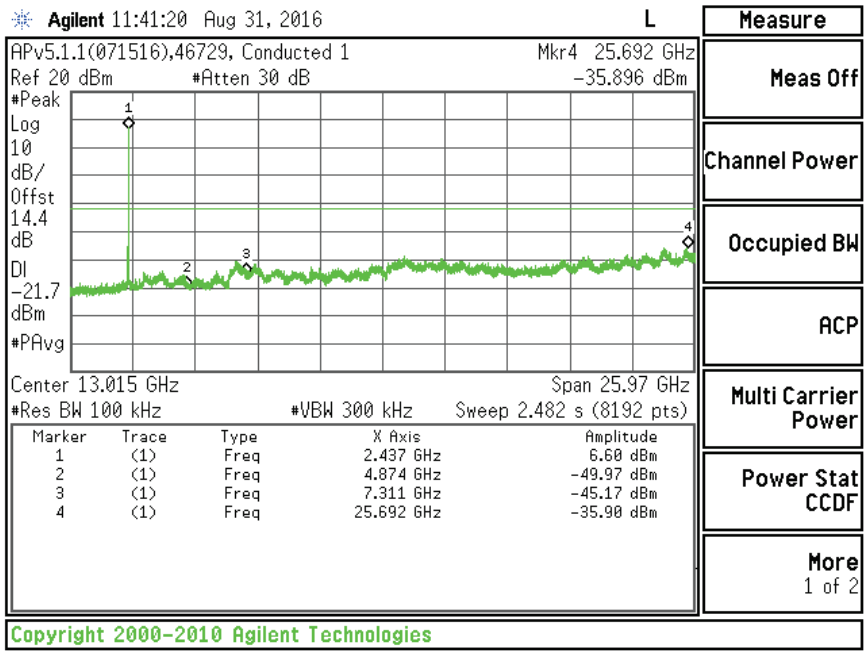
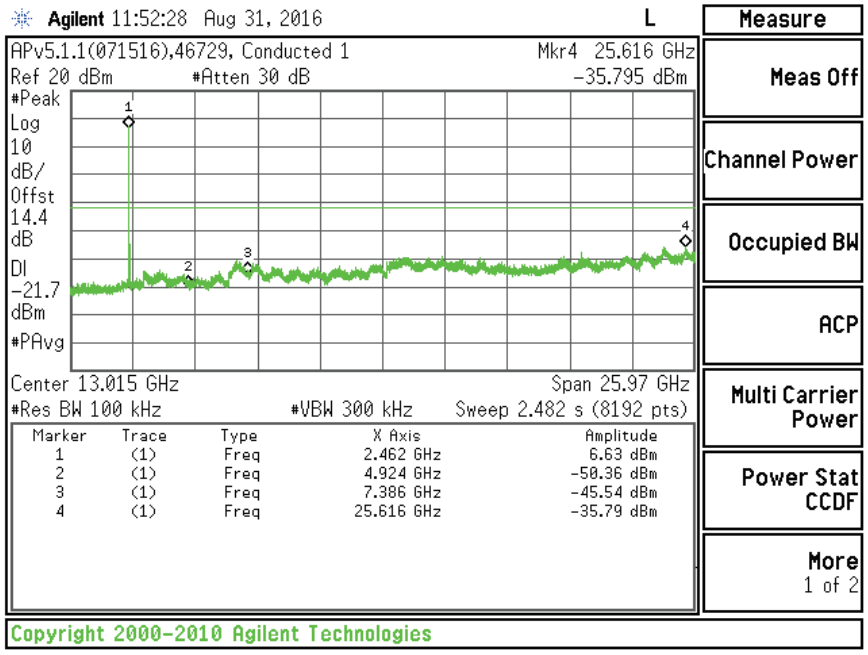
OUT OF BAND Chain 2 MID CH



OUT OF BAND Chain 2 HIGH CH 11



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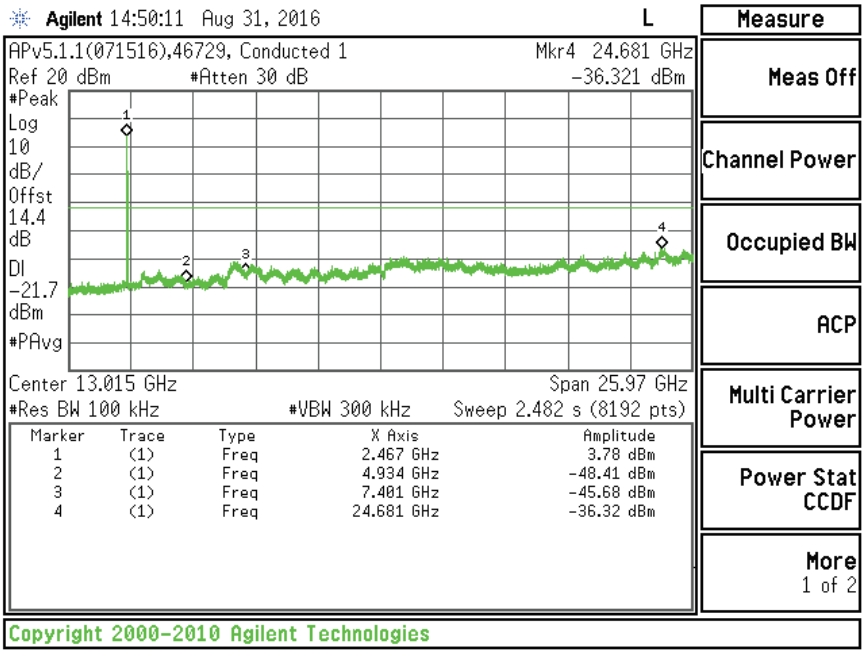
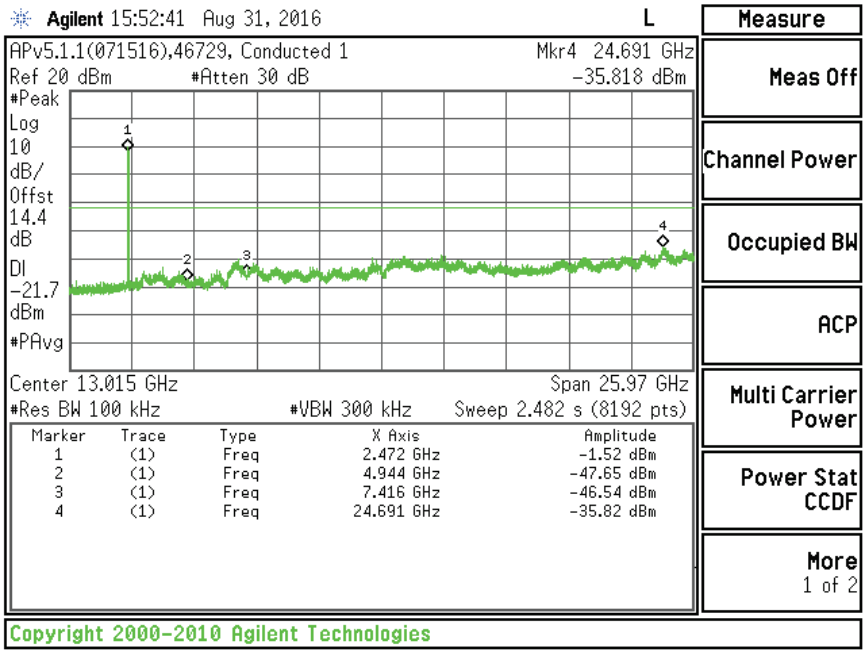
OUT OF BAND Chain 2 HIGH CH 12



OUT OF BAND Chain 2 HIGH CH 13



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8.5. 802.11n HT40 MODE IN THE 2.4 GHz BAND

8.5.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-247 5.2 (1)

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

802.11n HT40 SDM (MCS16)

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	6 dB BW Chain 2 (MHz)	Minimum Limit (MHz)
Low	2422	35.910	35.748	35.802	0.5
Mid	2437	35.964	35.802	36.025	0.5
High Ch 9	2452	35.964	36.018	36.025	0.5
High Ch 11	2462	35.964	35.910	35.964	0.5

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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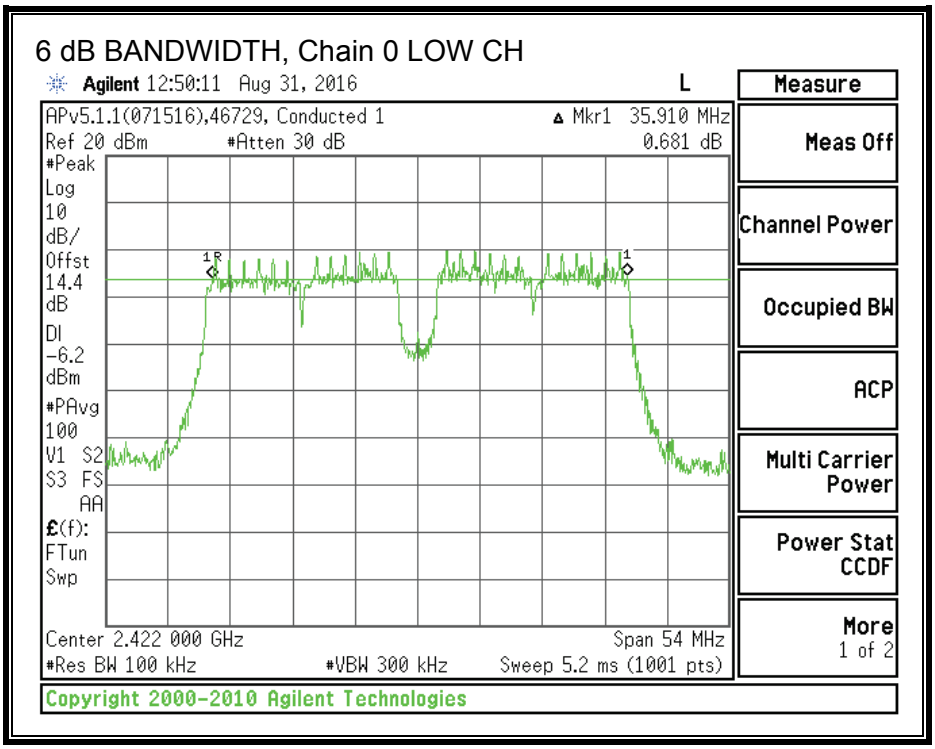
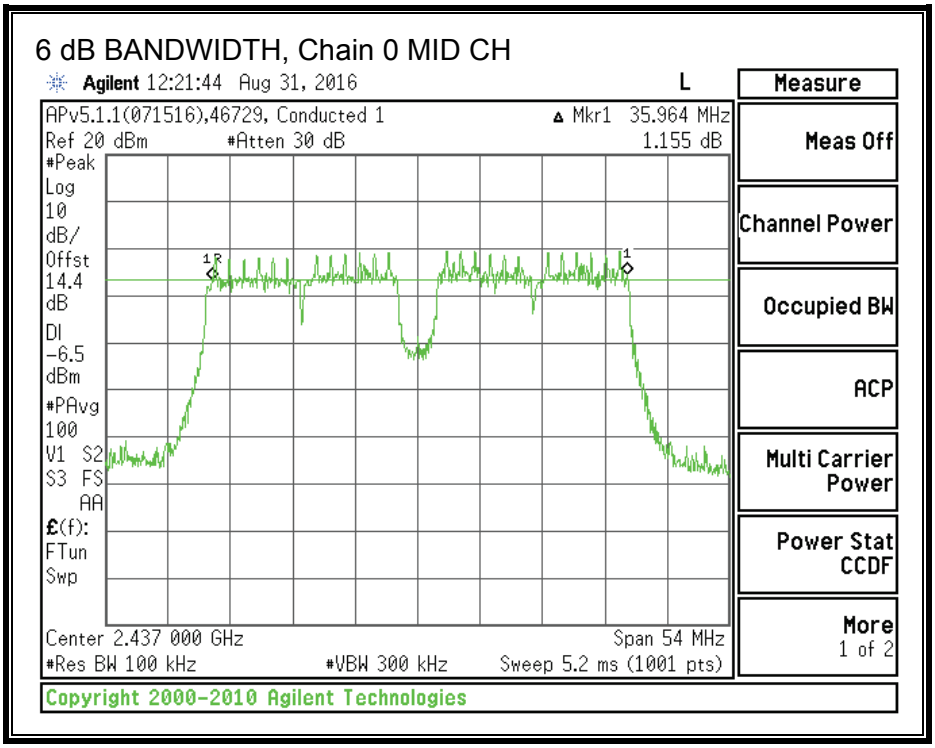
6 dB BANDWIDTH, Chain 0





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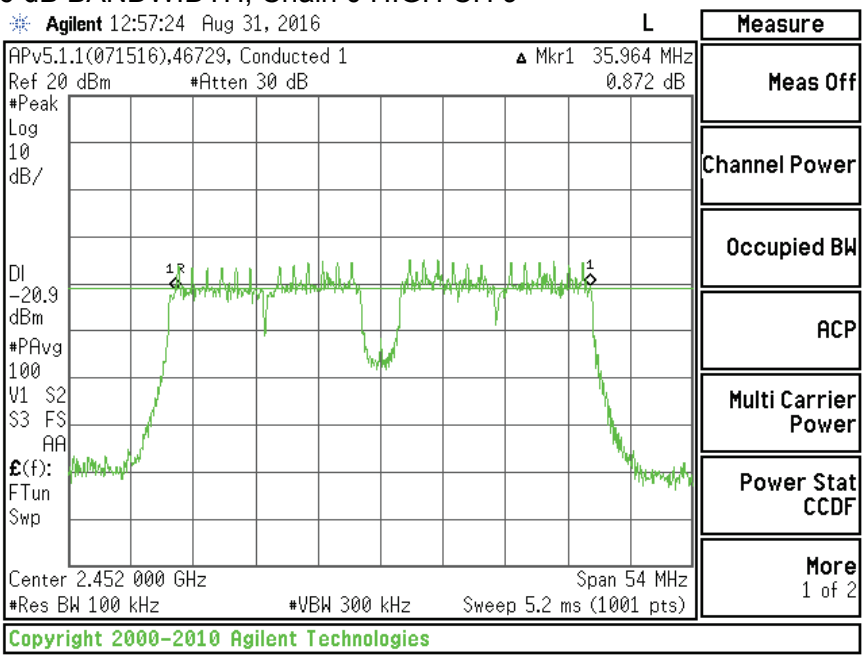
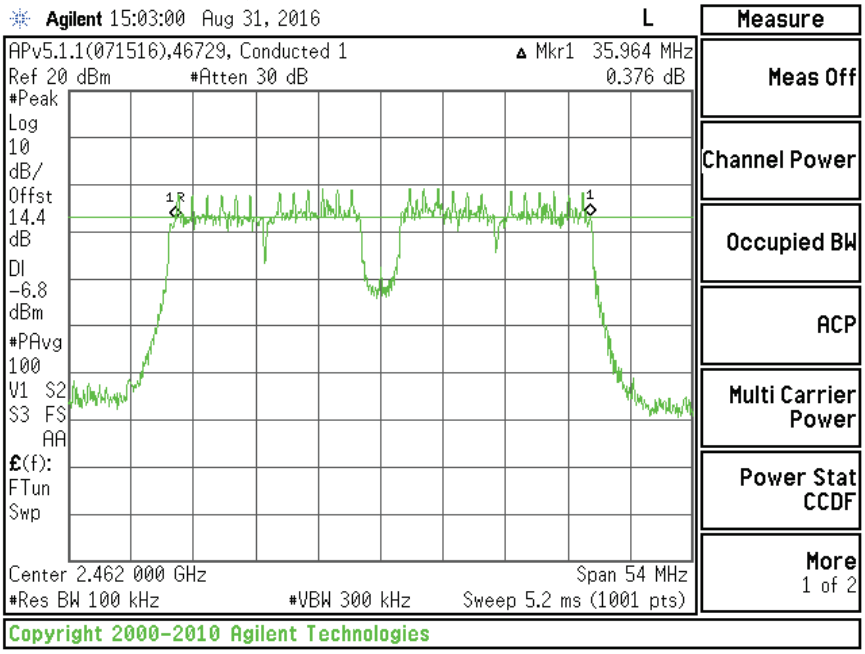
6 dB BANDWIDTH, Chain 0 HIGH CH 9



6 dB BANDWIDTH, Chain 0 HIGH CH 11



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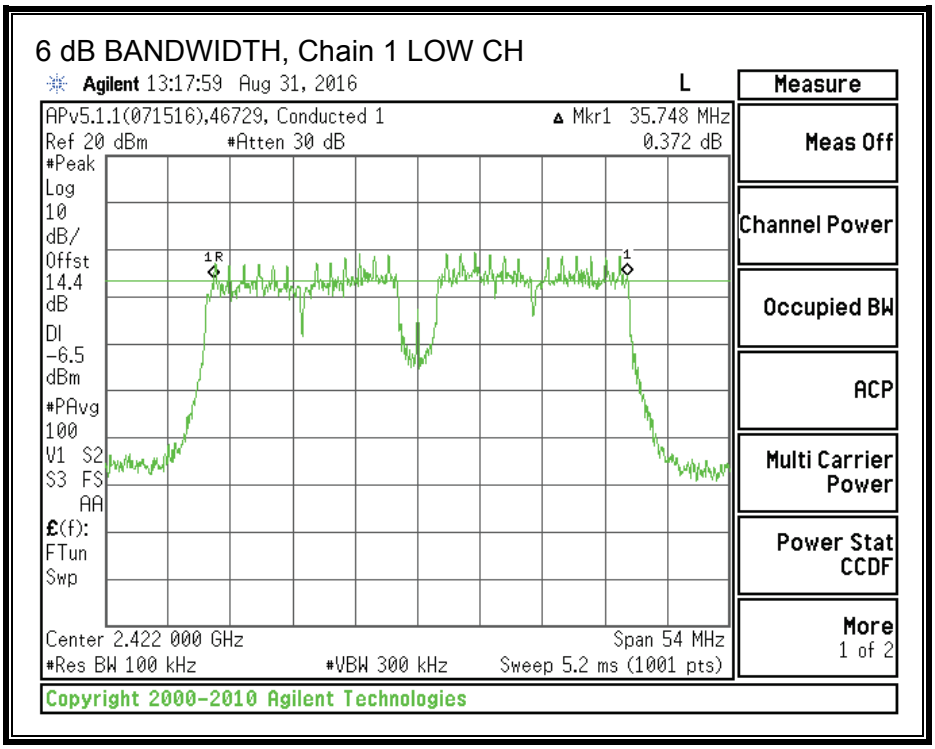
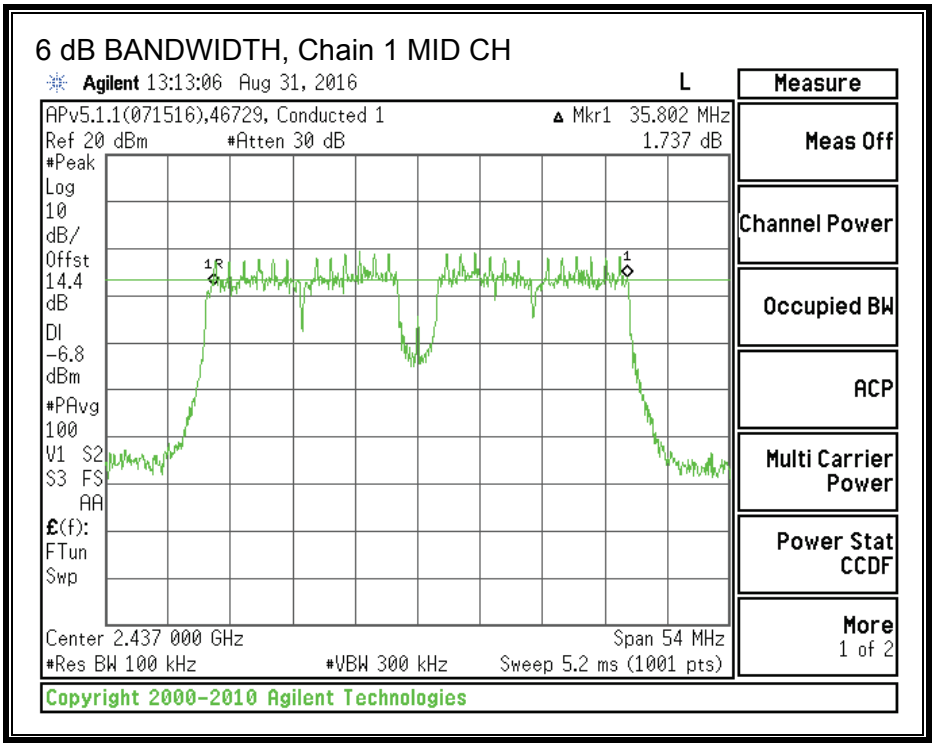
6 dB BANDWIDTH, Chain 1





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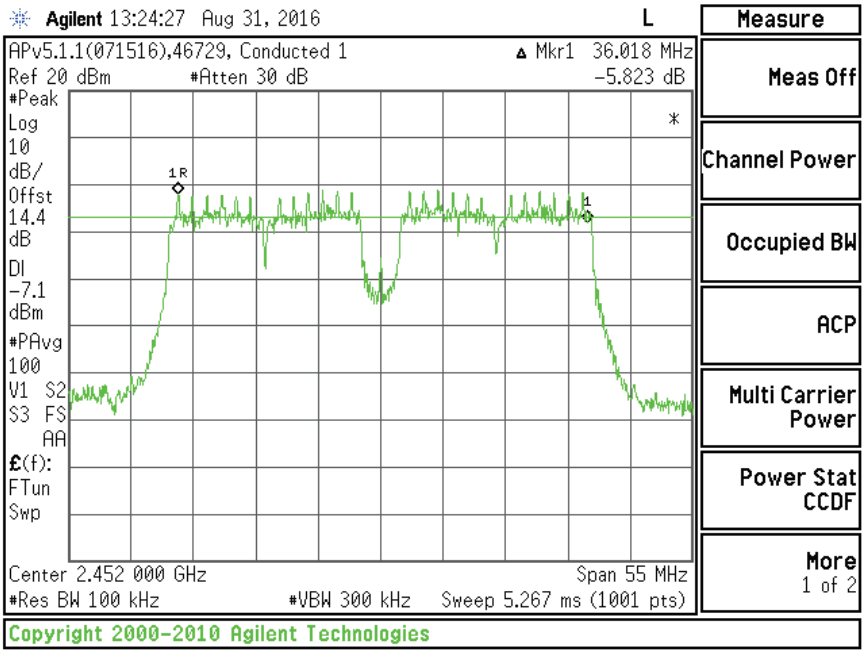
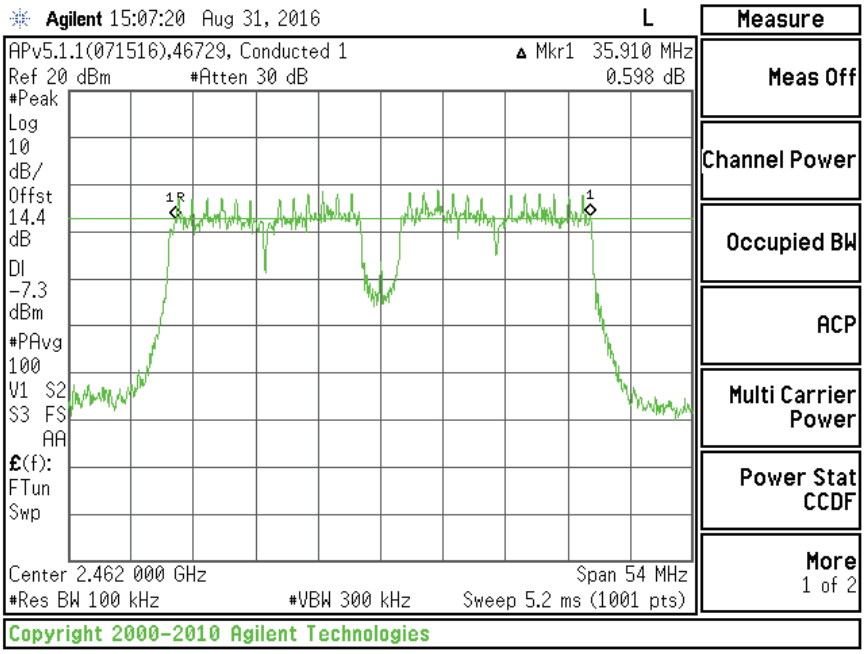
6 dB BANDWIDTH, Chain 1 HIGH CH 9



6 dB BANDWIDTH, Chain 0 HIGH CH 11



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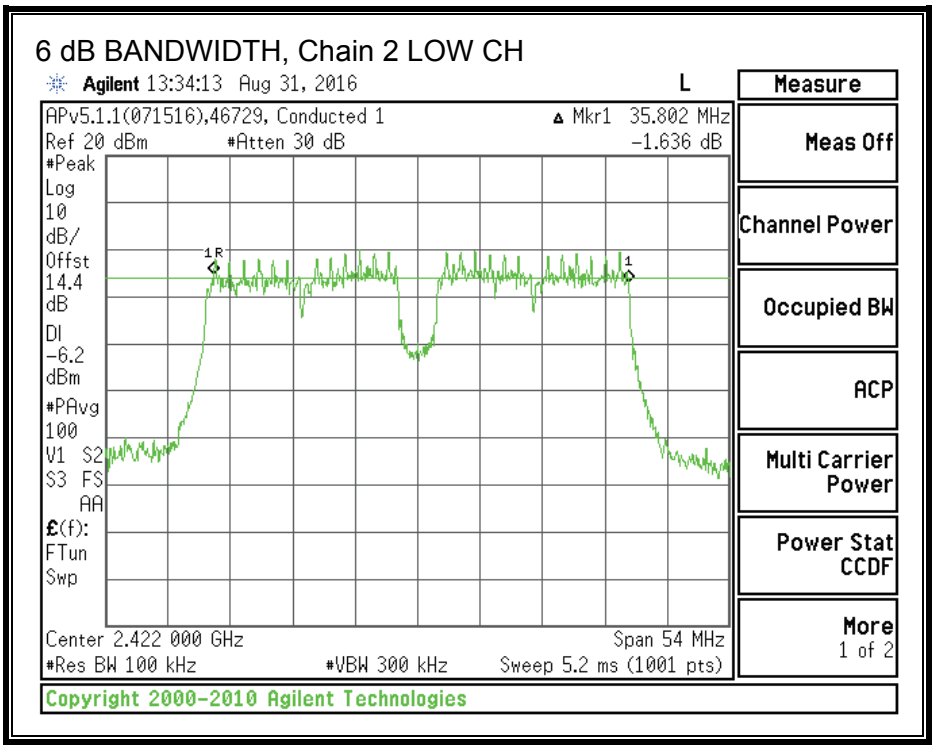
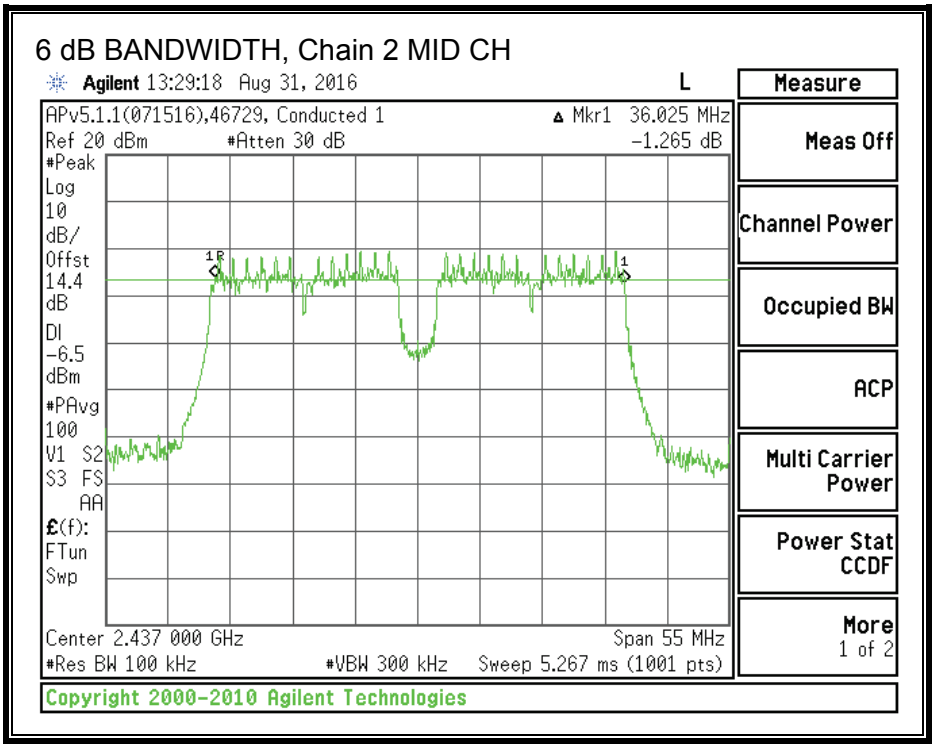
6 dB BANDWIDTH, Chain 2





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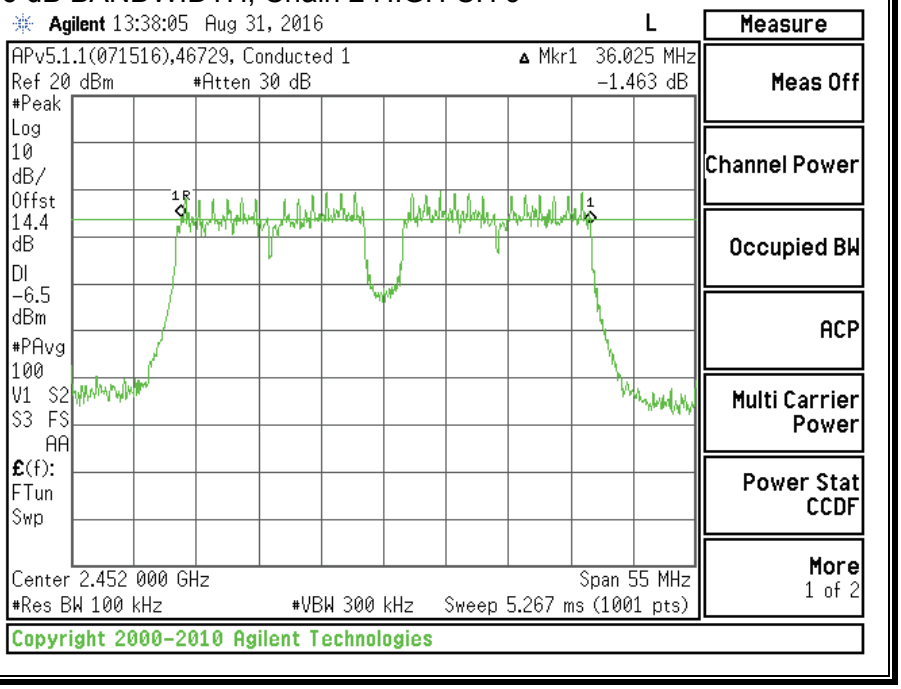
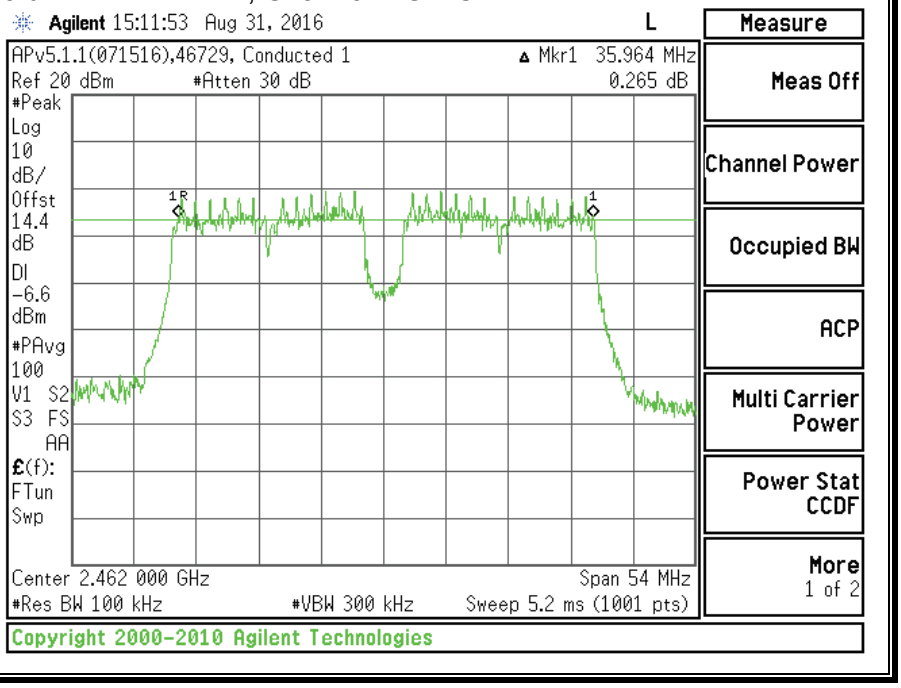
6 dB BANDWIDTH, Chain 2 HIGH CH 9



6 dB BANDWIDTH, Chain 0 HIGH CH 11



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8.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only. Testing per RSS-Gen Clause 6.6.

RESULTS

802.11n HT40 SDM (MCS16)

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)	99% BW Chain 2 (MHz)
Low	2422	36.2661	36.2422	36.4423
Mid	2437	36.3386	36.2284	36.3974
High Ch 9	2452	36.2930	36.3084	36.4498
High Ch 11	2462	36.2574	36.2401	36.4074

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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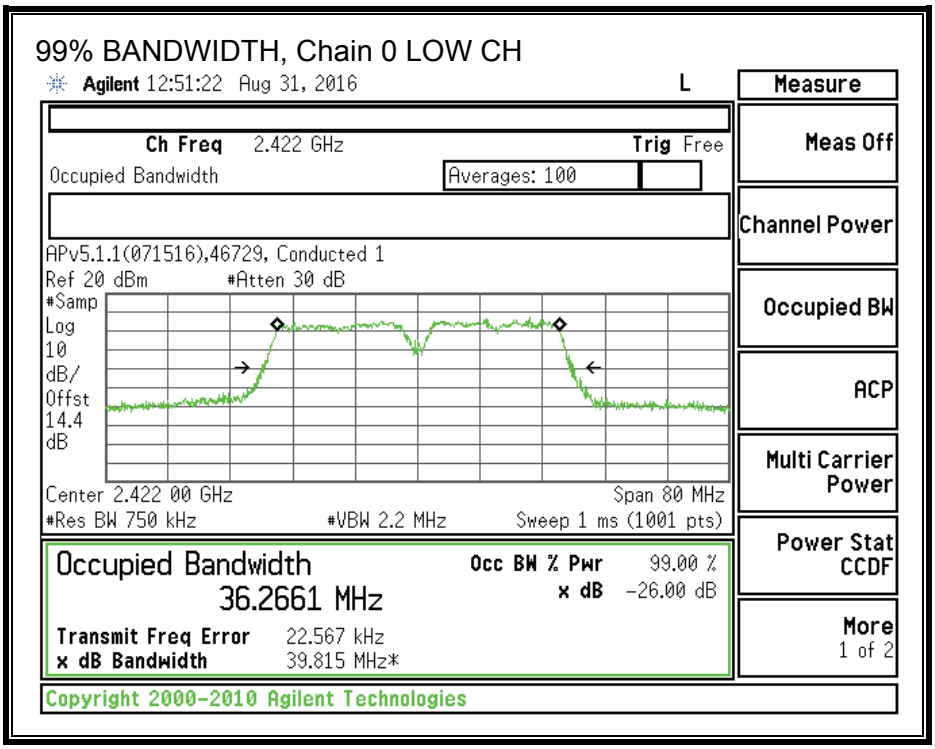
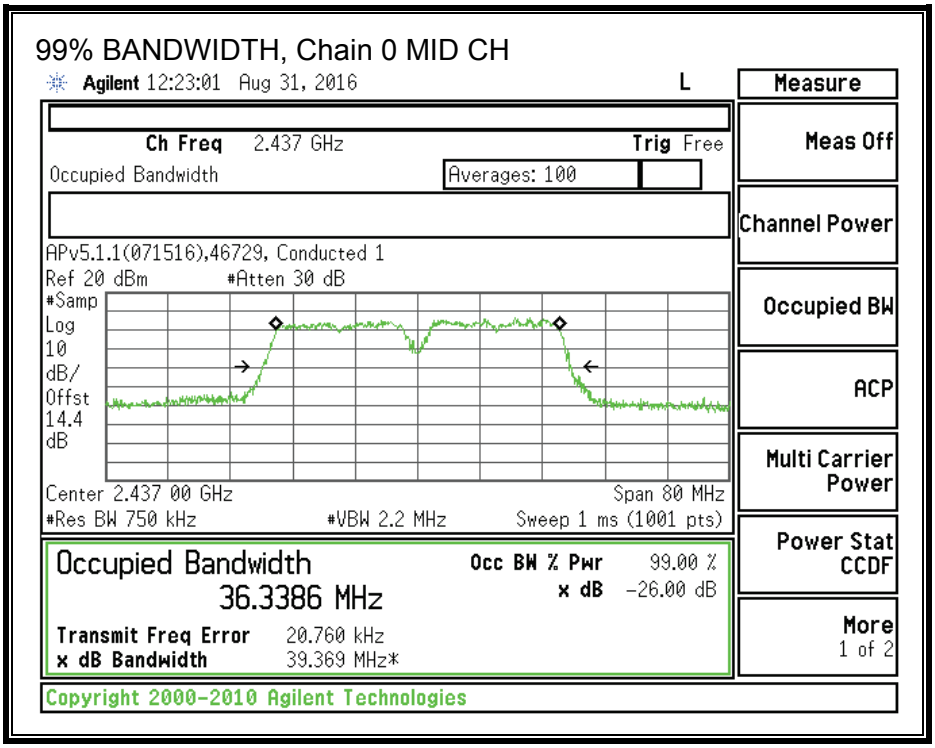
99% BANDWIDTH, Chain 0





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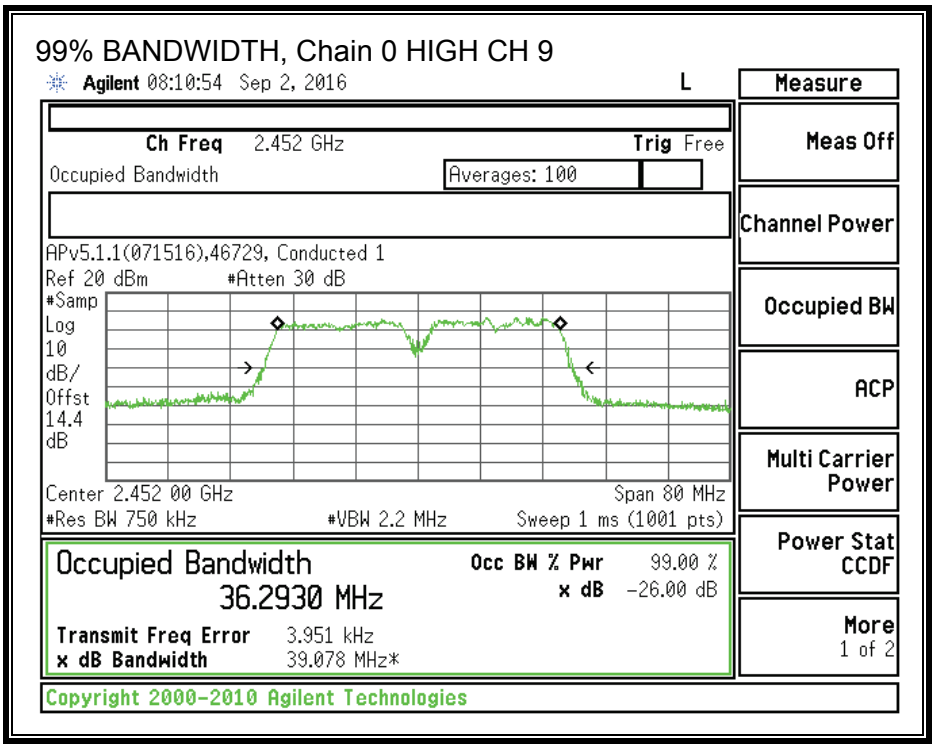

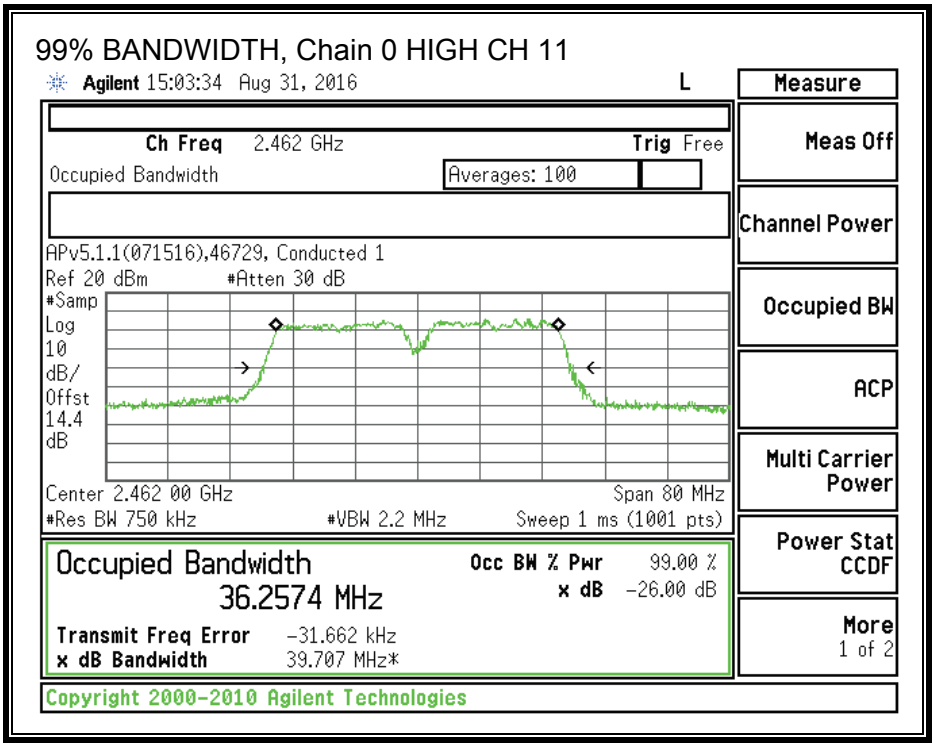

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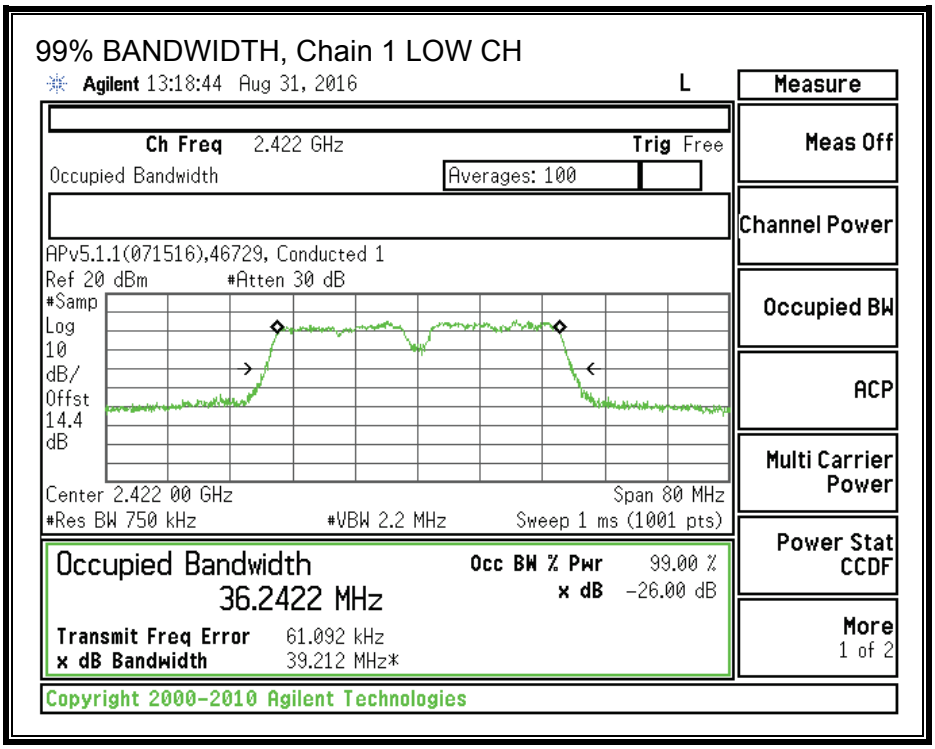
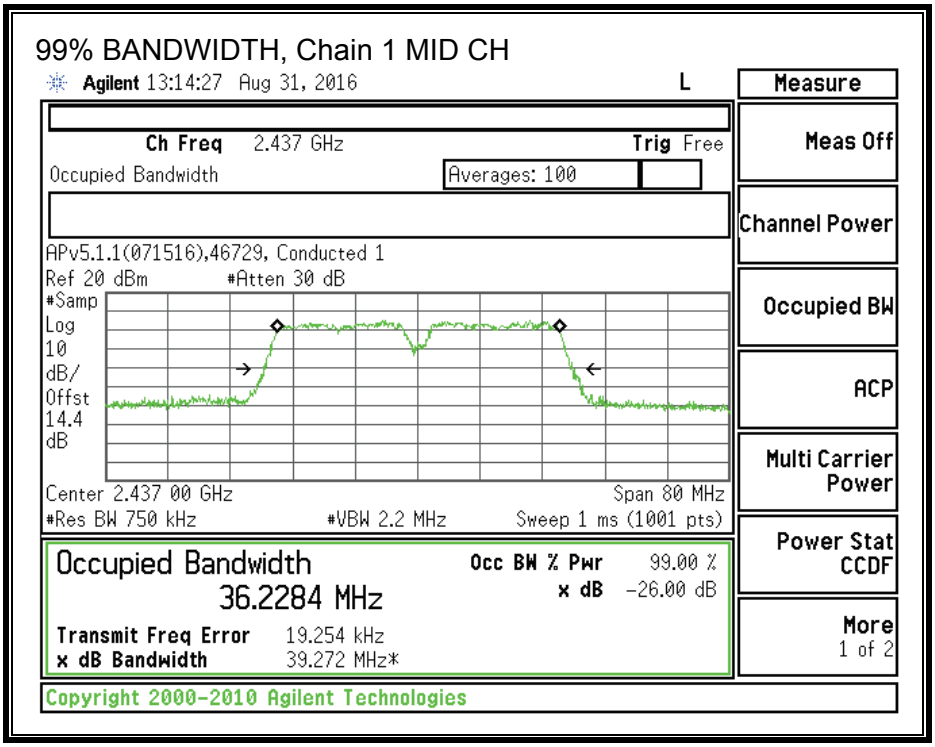
99% BANDWIDTH, Chain 1





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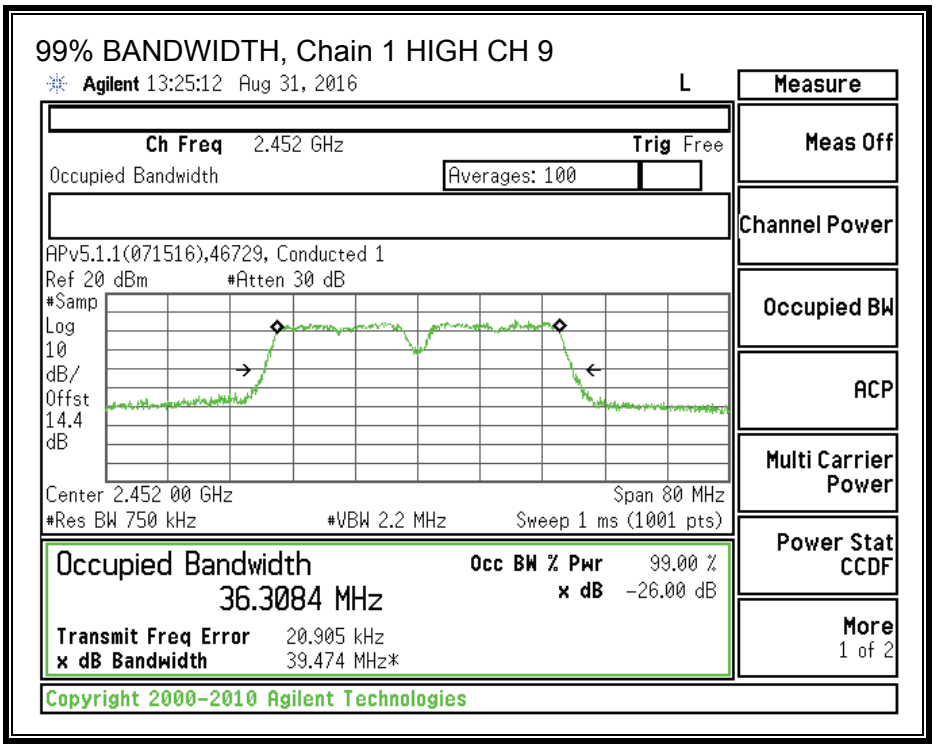
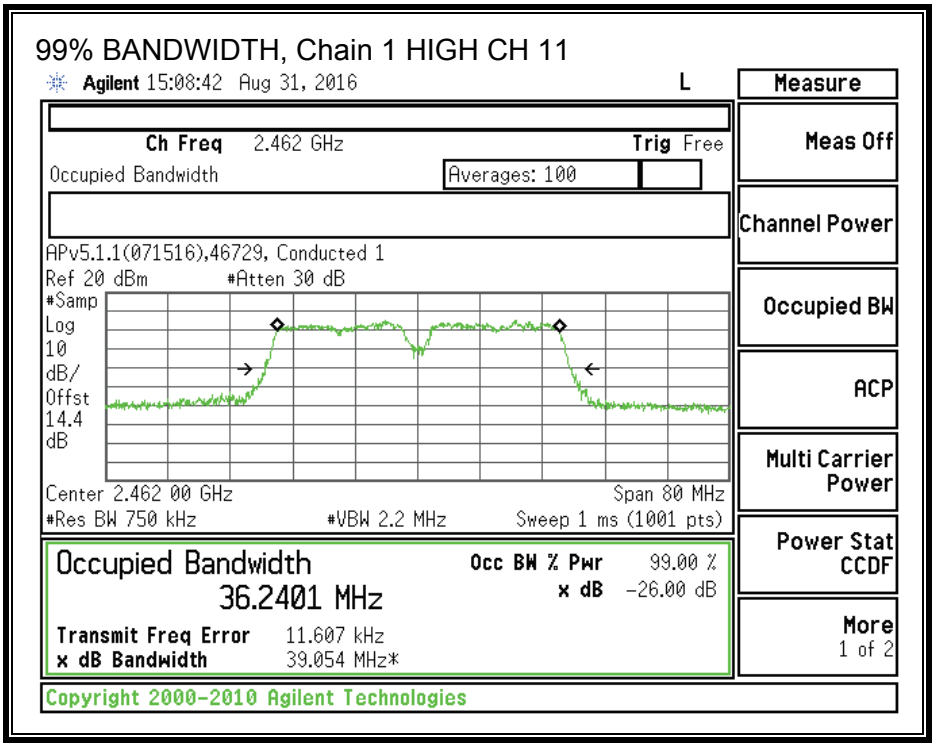
99% BANDWIDTH, Chain 1 HIGH CH 9



99% BANDWIDTH, Chain 1 HIGH CH 11



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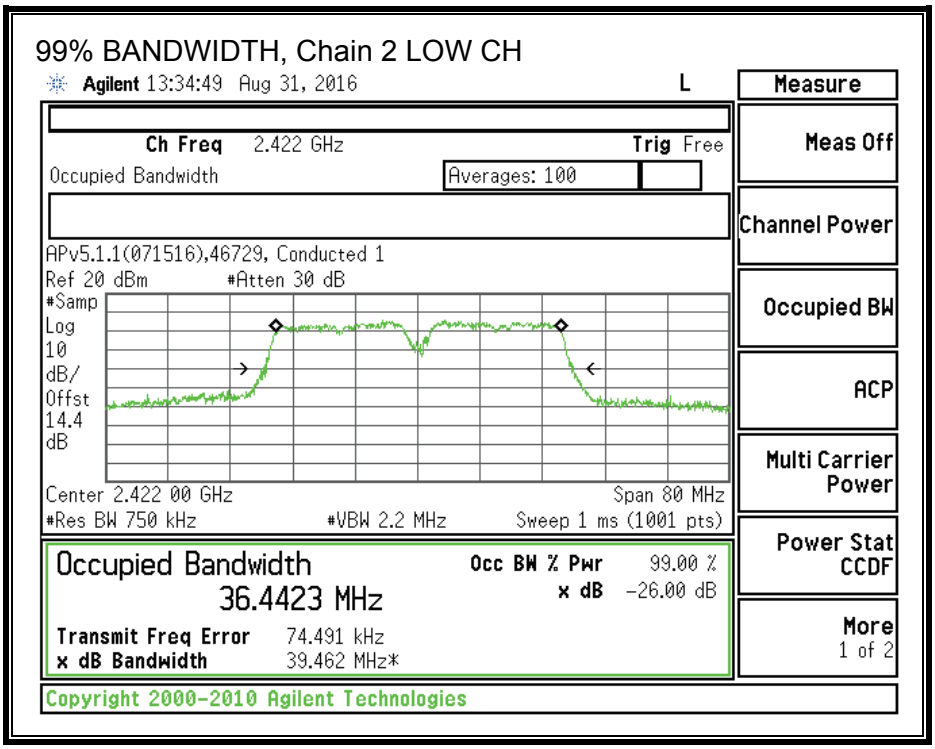
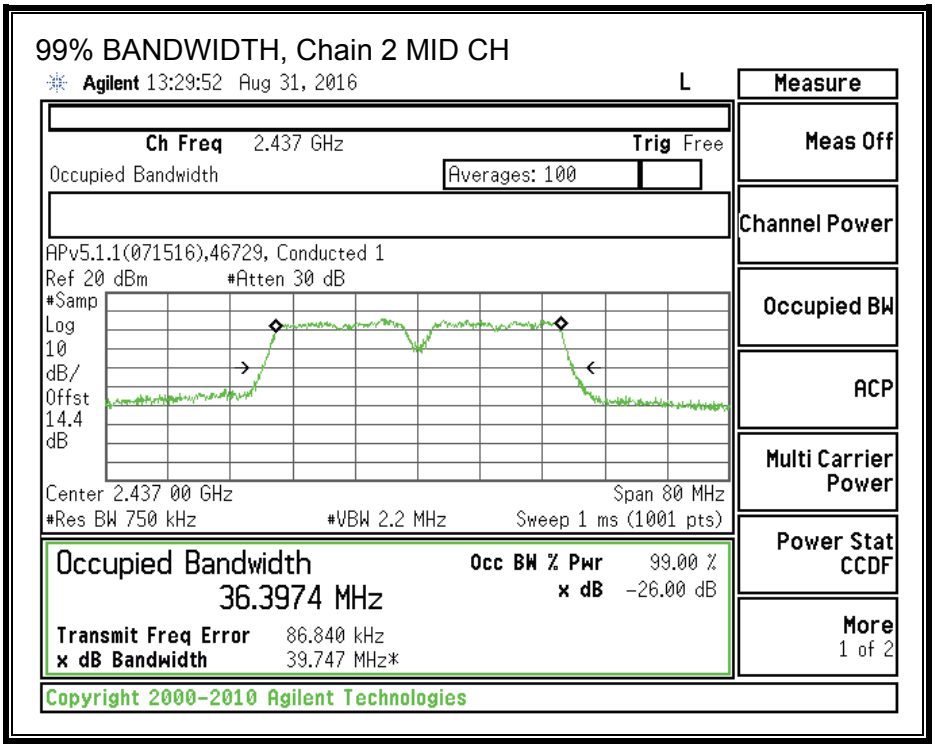
99% BANDWIDTH, Chain 2





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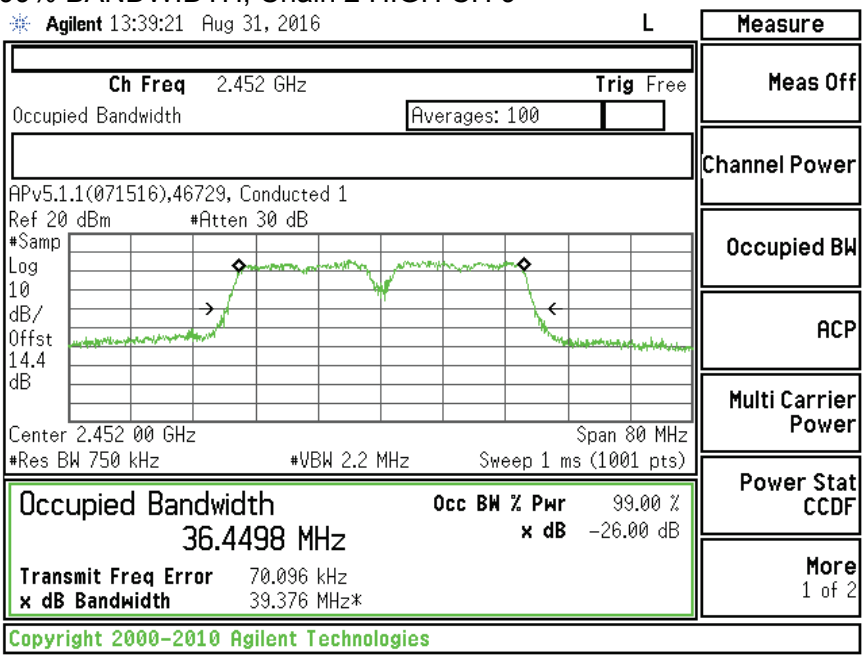
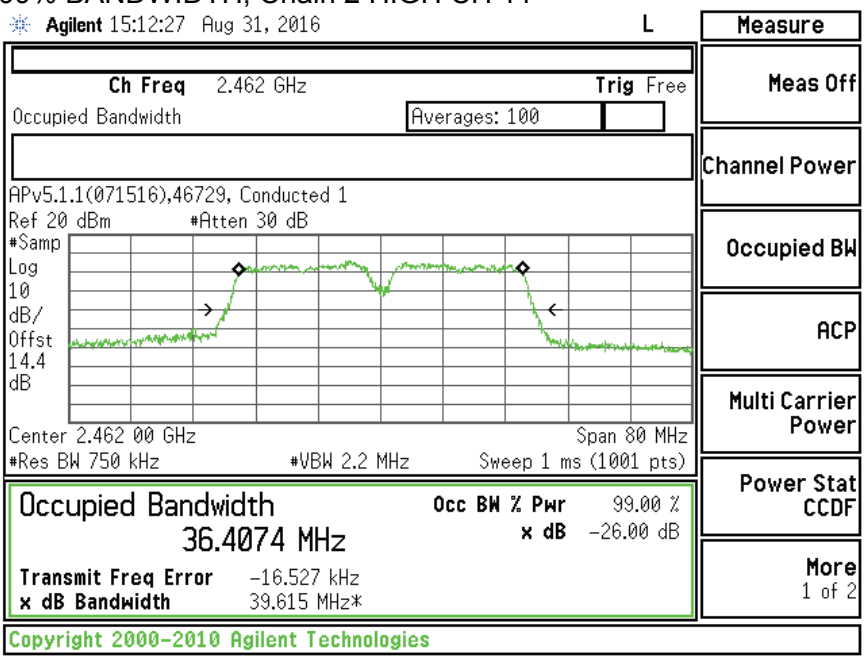
99% BANDWIDTH, Chain 2 HIGH CH 9



99% BANDWIDTH, Chain 2 HIGH CH 11



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8.5.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

IC RSS-247 5.4 (4)

FCC - For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS - For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

DIRECTIONAL ANTENNA GAIN

This EUT mode is 802.11n. Per KDB 662911, no array gain is added for power when N_{ANT} </= 4. Therefore, the directional gain is as follows::

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain 2 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
6.00	6.00	6.00	6.00

Test Performed: Niklas Haydon / Jeff Cabrera
Test Date: 2016-10-03, 2016-10-18 to 2016-10-19

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RESULTS

802.11n HT40 CDD (MCS0)

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2422	6.00	30.00	30	36	30.00
Mid	2437	6.00	30.00	30	36	30.00
High Ch 9	2452	6.00	30.00	30	36	30.00
High Ch 11	2462	6.00	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2422	11.71	11.05	11.63	16.24	30.00	-13.76
Mid	2437	11.88	11.34	11.55	16.37	30.00	-13.63
High Ch 9	2452	11.80	11.15	12.01	16.44	30.00	-13.56
High Ch 11	2462	10.78	10.02	10.75	15.30	30.00	-14.70

Note – The above are gated average power measurements.

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802.11n HT40 SDM (MCS16)

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2422	6.00	30.00	30	36	30.00
Mid	2437	6.00	30.00	30	36	30.00
High Ch 9	2452	6.00	30.00	30	36	30.00
High Ch 11	2462	6.00	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Chain 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2422	12.04	13.07	12.69	17.39	30.00	-12.61
Mid	2437	13.87	12.66	13.12	18.02	30.00	-11.98
High Ch 9	2452	13.96	14.00	14.47	18.92	30.00	-11.08
High Ch 11	2462	10.30	10.49	10.84	15.32	30.00	-14.68

Note – The above are gated average power measurements.

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8.5.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-247 5.2 (2)

For digitally modulated systems, the power spectral density conducted form the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

RESULTS

802.11n HT40 SDM (MCS16)

Duty Cycle CF (dB)	0.00	Included in Calculations of Corr'd PSD

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Chain 2 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2422	-10.23	-10.94	-9.91	-5.57	8.0	-13.6
Mid	2437	-10.65	-10.46	-10.47	-5.75	8.0	-13.8
High Ch 9	2452	-10.17	-10.60	-10.49	-5.65	8.0	-13.6
High Ch 11	2462	-10.83	-11.64	-10.33	-6.13	9.0	-15.1

Note – Peak method used, therefore duty cycle correction not included.
Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

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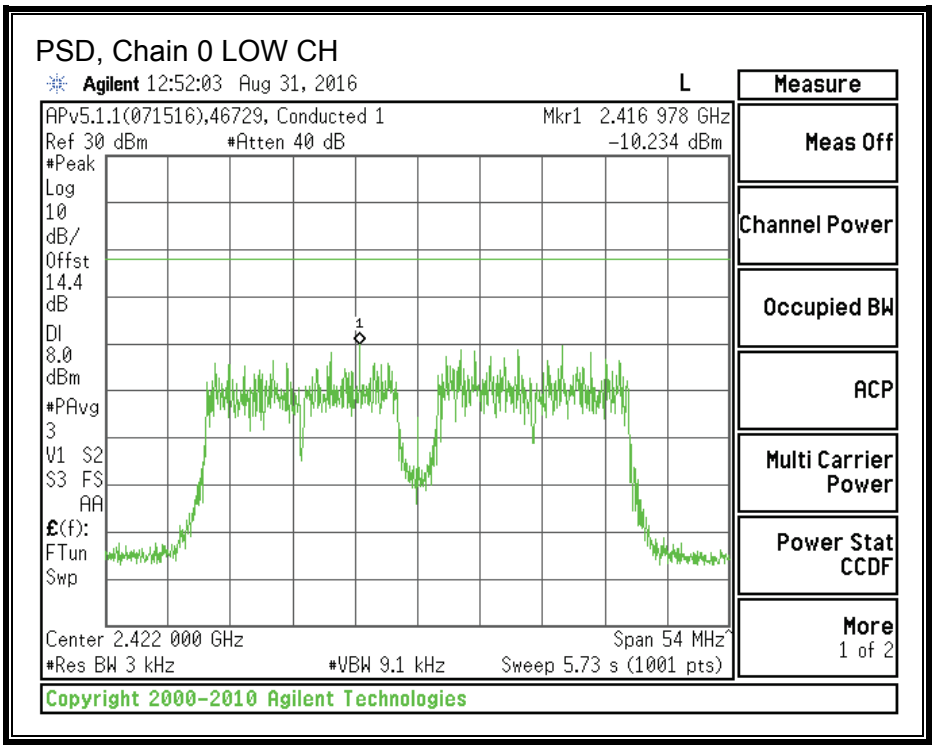
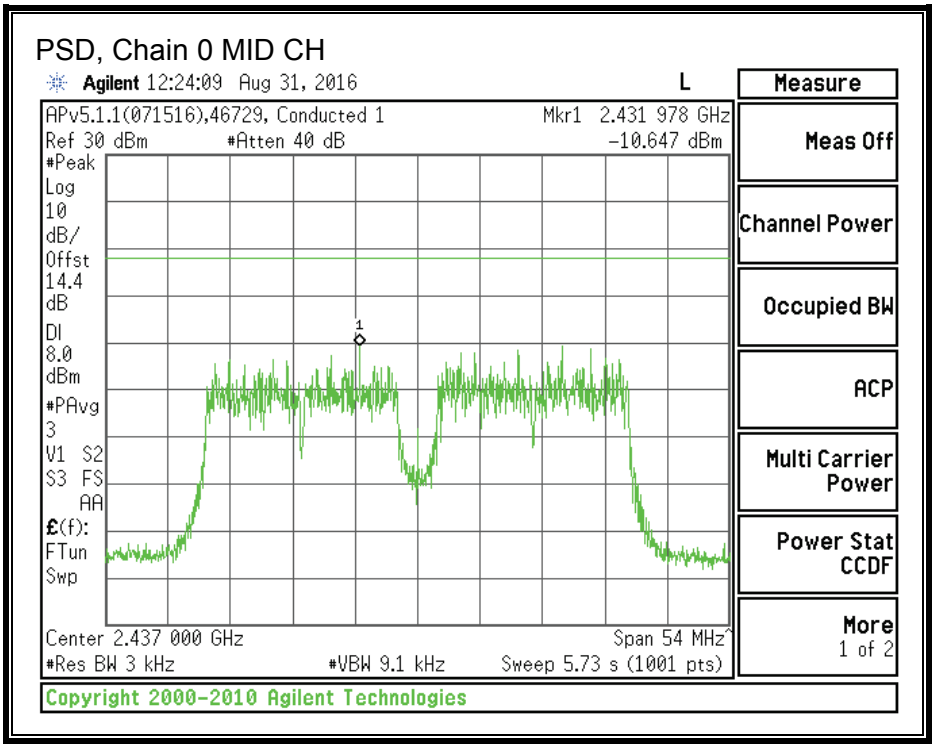
PSD, Chain 0





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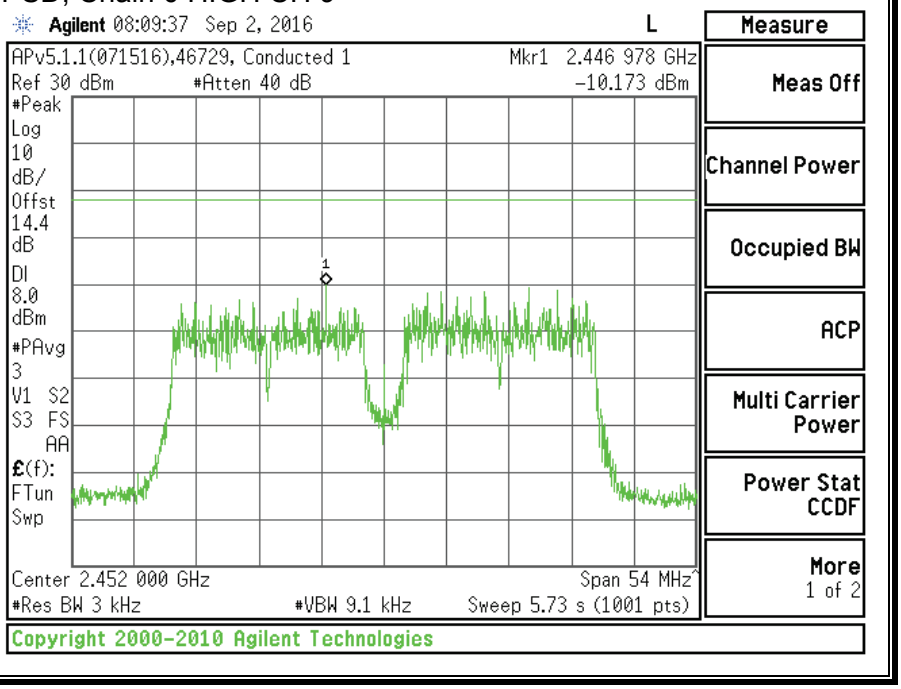
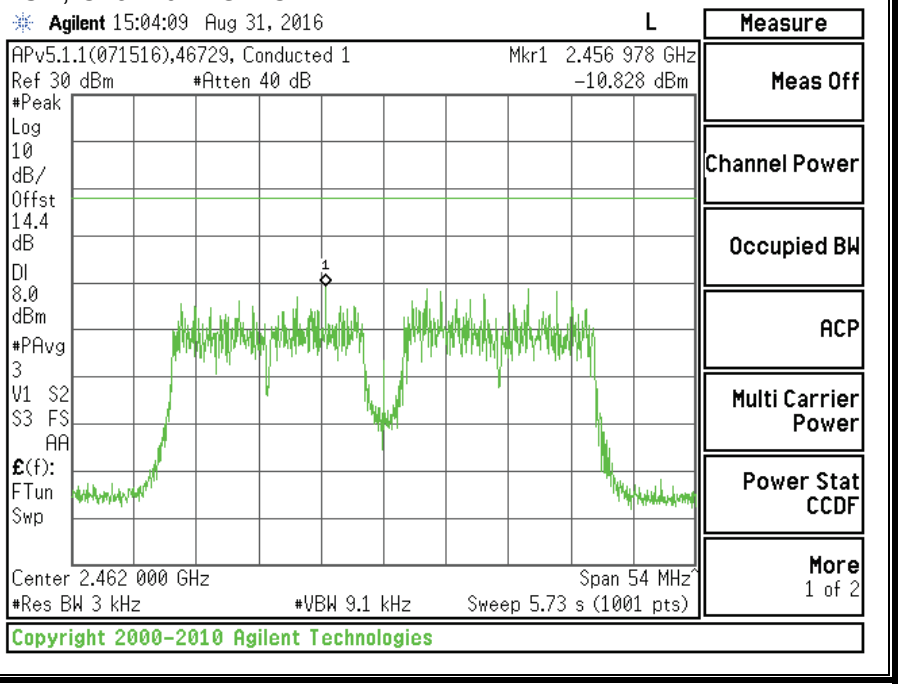
PSD, Chain 0 HIGH CH 9



PSD, Chain 0 HIGH CH 11



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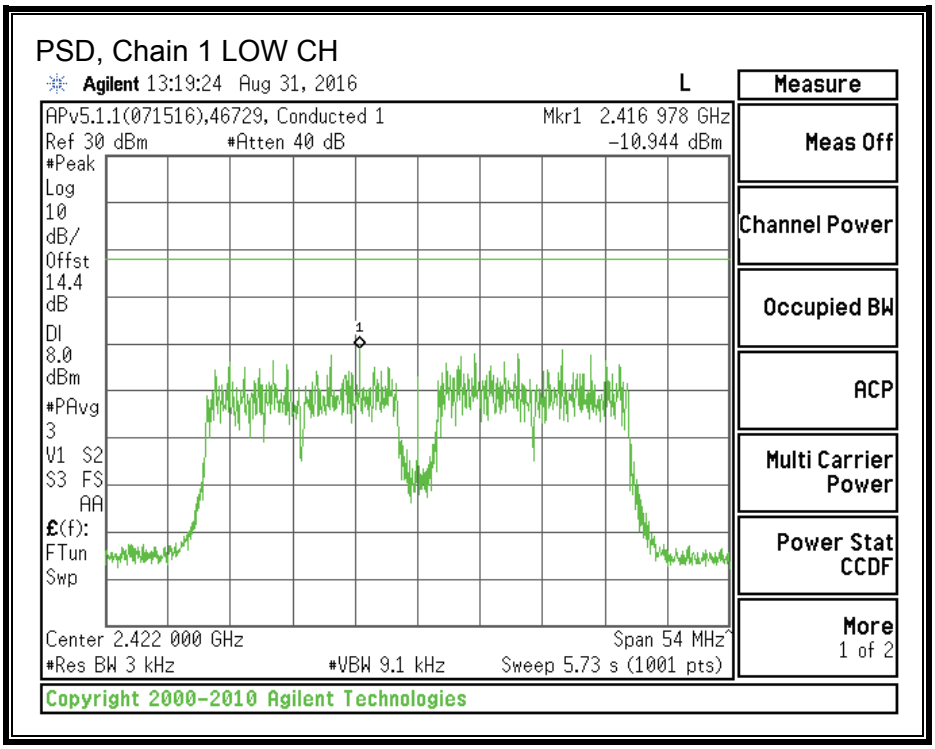
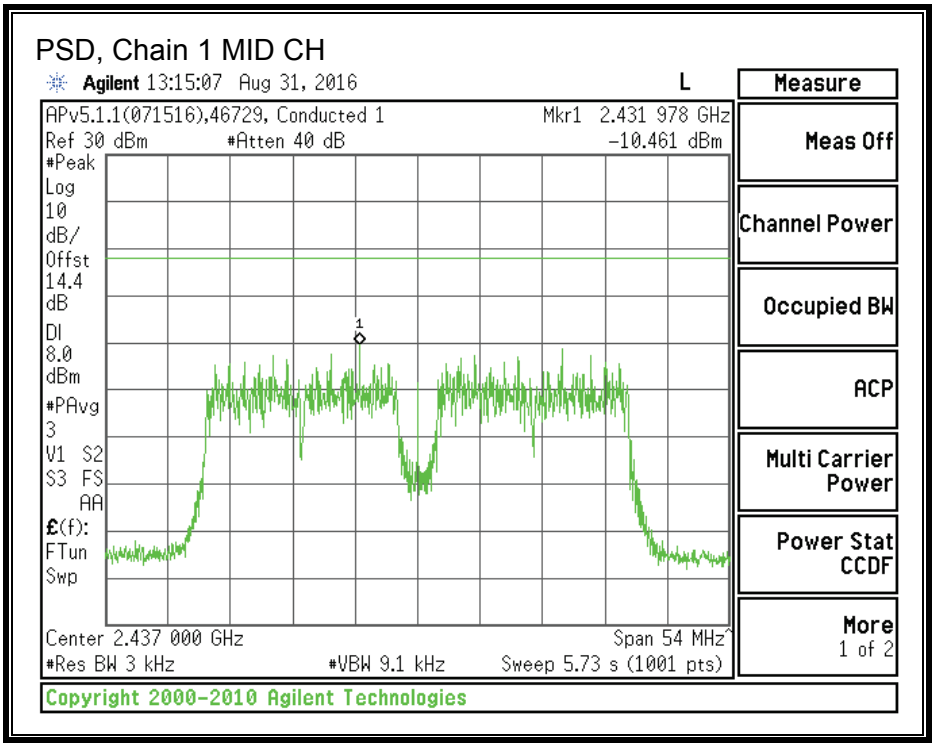
PSD, Chain 1





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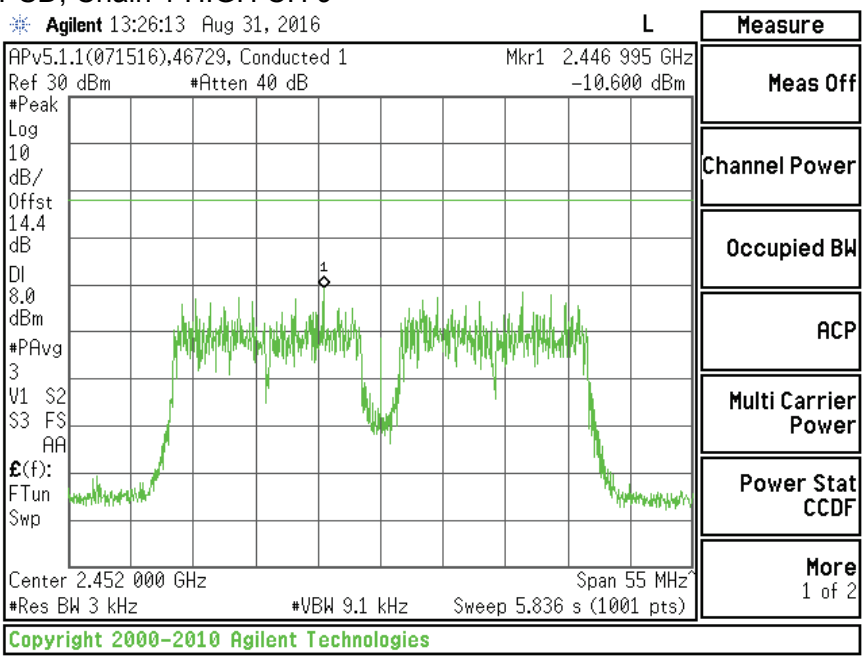
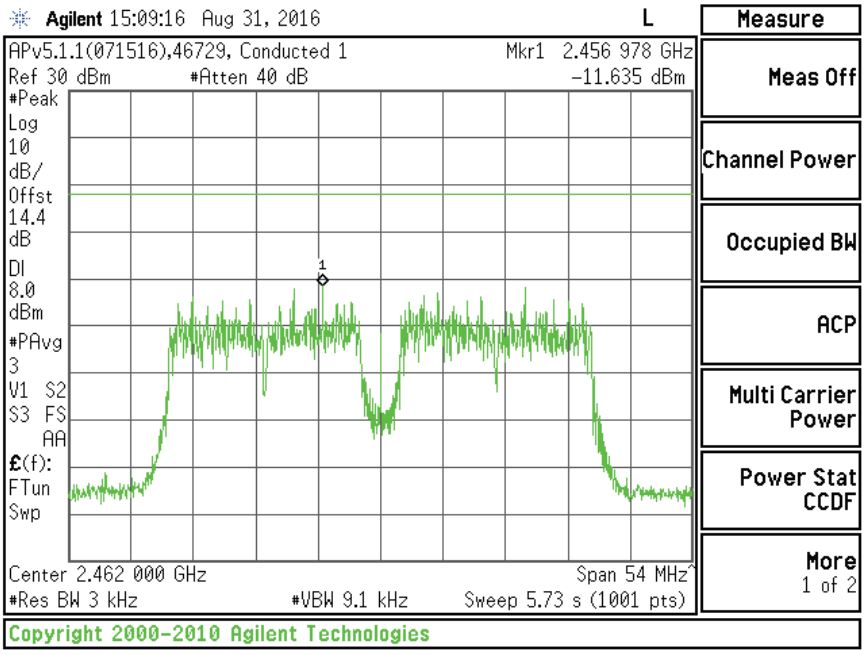
PSD, Chain 1 HIGH CH 9



PSD, Chain 1 HIGH CH 11



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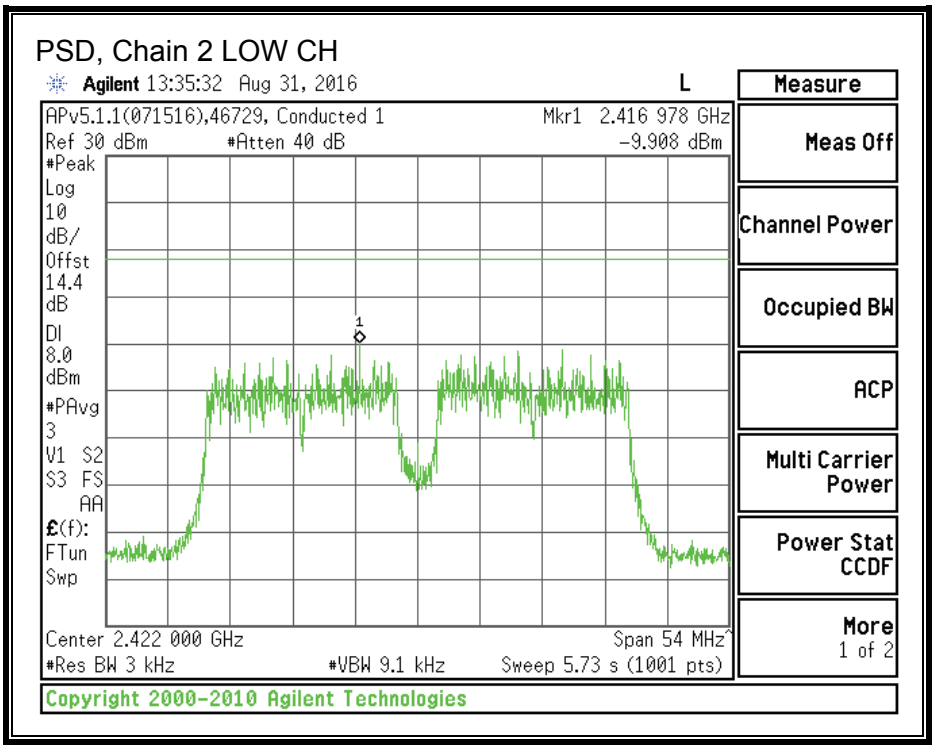

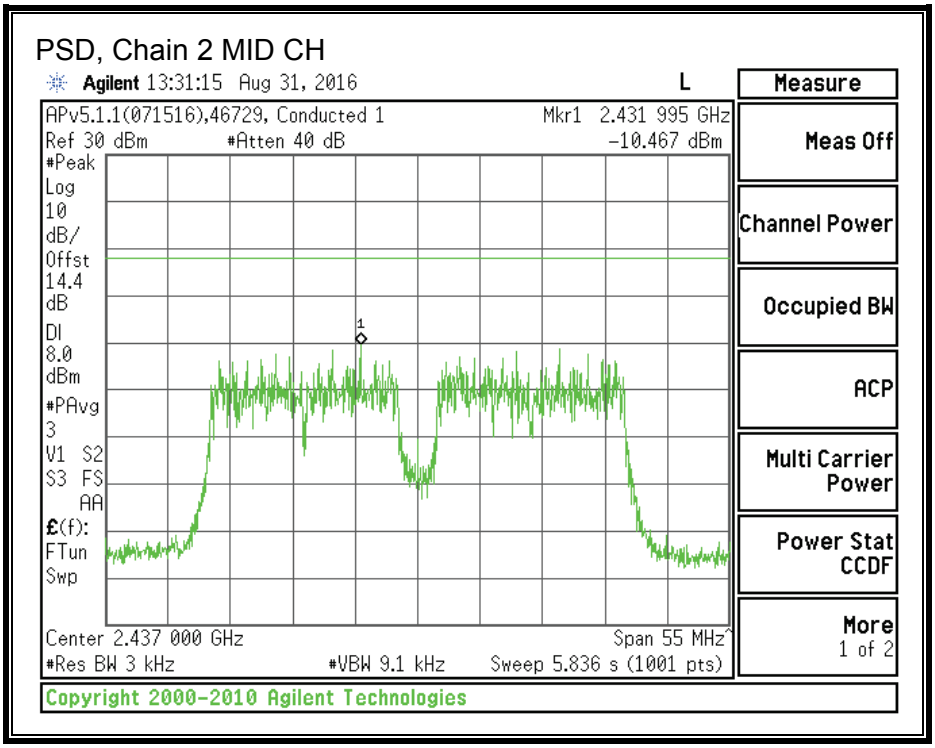

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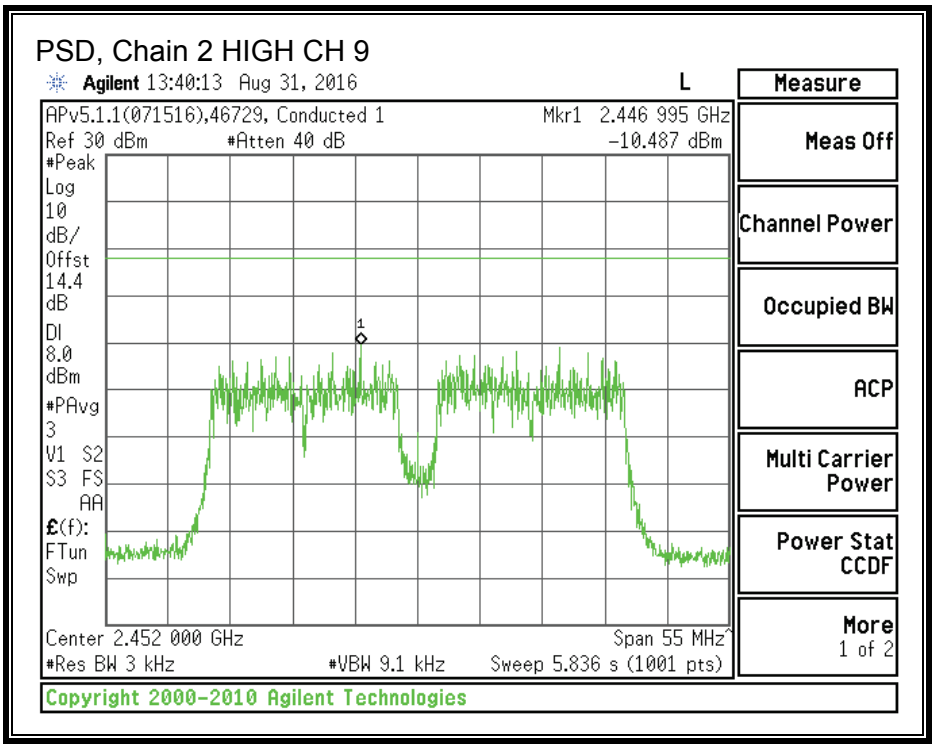

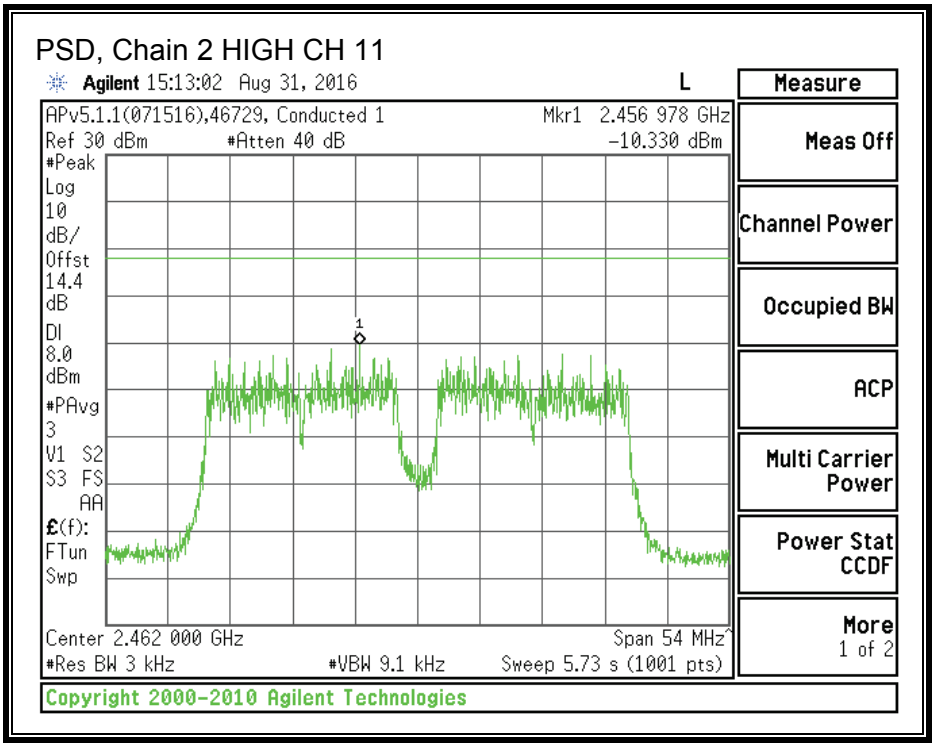

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8.5.5. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-247 5.5

FCC - In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RSS - In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RESULTS

Test Performed: Ron Reichard / Jeff Cabrera
Test Date: 2016-08-31

Mode - 802.11n HT40 SDM (MCS16)

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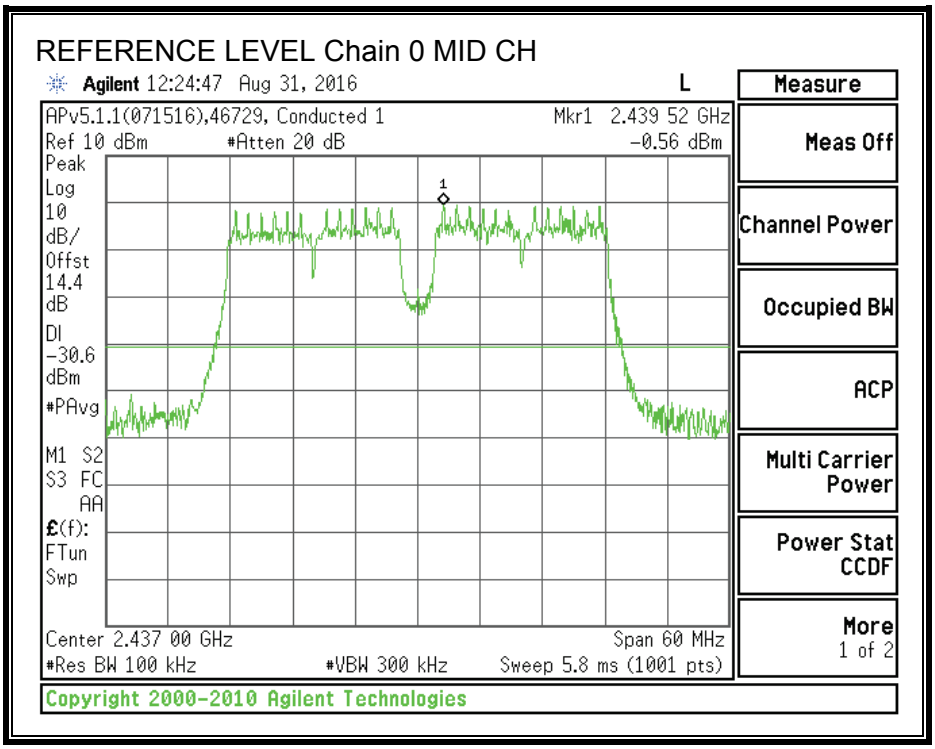
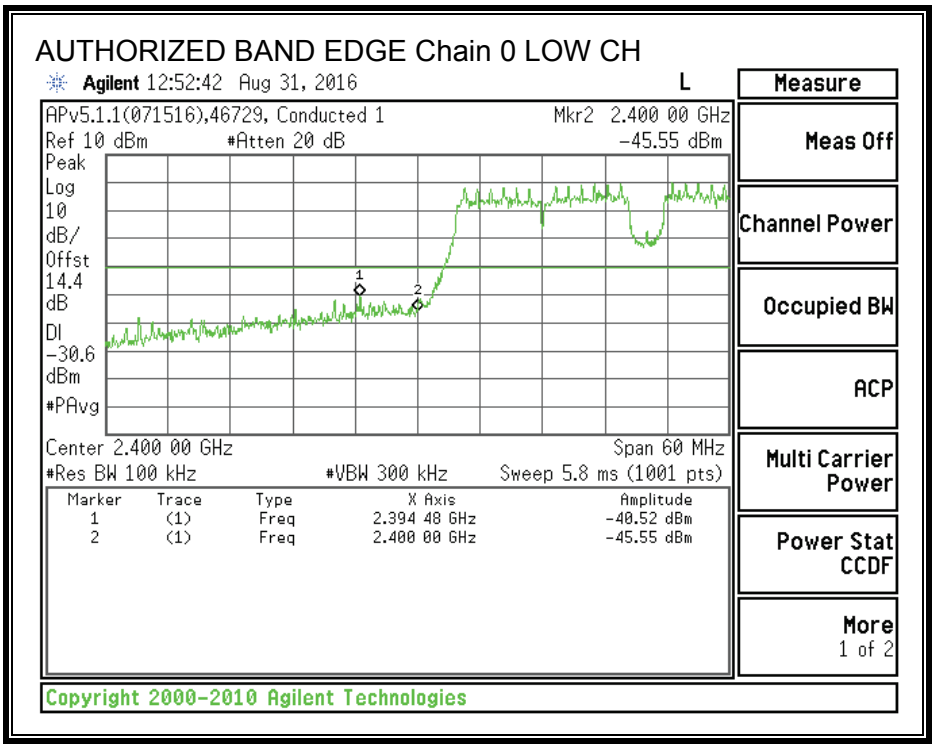
IN-BAND REFERENCE LEVEL, Chain 0



LOW CHANNEL BANDEDGE, Chain 0



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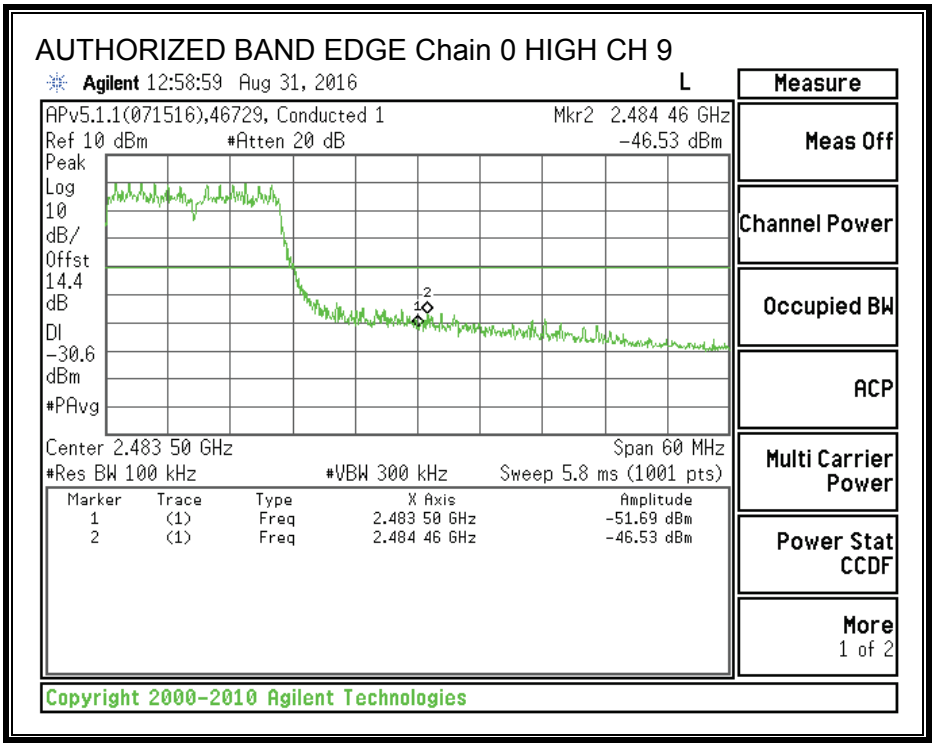
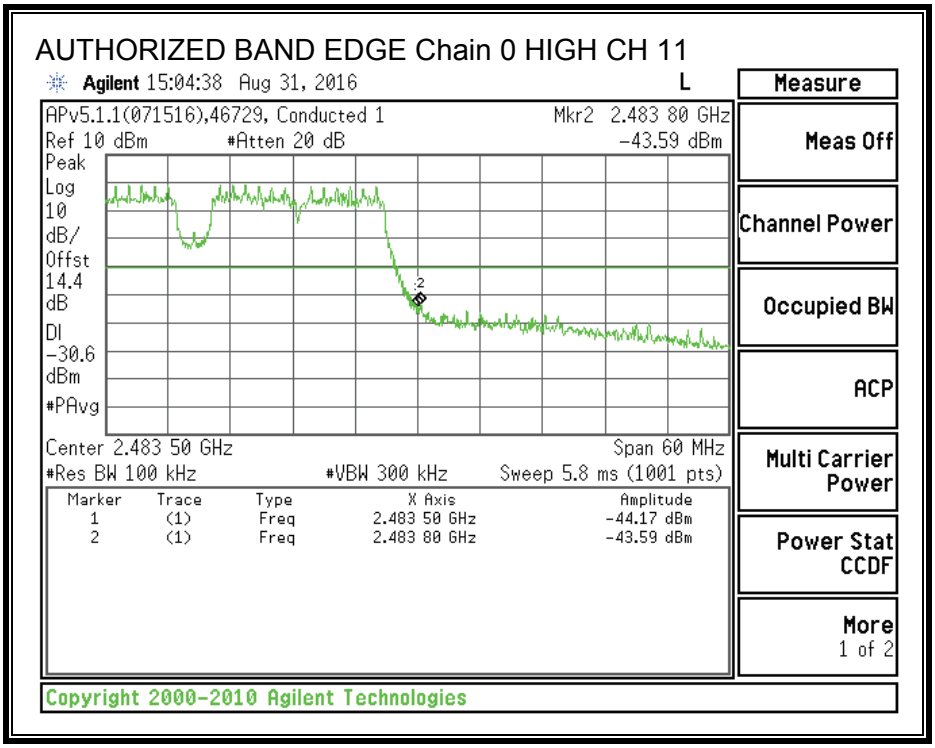
HIGH CHANNEL BANDEDGE, Chain 0





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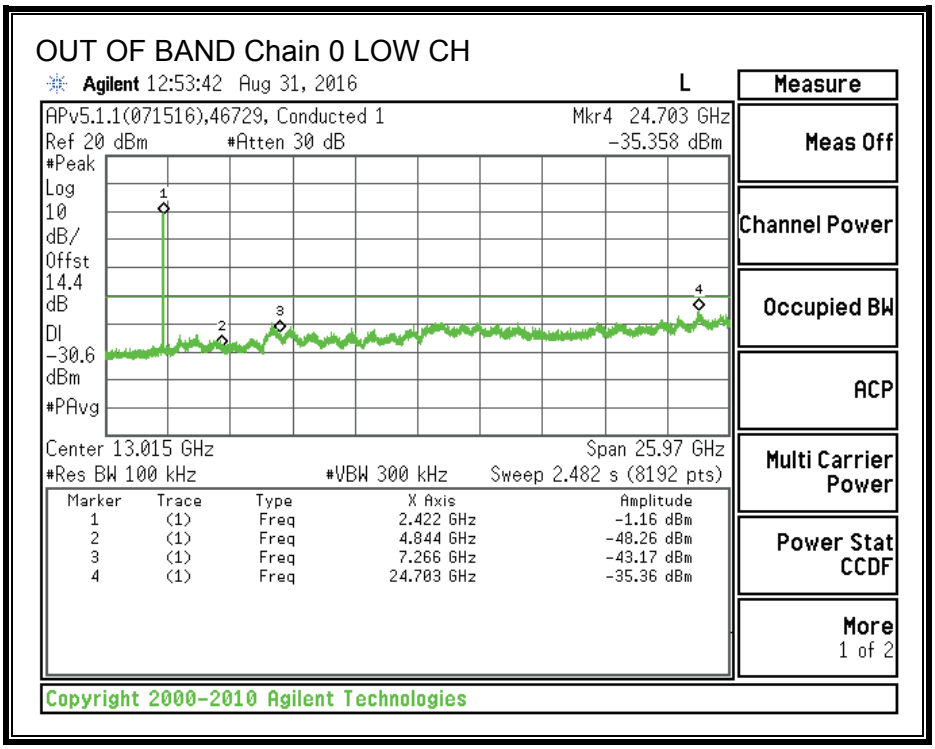
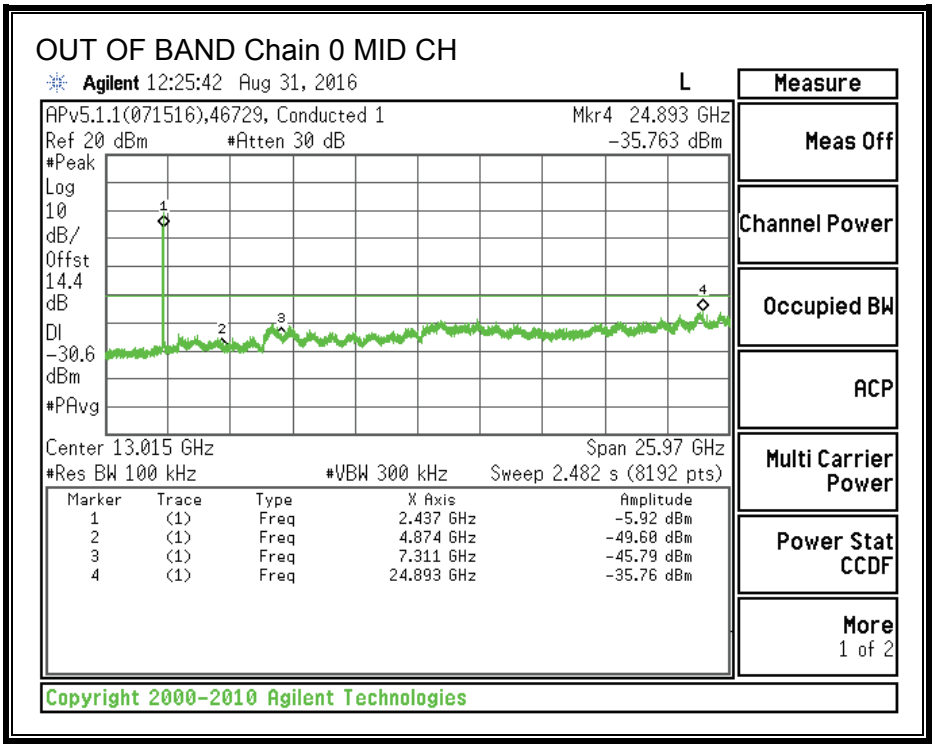
OUT-OF-BAND EMISSIONS, Chain 0





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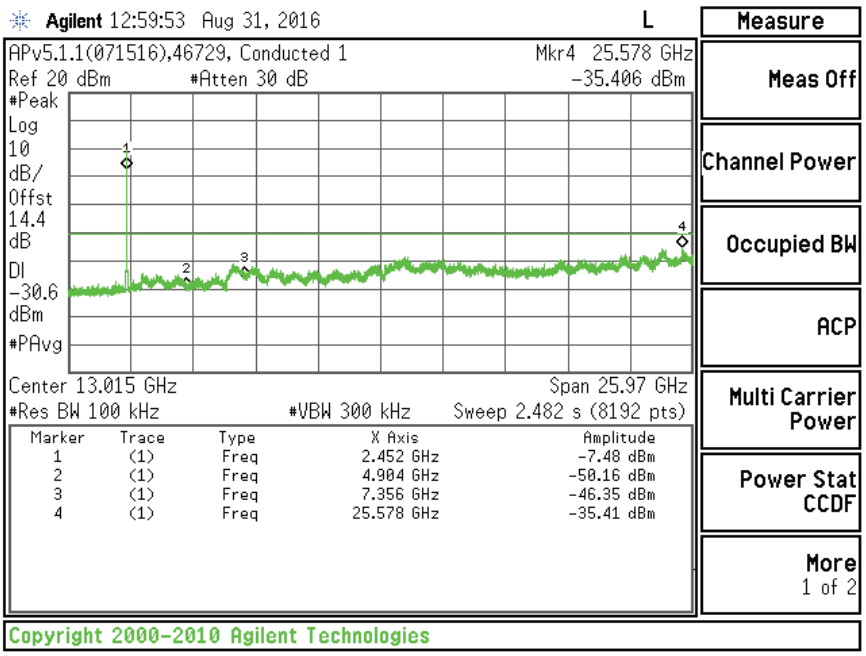
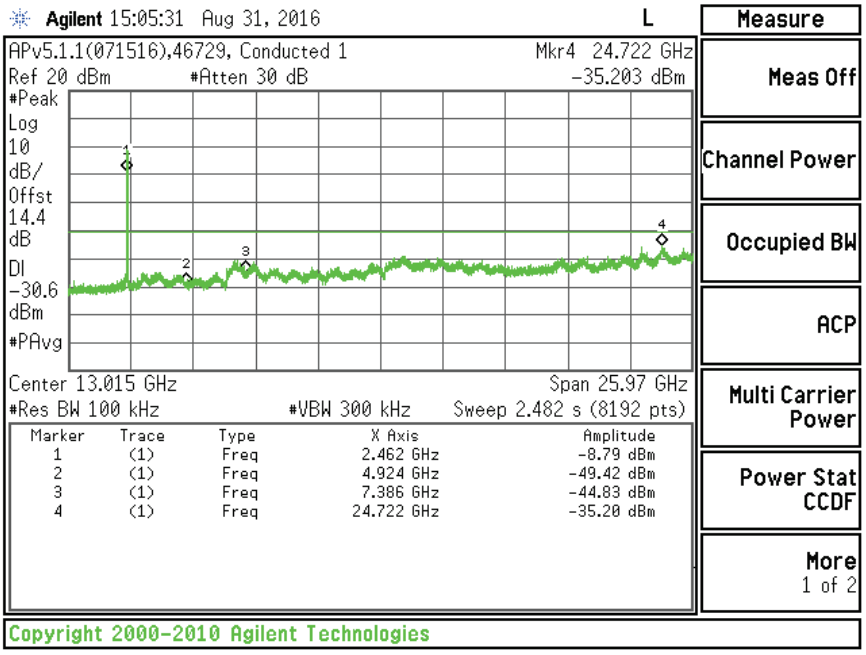
OUT OF BAND Chain 0 HIGH CH 9



OUT OF BAND Chain 0 HIGH CH 11



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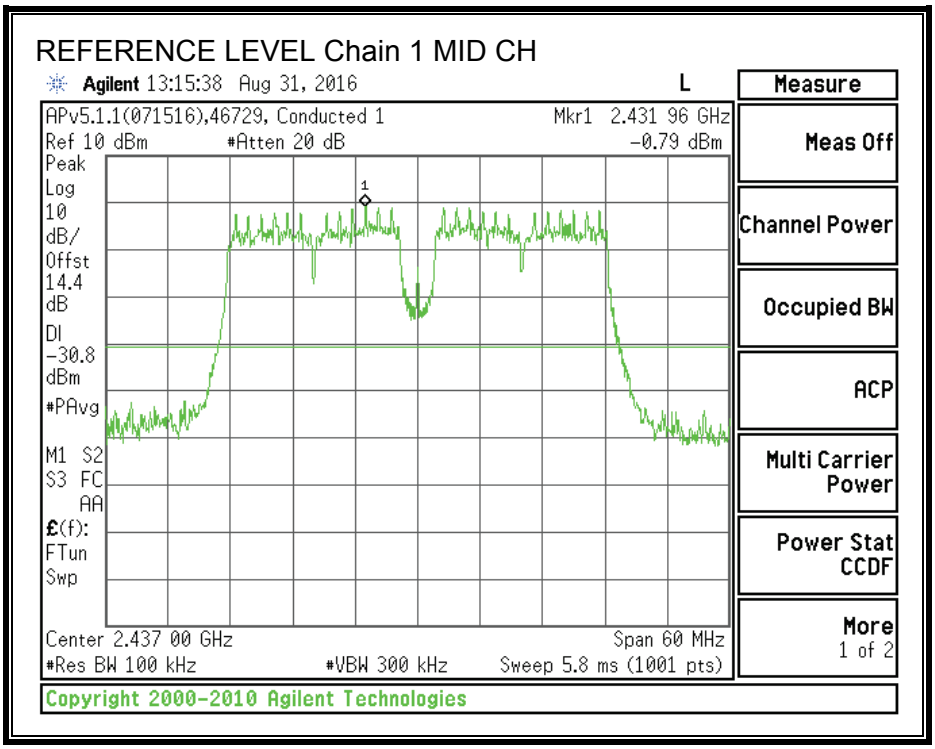
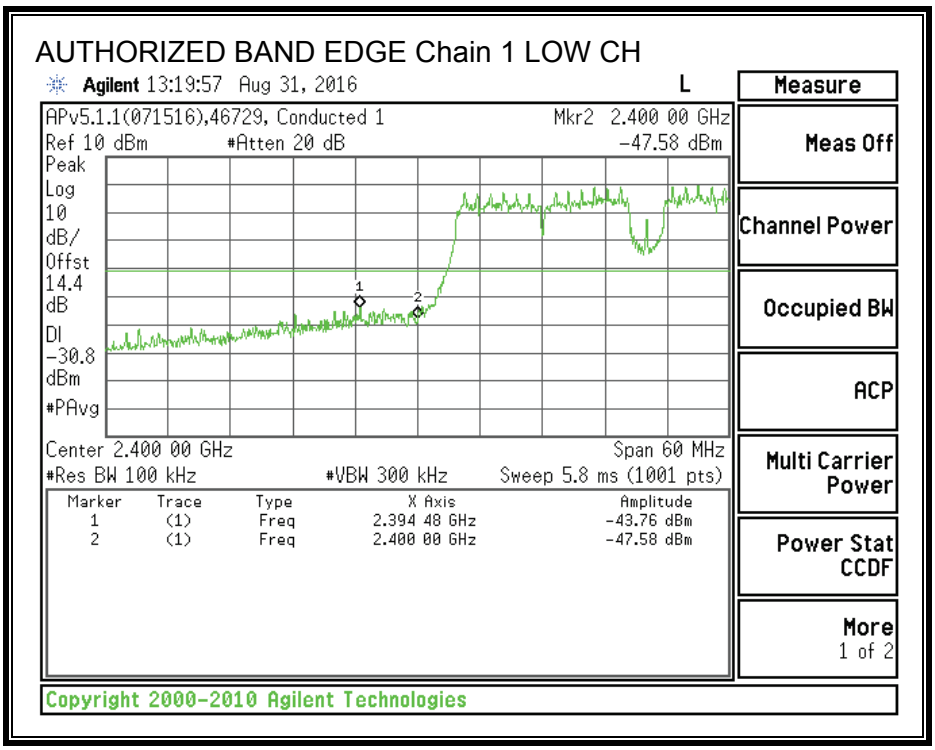
IN-BAND REFERENCE LEVEL, Chain 1



LOW CHANNEL BANDEDGE, Chain 1



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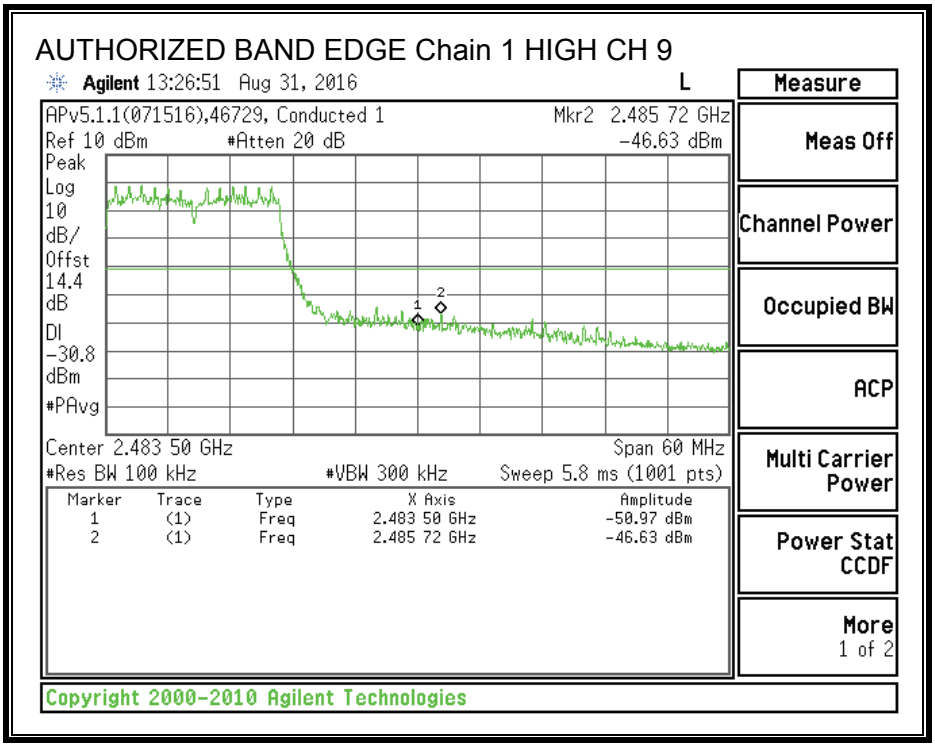
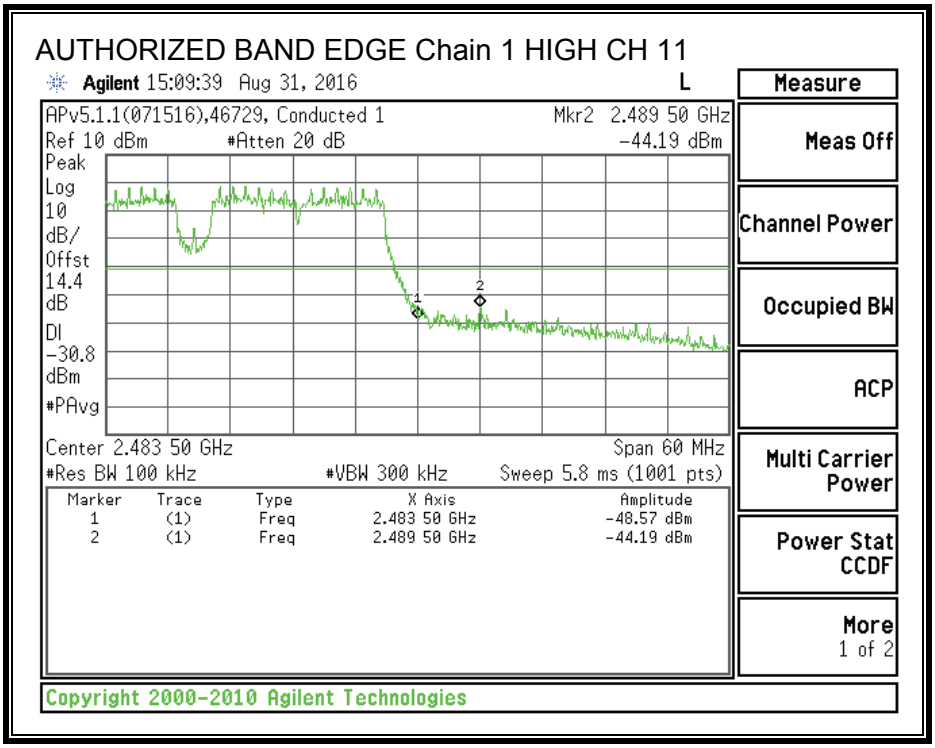
HIGH CHANNEL BANDEDGE, Chain 1





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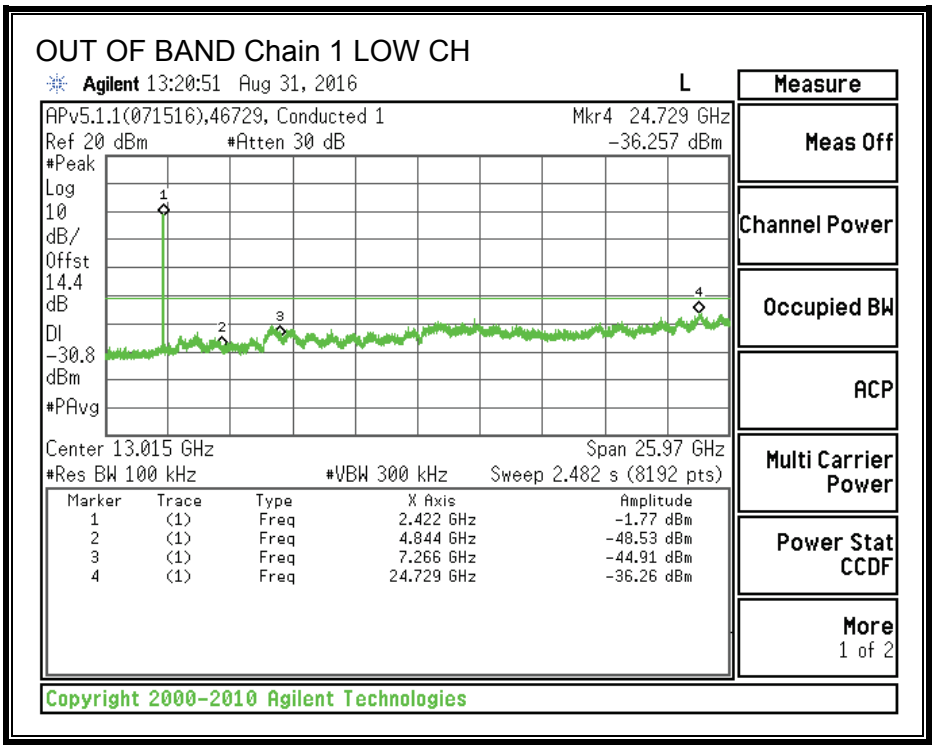
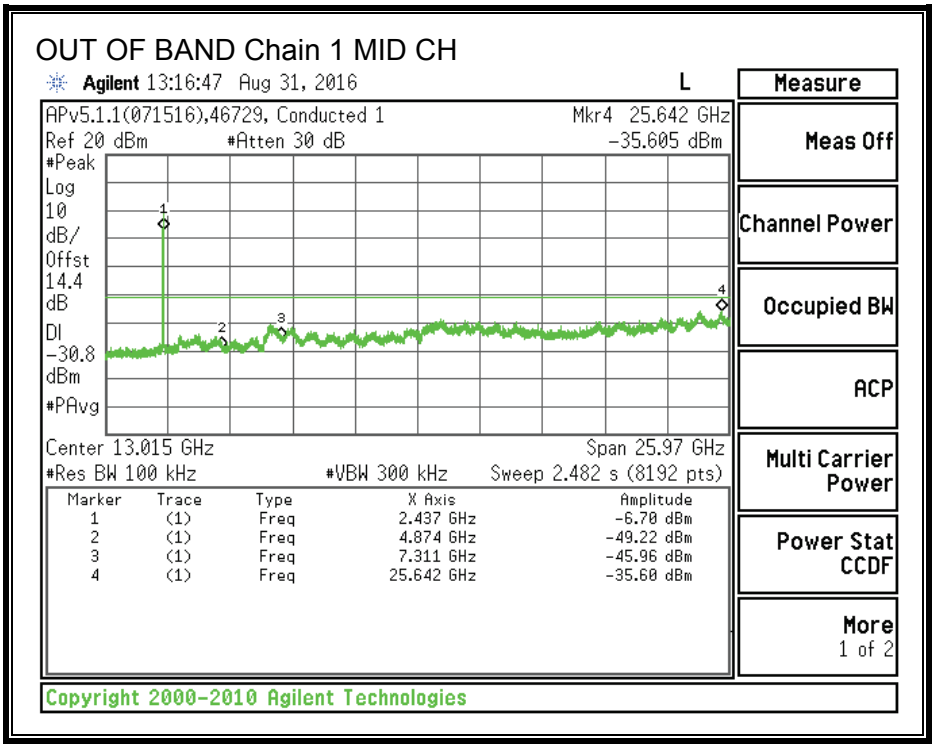
OUT-OF-BAND EMISSIONS, Chain 1





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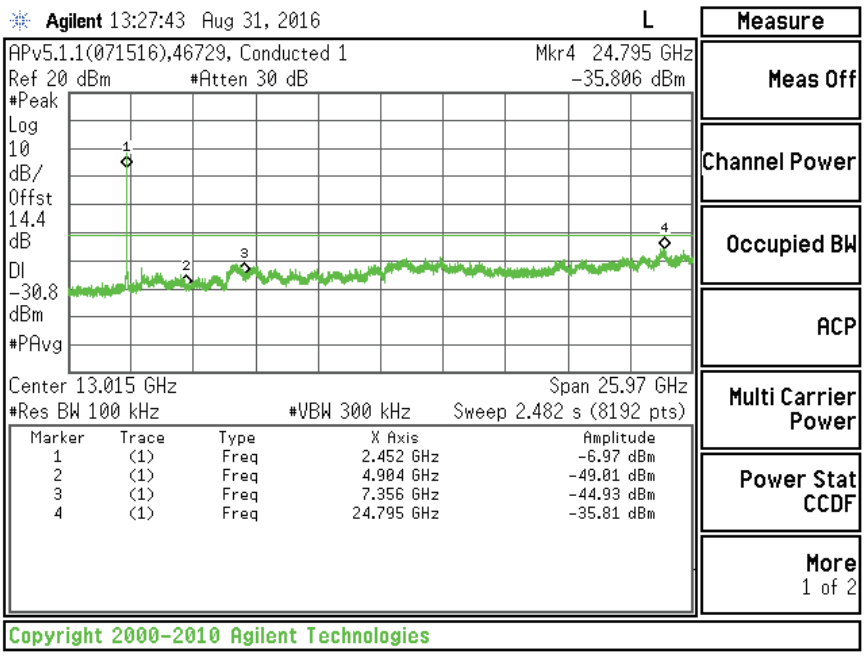
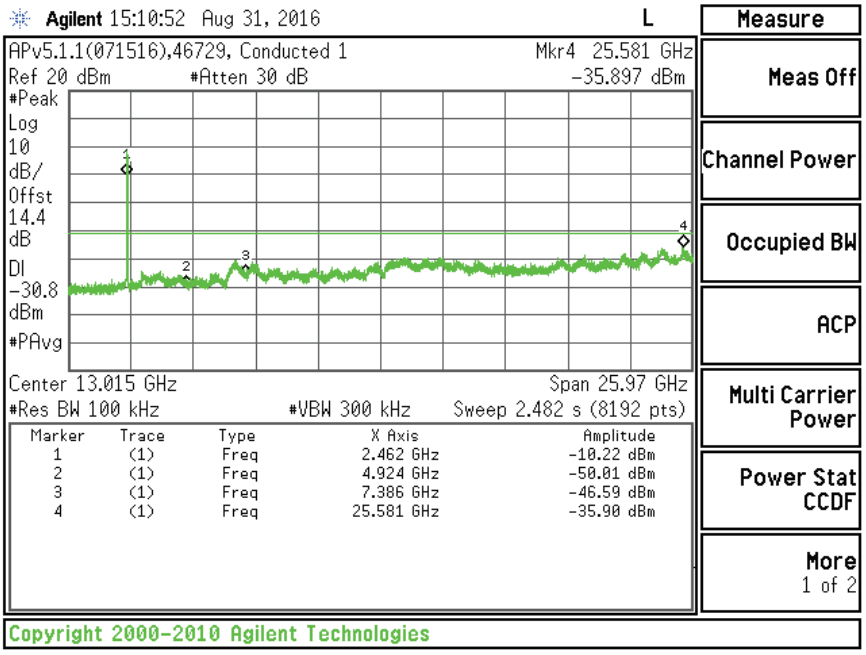
OUT OF BAND Chain 1 HIGH CH 9



OUT OF BAND Chain 1 HIGH CH 11



UL LLC
12 Laboratory Dr., RTP, NC 27709

FORM NO: 03-EM-F00858
TEL: (919) 549-1400

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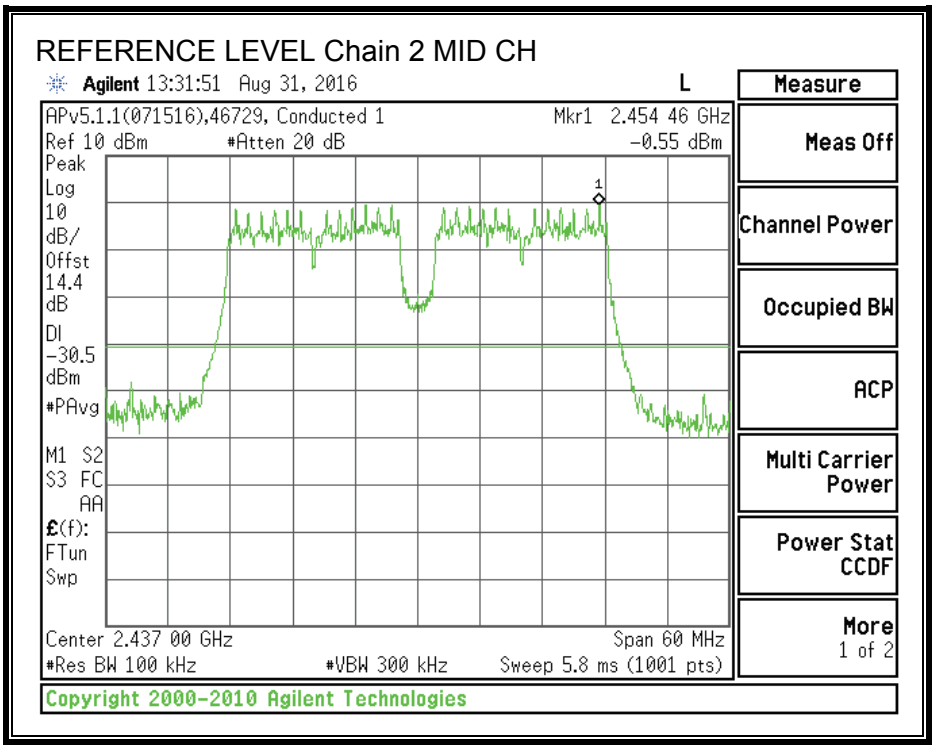
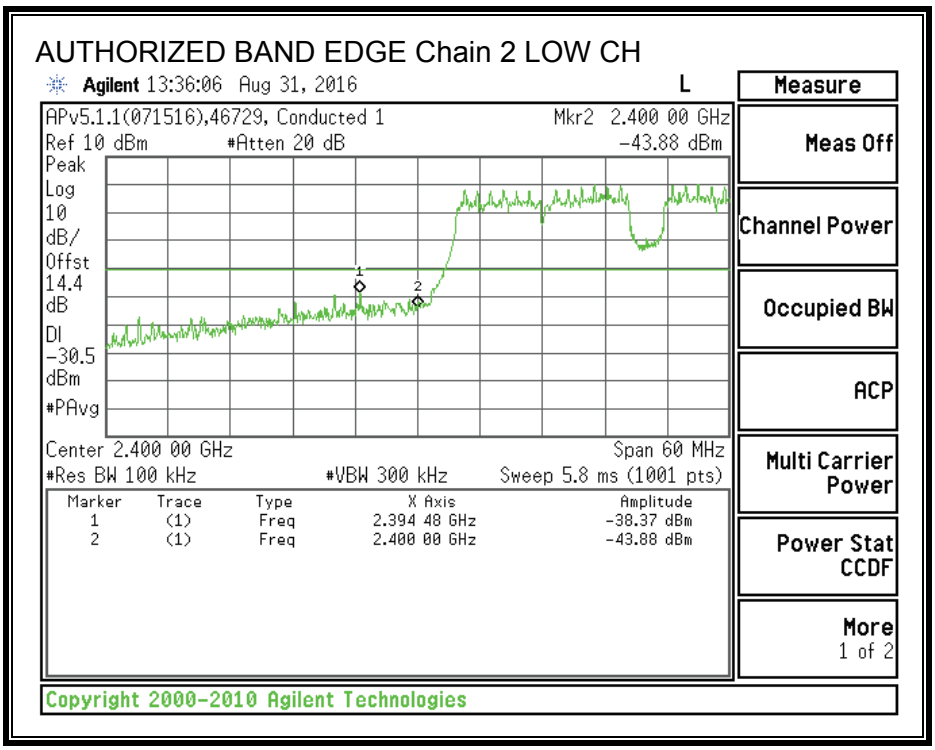
IN-BAND REFERENCE LEVEL, Chain 2



LOW CHANNEL BANDEDGE, Chain 2



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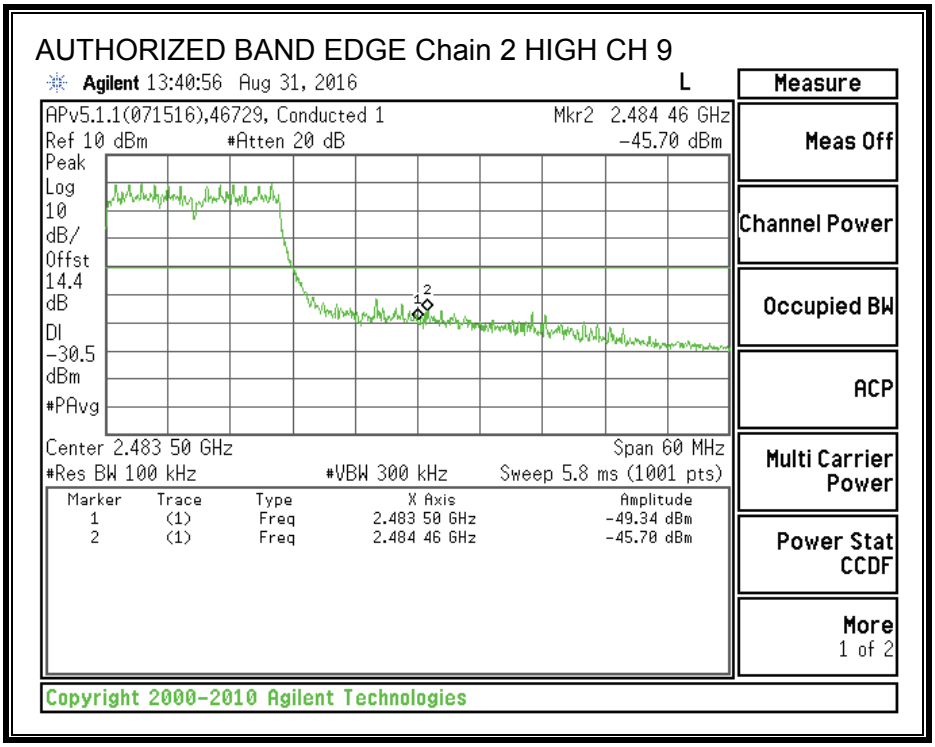
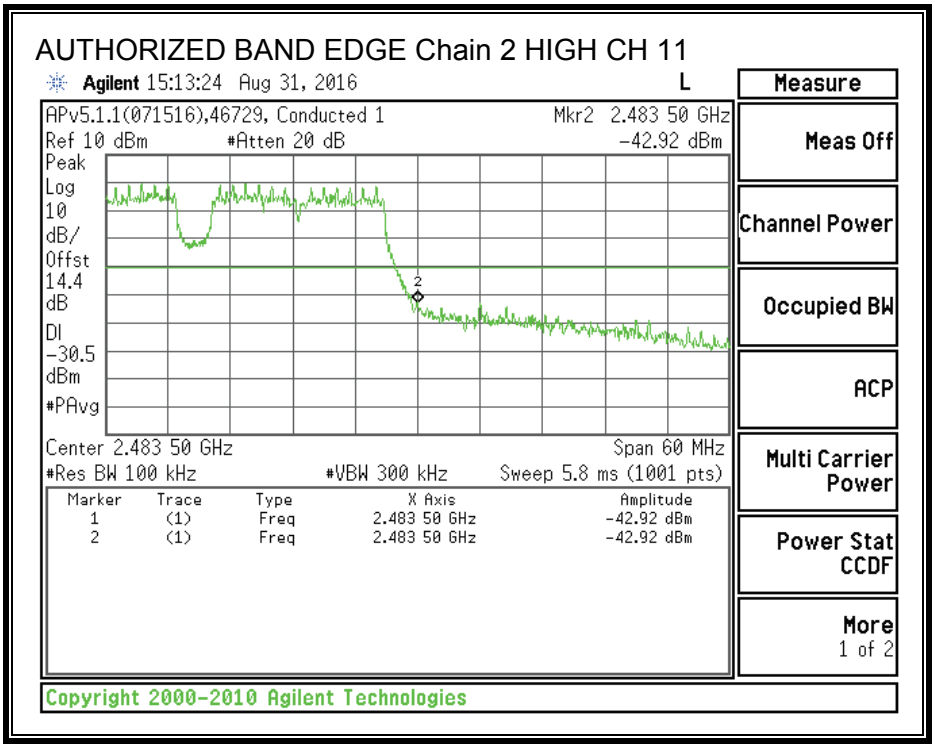
HIGH CHANNEL BANDEDGE, Chain 2





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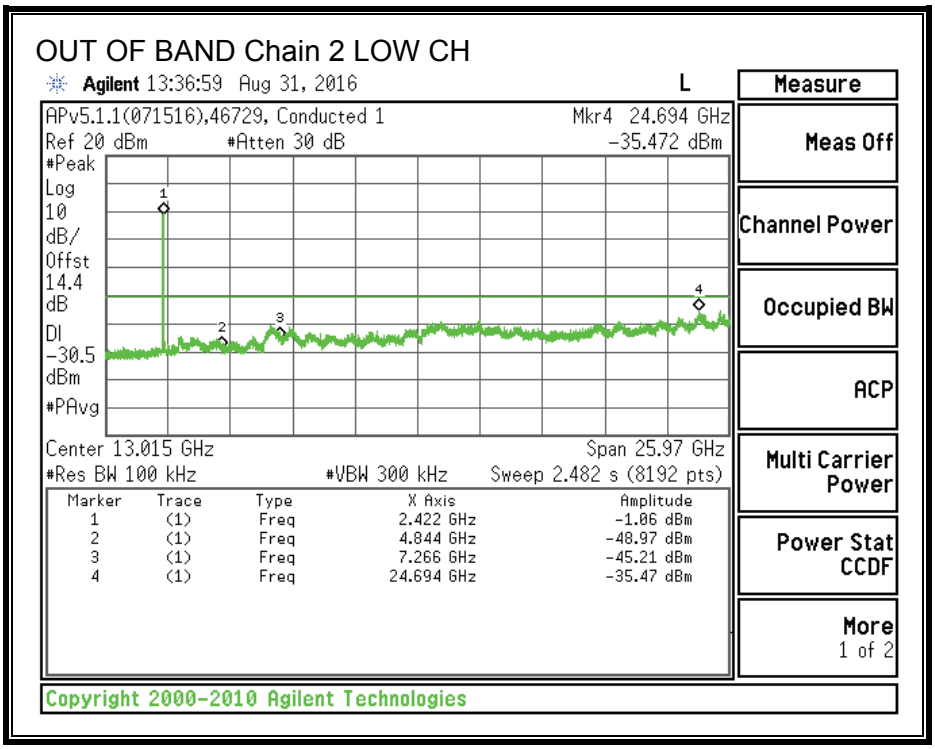
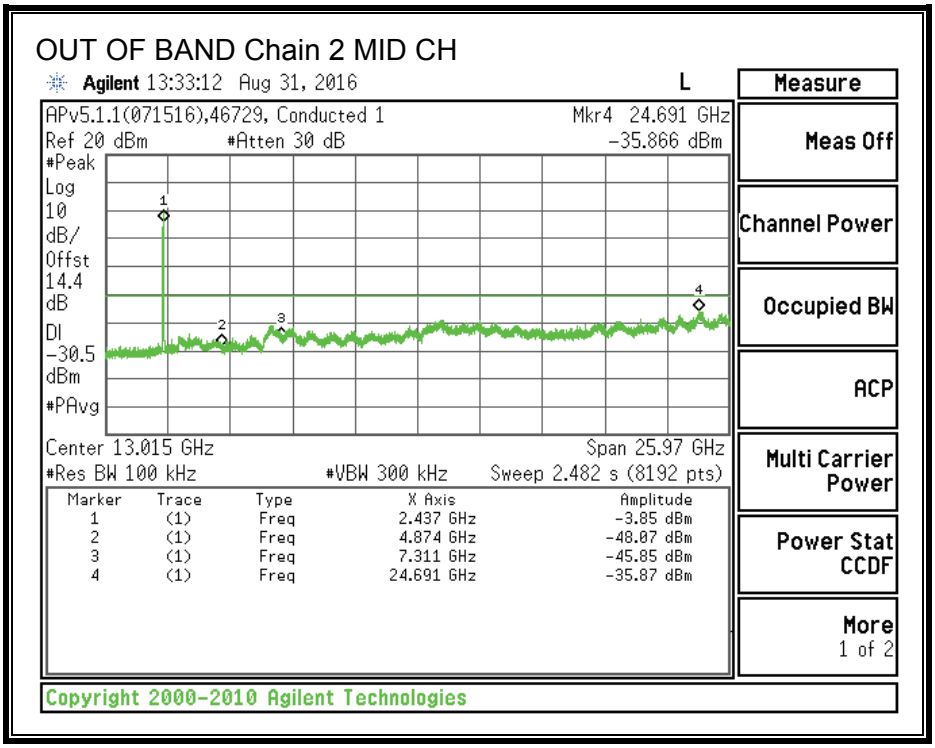
OUT-OF-BAND EMISSIONS, Chain 2





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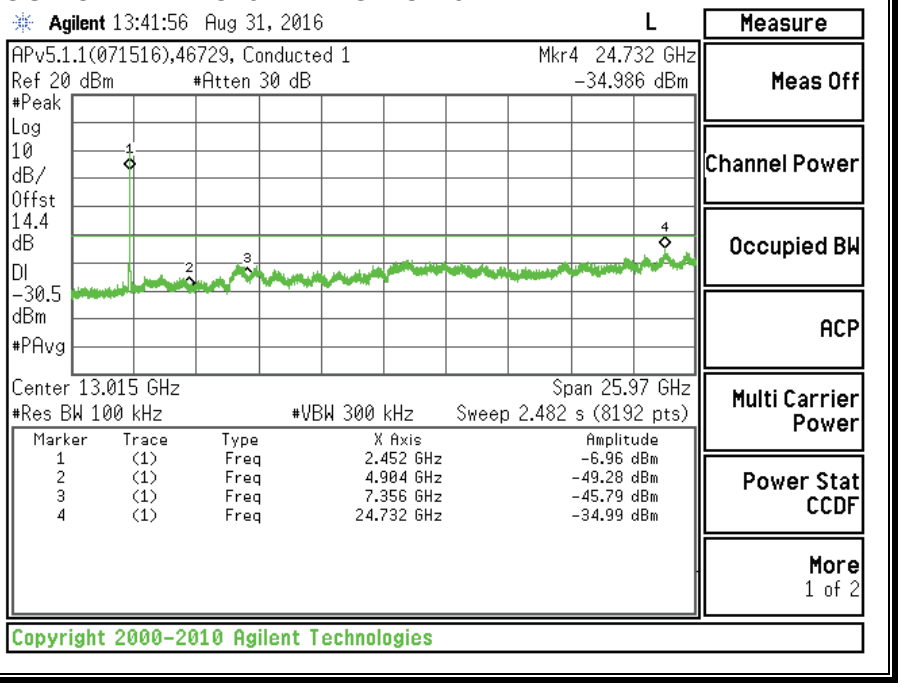
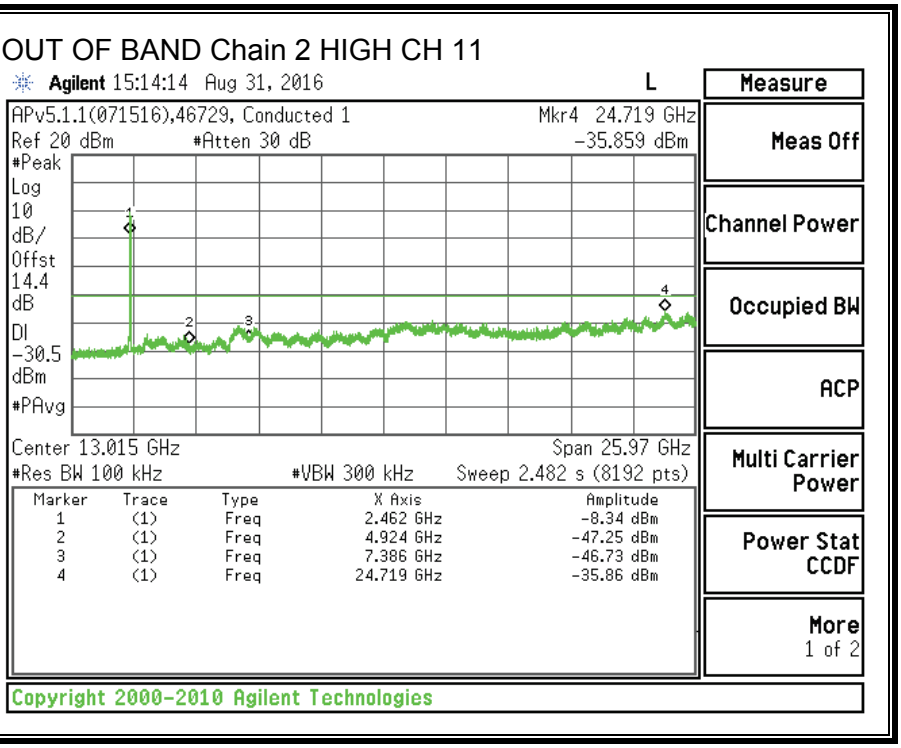
OUT OF BAND Chain 2 HIGH CH 9



OUT OF BAND Chain 2 HIGH CH 11



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