Testing Tomorrow's Technology

Application

For

Part 2, Subpart J, Paragraph 2.907 Equipment Authorization of Certification for an Intentional Radiator per Part 15, Subpart E, paragraphs 15.401, 15.403, 15.405 and 15.407

And

RSS-247 Issue 1 of Industry Canada

For the

Inventek Systems

Model: ISM4334X-M4G-L44

FCC ID: O7P-341
IC: 10147A-341

UST Project: 15-0108B
Issue Date: November 12, 2015

Total Pages in This Report: 144

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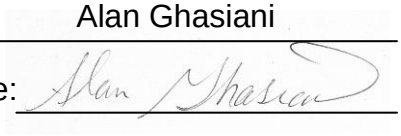
I certify that I am authorized to sign for the Test Agency and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US TECH (Agent Responsible For Test):

By: Alan Ghasiani

Name: 

Title: Compliance Engineer – President

Date November 12, 2015

NVLAP LAB CODE 200162-0

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MEASUREMENT TECHNICAL REPORT

COMPANY NAME: Inventek Systems

MODEL: ISM4334X-M4G-L44

FCC ID: O7P-341

IC: 10147A-341

DATE: November 12, 2015

This report concerns (check one): Original grant [X]
Class II change

Equipment type: 5.15-5.25 GHz and 5.725- 5.825 GHz Transmitter

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes_____ No X

If yes, defer until: _____N/A_____
date
agrees to notify the Commission by N/A
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

US Tech
3505 Francis Circle
Alpharetta, GA 30004

Phone Number: (770) 740-0717
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1 General Information

1.1 Purpose of this Report

This report is prepared as a means of conveying test results and information concerning the suitability of this exact product for public distribution according to the FCC Rules and Regulations Part 15, Section 407 and IC RSS 247 Issue 1.

1.2 Characterization of Test Sample

The sample used for testing was received by US Tech on June 18, 2015 in good operating condition.

1.3 Product Description

The Equipment under Test (EUT) is the Inventek Systems Model ISM4334X-M4G-L44 Module. The ISM4334X-M4G-L44 Module is an embedded wireless internet connectivity module that operates in the 2.4 and 5.0 GHz spectrum. The Wi-Fi module's hardware consists of an ARM Cortex M4 host processor, Broadcom BCM43341/0 Dual-Band 802.11 g/n MAC/Baseband/Radio with integrated Bluetooth 4.0 and NFC support. 1.3 Product Description

The Equipment Under Test (EUT) is the Inventek Systems Model ISM4334X-M4G-L44 Module. The ISM4334X-M4G-L44 Module is an embedded wireless internet connectivity module that operates in the 2.4 and 5.0 GHz spectrum. The Wi-Fi modules' hardware consists of an ARM Cortex M4 host processor, Broadcom BCM43341/0 Dual-Band 802.11 g/n MAC/Baseband/Radio with integrated Bluetooth 4.0 and NFC support.

The Model Numbers to be included in the approval are:

ISM43340-M4G-L44-C
ISM43340-M4G-L44-U
ISM43341-M4G-L44-C
ISM43341-M4G-L44-U
ISM43340-M4G-L44-10CFH
ISM43340-M4G-L44-10UFH
ISM43341-M4G-L44-10CFH
ISM43341-M4G-L44-10UFH
ISM341-USB

The different model numbers for are marketing purposes: The ISM4330 does not support NFC, the ISM43341 supports NFC. The C or U is for the antenna to be used, either the chip (C) or the external antenna path (U). The F is for an optional external Flash memory, and the H is for Apple HomeKit. The final part number, ISM341-USB, is for a specific customer and includes the NFC filter circuit.

The EUT has two antenna options, a dual band chip antenna or a U.FL connector for use with an approved external antenna.

The 2.4 GHz Wi-Fi, integrated Bluetooth, and NFC radio features have been tested and the results detailed in a separate report.

Antenna Gain: 2.3 dBi (Chip-AA077); 3.3 dBi (u.fl external antenna-W2.4-5P-U)
Modulation: 20 MHz bandwidth modulation at up to 144 Mbps
Maximum Output Power: 18.26 dBm

1.4 Configuration of Tested System

The Test Sample was tested per *ANSI C63.4:2009/2014, Methods of Measurement of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2009/2014)* for FCC subpart A Digital equipment Verification requirements and per FCC KDB Publication number 789033 D02 v01 for Digital Transmission Systems Operating Under section 15.247. Also, FCC, KDB Publication No. 789033 D02 v01 was used as a test procedure guide.

A list of EUT and Peripherals is found in Table 1 below. A block diagram of the tested system is shown in Figure 1. Test configuration photographs are provided in separate Appendices.

1.5 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA 30004. This site has been fully described and registered with the FCC. Its designation number is 186022. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 9900A-1.

1.6 Related Submittals

The EUT is subject to the following FCC authorizations:

a) Certification under section 15.247 as a transmitter.

b) Verification under 15.101 as a digital device and receiver.
c) Certification under section 15.249 as a transmitter.
d) Certification under section 15.225 as a transmitter.
e) Certification under section 15.407 as a transmitter.

Table 1. EUT and Peripherals

PERIPHERAL MANUFACTURER.	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Inventek Systems	ISM4334X-M4G-L44 Module	Engineering Sample	O7P-341 (pending) 10147A-341 (pending)	N/A
Antenna See antenna details	--	--	--	--

U= Unshielded
S= Shielded
P= Power
D= Data

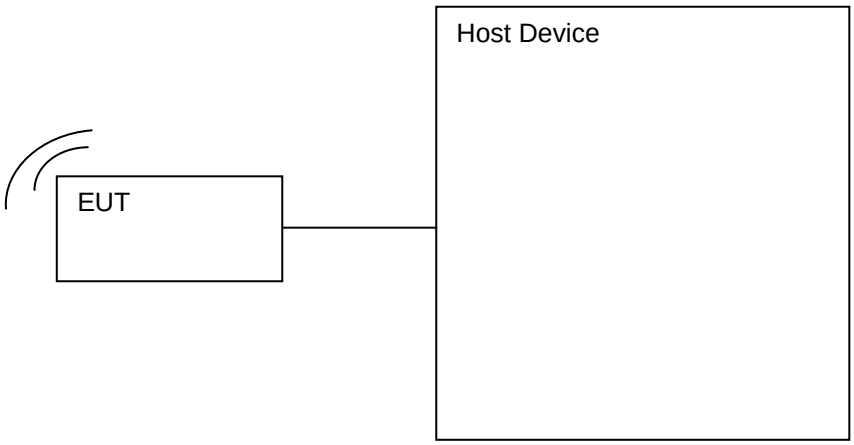


Figure 1. Block Diagram of Test Configuration

2 Tests and Measurements

2.1 Test Equipment

The table below lists test equipment used to evaluate this product. Model numbers, serial numbers and their calibration status are indicated.

Table 2. Test Instruments

TEST INSTRUMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	DATE OF LAST CALIBRATION
SPECTRUM ANALYZER	8566B	HEWLETT-PACKARD	2747A05665	5/7/2015
SPECTRUM ANALYZER	E4407B	AGILENT	US41442935	1/28/2015
LOOP ANTENNA	SAS-200/562	A.H. Systems	142	9/28/2015 2 yr.
BICONICAL ANTENNA	3110B	EMCO	9306-1708	11/24/2014 2 yr.
LOG PERIODIC ANTENNA	3146	EMCO	9110-3236	11/19/2014 2 yr.
LOG PERIODIC ANTENNA	3146	EMCO	9305-3600	7/1/2014 2 yr.
HORN ANTENNA	SAS-571	A.H. Systems	605	8/25/2015 2 yr.
HORN ANTENNA	3115	EMCO	9107-3723	7/8/2014 2 yr.
HORN ANTENNA	3116	EMCO	9505-2255	1/27/2015 2 yr.
AMPLIFIER	11975A	HEWLETT-PACKARD	2517A00647	12/05/2014
HARMONIC MIXER	11970K	HEWLETT-PACKARD	2332A01241	Not Required
PRE-AMPLIFIER	8449B	HEWLETT-PACKARD	3008A00480	12/5/2014
PRE-AMPLIFIER	8477E	HEWLETT-PACKARD	1145A00307	11/21/2014
PRE-AMPLIFIER	8447D	HEWLETT-PACKARD	1937A02980	12/4/2014
LISN x 2	9247-50-TS-50-N	SOLAR ELECTRONICS	955824 and 955825	12/30/2014

Note: The calibration interval of the above test instruments are 12 months unless stated otherwise and all calibrations are traceable to NIST/USA.

2.2 Modifications to EUT Hardware

No physical modifications were made by US Tech in order to bring the EUT into compliance with FCC Part 15, Subpart C Intentional Radiator Limits for the transmitter portion of the EUT or the Subpart B Unintentional Radiator Limits (Receiver and Digital Device) Requirements.

2.3 Number of Measurements for Intentional Radiators (15.31(m))

Measurements of intentional radiators or receivers shall be performed and reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in Table 3 below.

Table 3. Number of Test Frequencies for Intentional Radiators

Frequency Range over which the device operates	Number of Frequencies	Location in the Range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near the top 1 near the bottom
Greater than 10 MHz	3	1 near top 1 near middle 1 near bottom

Because the EUT operates at 5.15 GHz to 5.85 MHz, at least 3 test frequencies were used.

2.4 Frequency Range of Radiated Measurements (Part 15.33)

2.4.1 Intentional Radiator

The spectrum shall be investigated for the intentional radiator from the lowest RF signal generated in the EUT, without going below 9 kHz to the 10th harmonic of the highest fundamental frequency generated or 40 GHz, whichever is the lowest.

2.4.2 Unintentional Radiator

For the digital device, an unintentional radiator, the frequency range shall be 30 MHz to 1000 MHz, or to 5 times the highest internal clock frequency.

2.5 Measurement Detector Function and Bandwidth (CFR 15.35)

The radiated and conducted emissions limits shown herein are based on the following:

2.5.1 Detector Function and Associated Bandwidth

On frequencies below 1000 MHz, the limits herein are based upon measurement equipment employing a CISPR Quasi-peak detector function and related measurement bandwidths (i.e. 9 kHz from 150 kHz to 30 MHz and 120 kHz from 30 MHz to 1000 MHz). Alternatively, measurements may be made with equipment employing a peak detector function as long as the same bandwidths specified for the Quasi-peak device are used.

2.5.2 Corresponding Peak and Average Requirements

Above 1000 MHz, radiated limits are based on measuring instrumentation employing an average detector function. When average radiated emissions are specified there is also a corresponding Peak requirement, as measured using a peak detector, of 20 dB greater than the average limit. For all measurements above 1000 MHz the Resolution Bandwidth shall be at least 1 MHz.

2.5.3 Pulsed Transmitter Averaging

When the radiated emissions limit is expressed as an average value, and the transmitter is pulsed, the measured field strength shall be determined by applying a Duty Cycle Correction Factor based upon dividing the total ON time during the first 100 ms period by 100 ms (or by the period if less than 100 ms). The duty cycle may be expressed logarithmically in dB.

NOTE: If the transmitter was programmed to transmit at >98% duty cycle, then, wherever applicable (where the detection mode was AVG) the duty cycle factor calculated will be applied.

2.6 EUT Antenna Requirements (CFR 15.203)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. Only the antenna(s) listed in Table 4 will be used with this module.

Table 4. Allowed Antenna(s)

REPORT REFERENCE	MANUFACTURER	TYPE OF ANTENNA	MODEL	GAIN dB_i	TYPE OF CONNECTOR
1	Unictron Technologies Corp.	Chip	AA077	2.3	Chip
2.	Inventek Systems	U.FL	W2.4--5P-U	3.3	U.FL

2.7 Restricted Bands of Operation (Part 15.205)

Only spurious emissions can fall in the frequency bands of CFR 15.205. The field strength of these spurious cannot exceed the limits of 15.209. Radiated harmonics and other Spurious are examined for this requirement see paragraph 2.1

2.8 Transmitter Duty Cycle (CFR 35 (c))

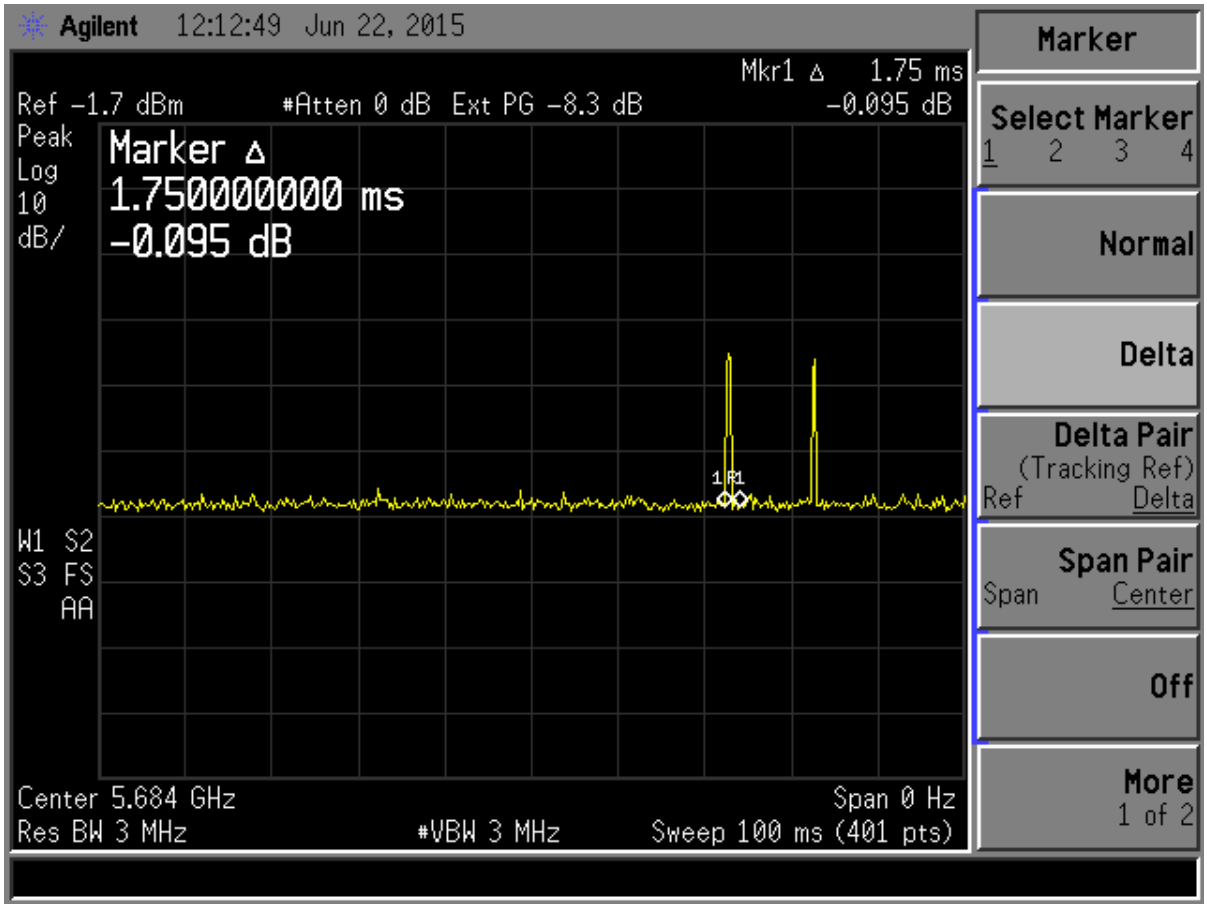


Figure 2. Duty Cycle 100ms Sweep

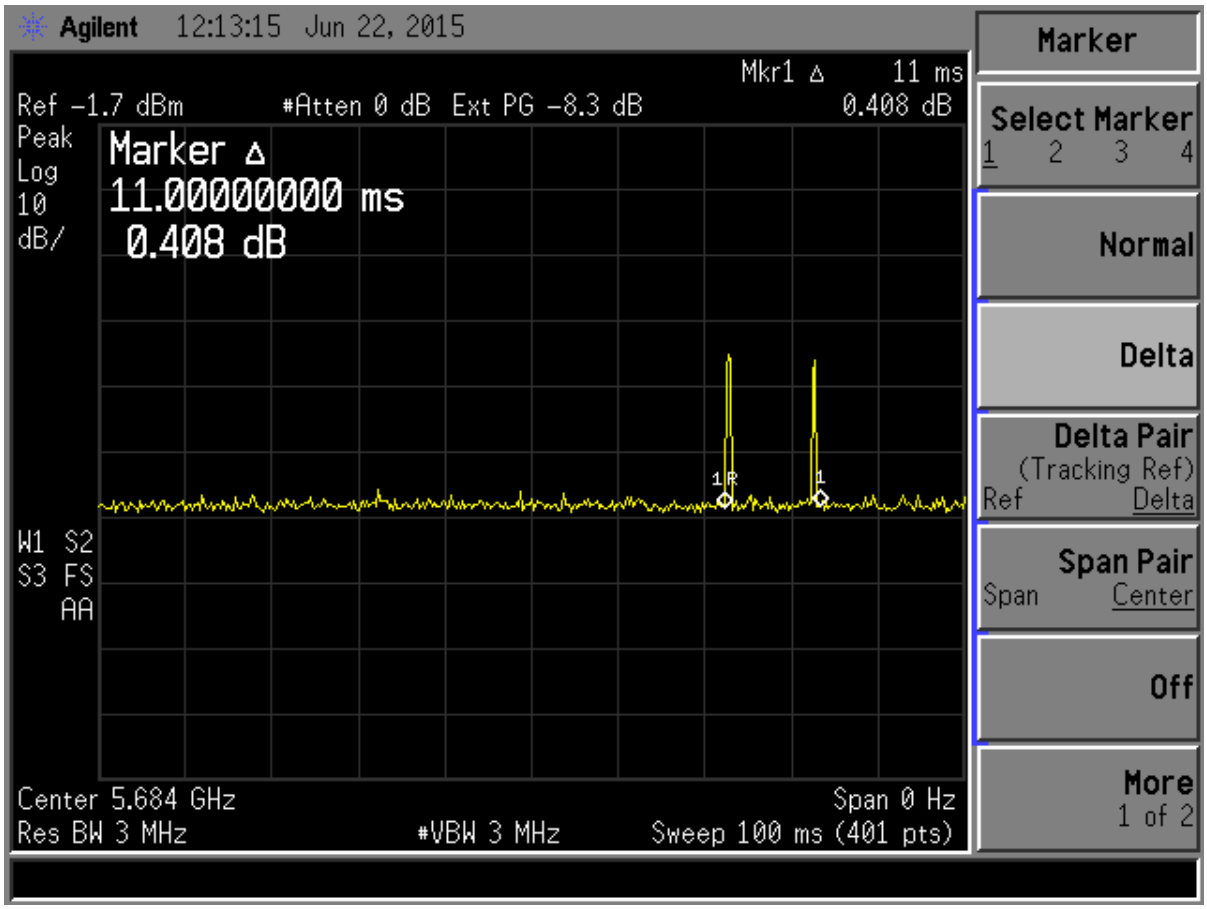


Figure 3. Transmitter Pulse Width

Total Time On from Figure 2 = 1.75 ms (Transmitter Pulse Width)
Total Pulse Train from Figure 3 = 11.00 ms (Pulse Train)

(1.75 ms Total Time On)/(11.00 ms Total Pulse Train) = 0.16 Numeric Duty Cycle
Duty Cycle = 20 Log (0.16) = -15.97 dB

NOTE: The transmitter was programmed to transmit at >98% duty cycle, therefore wherever applicable (where the detection mode was AVG) the duty cycle factor calculated above will be applied.

2.9 Intentional Radiator, Power Line Conducted Emissions (CFR 15.207)

The EUT is powered by 3.3 VDC through a host device, since the host was connected to the AC mains the power line conducted emissions testing was performed. Power line conducted emissions testing was performed to ensure that with the EUT in operation (exercising all transmitter functions), the complete system continues to meet the applicable requirements for CFR 15.207. These measurements were completed and are displayed along with the 15.107 power line test data in the sections below.

Table 5. Transmitter Power Line Conducted Emissions Test Data, Part 15.207/107

150 KHz to 30 MHz with Class B Limits						
Test: Power Line Conducted Emissions				**Client:** Inventek Systems		
Project: 15-0108				**Model:** ISM4334X-M4G-L44 Module		
Frequency (MHz)	**Test Data (dBuv)**	**LISN+CL-PA (dB)**	**Results (dBuV)**	**AVG Limits (dBuV)**	**Margin (dB)**	**Detector PK, QP, or AVG**
120 VAC, 60 Hz Phase						
0.21	50.70	0.88	51.58	63.1*	11.5	**QP**
0.21	46.80	0.88	47.68	53.1	5.4	**AVG**
0.53	39.80	0.42	40.22	46.0	5.8	**AVG**
1.94	39.00	0.36	39.36	46.0	6.6	**AVG**
6.03	42.70	0.47	43.17	50.0	6.8	**AVG**
19.35	42.30	0.61	42.91	50.0	7.1	**AVG**
20.26	42.00	0.62	42.62	50.0	7.4	**AVG**
120VAC, 60 Hz Neutral						
0.1511	61.30	1.41	62.71	65.9*	3.2	**QP**
0.1511	44.30	1.41	45.71	55.9	10.2	**AVG**
0.5992	40.40	0.39	40.79	46.0	5.2	**AVG**
1.1920	39.00	0.35	39.35	46.0	6.6	**AVG**
5.2000	41.10	0.44	41.54	50.0	8.5	**AVG**
12.7600	40.80	0.64	41.44	50.0	8.6	**AVG**
22.4800	40.90	0.65	41.55	50.0	8.4	**AVG**

Note: * denotes QP Limits

SAMPLE CALCULATION at 0.21 MHz:

Magnitude of Measured Frequency	50.70	dBuV
+ Cable Loss+ LISN Loss	0.88	dB
=Corrected Result	51.58	dBuV
Limit	63.10	dBuV
-Corrected Result	51.58	dBuV
Margin	11.5	dB

Test Date: August 3, 2015
Tested By
Signature: Sina Sobhaniyan Name: Sina Sobhaniyan

2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.407(d)) (IC RSS 247, 6.2)

Radiated Spurious measurements: the EUT was placed into a continuous transmit mode of operation (>98% duty cycle) and tested per FCC KDB Publication 789033 D02 v01 and ANSI C63.10:2013. A preliminary scan was performed on the EUT to find signal frequencies that were caused by the transmitter part of the device. To obtain worse case results the EUT was tested in X, Y, and Z axes or in the orientation of normal operation if the device is designed to operate in a fixed position.

Radiated measurements were then conducted between the frequency range of 9KHz (or lowest frequency used/generated by the device) up to the tenth harmonic of the device (no greater than 40 GHz). In the band below 30 MHz a resolution bandwidth (RBW) of 9 kHz was used, emissions below 1 GHz were tested with a RBW of 120 KHz and emissions above 1 GHz were tested with a RBW of 1 MHz. All video bandwidth settings were at least three times the RBW value.

The EUT was investigated to CFR 15.209, General requirements for unwanted spurious emissions. The conducted spurious method as described below was used to investigate all other emissions emanating from the antenna port.

Conducted Spurious measurements: the EUT was put into a continuous-transmit mode of operation (>98% duty cycle) and tested per FCC KDB Publication 7789033 D02 v01 for conducted out of band emissions emanating from the antenna port over the frequency range of 30 MHz to 50 GHz. A conducted scan was performed on the EUT to identify and record spurious signals that were related to the transmitter.

The conducted output power (in dBm) was recorded. The maximum transmit antenna gain in dBi was added to determine the EIRP level. The appropriate maximum ground reflection factor to the EIRP level, 6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz – 1000 MHz, and 0 dB for frequencies > 1000 MHz, was also added to the EIRP calculation.

The results are displayed in the plots below. Radiated emissions per CFR 15.209 were performed to address the concerns of unwanted emissions that may radiate from the EUT cabinet, control circuits, or power leads. The results for this test can be found in section 2.18 below.

Table 6. Peak Radiated Fundamental & Harmonic Emissions, 802.11n with Chip Antenna

Test: FCC Part 15, Para 15.209, 15.407(a)					**Client:** Inventek Systems			
Project: 15-0108					**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuV)**	**Factor (dB)**	**AF+CA -AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector Mode**
Channel 36								
5180	66.29	-	31.03	104.43		3m./Vert		PK
10360	47.01	-	12.43	59.44	74.00	3m./Vert	14.56	PK
Channel 48								
5240	66.89	-	38.32	105.21		3m./Vert		PK
10480	45.65	-	12.76	58.41	74.00	3m./Vert	15.59	PK
Channel 149								
5745	68.10	-	38.40	106.50		3m./Vert		PK
11490	44.66	-	13.23	57.89	74.00	3m./Vert	16.11	PK
Channel 165								
5825	68.44	-	38.39	106.83		3m.Vert		PK
11650	45.89	-	13.81	59.70	74.00	3m./Vert	14.3	PK

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~)Measurements taken at 1 meter were extrapolated to 3 meters using a factor of (-9.5 dB).
4. The EUT was placed in three orthogonal positions and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 10360 MHz:

Magnitude of Measured Frequency	47.01	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	12.43	dB/m
Corrected Result	59.44	dBuV/m

Test Date: August 6-7, 2015
Tested By
Signature: Sina Sobhaniyan Name: Sina Sobhaniyan

Table 7. Average Radiated Fundamental & Harmonic Emissions 802.11n with Chip Antenna

Test: FCC Part 15, Para 15.209, 15.407(a)					**Client:** Inventek Systems			
Project: 15-0108					**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuV)**	**Factor (dB)**	**AF+CA -AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector Mode**
Channel 36								
5180	49.40	-	38.13	87.53		3.0m./Vert		AVG
10360	47.01	-15.0	12.43	44.44	54.0	3.0m./Vert	9.6	PK
Channel 48								
5240	48.86	-	48.86	87.18		3.0m./Vert		AVG
10480	45.65	-15.0	12.76	43.41	54.0	3.0m./Vert	9.6	PK
Channel 149								
5745	50.67	-	38.40	89.07		3.0m./Vert		AVG
11490	44.66	-15.0	13.23	42.89	54.0	3.0m./Vert	11.1	PK
Channel 165								
5825	49.98	-	38.39	88.37		3.0m./Vert		AVG
11650	45.89	-15.0	13.81	44.70	54.0	3.0m./Vert	9.3	PK

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~)Measurements taken at 1 meter were extrapolated to 3 meters using a factor of (-9.5 dB).
4. The EUT was placed in three orthogonal positions and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 10360.00MHz:

Magnitude of Measured Frequency	47.01	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	12.43	dB/m
-Duty Cycle	-15.00	dB
Corrected Result	44.44	dBuV/m

Test Date: August 6-7, 2015
Tested By
Signature: Sina Sobhaniyan Name: Sina Sobhaniyan

Table 8. Peak Radiated Fundamental & Harmonic Emissions, 802.11a with Chip Antenna

Test: FCC Part 15, Para 15.209, 15.407(a)					**Client:** Inventek Systems			
Project: 15-0108					**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuV)**	**Factor (dB)**	**AF+CA -AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector Mode**
Channel 36								
5180	66.83	-	38.07	104.90		3.0m./HORZ		PK
No harmonics seen greater than 20 dB from the limit								
Channel 48								
5240	67.83	-	38.31	106.14		3.0m./HORZ		PK
No harmonics seen greater than 20 dB from the limit								
Channel 149								
5745	65.09	-	38.39	103.48		3.0m./HORZ		PK
No harmonics seen greater than 20 dB from the limit								
Channel 165								
5825	65.37	-	38.41	103.78		3.0m./HORZ		PK
No harmonics seen greater than 20 dB from the limit								

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~)Measurements taken at 1 meter were extrapolated to 3 meters using a factor of (-9.5 dB).
4. The EUT was placed in three orthogonal positions and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 5180 MHz:

Magnitude of Measured Frequency	66.83	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	38.07	dB/m
Corrected Result	107.90	dBuV/m

Test Date: October 1-2, 2015
Tested By
Signature: _____ Name: George Yang

Table 9. Average Radiated Fundamental & Harmonic Emissions 802.11a with Chip Antenna

Test: FCC Part 15, Para 15.209, 15.407(a)					**Client:** Inventek Systems			
Project: 15-0108					**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuV)**	**Factor (dB)**	**AF+CA -AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector Mode**
Channel 36								
5180	48.77	-	38.07	86.84		3.0m./HORZ		AVG
No harmonics seen greater than 20 dB from the limit								
Channel 48								
5240	58.02	-	38.31	96.33		3.0m./HORZ		AVG
No harmonics seen greater than 20 dB from the limit								
Channel 149								
5745	48.87	-	38.39	87.26		3.0m./HORZ		AVG
No harmonics seen greater than 20 dB from the limit								
Channel 165								
5825	47.97	-	38.41	86.38		3.0m./HORZ		AVG
No harmonics seen greater than 20 dB from the limit								

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~)Measurements taken at 1 meter were extrapolated to 3 meters using a factor of (-9.5 dB).
4. The EUT was placed in three orthogonal positions and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 5180 MHz:

Magnitude of Measured Frequency	48.28	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain – Duty Cycle	38.07	dB/m
Corrected Result	86.84	dBuV/m

Test Date: October 1-2, 2015
Tested By
Signature: _____ Name: George Yang

Table 10. Peak Radiated Fundamental & Harmonic Emissions, 802.11n with U.FL Antenna

Test: FCC Part 15, Para 15.209, 15.407(a)					**Client:** Inventek Systems			
Project: 15-0108					**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuV)**	**Factor (dB)**	**AF+CA -AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector Mode**
Channel 36								
5180	65.95	-	38.07	104.02		3.0m./Horz		PK
No harmonics seen greater than 20 dB from the limit								
Channel 48								
5240	68.90	-	38.31	107.21		3.0m./Horz		PK
No harmonics seen greater than 20 dB from the limit								
Channel 149								
5745	72.97	-	38.39	111.36		3.0m./Horz		PK
No harmonics seen greater than 20 dB from the limit								
Channel 165								
5825	71.99	-	38.41	110.40		3.0m./Horz		PK
No harmonics seen greater than 20 dB from the limit								

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~)Measurements taken at 1 meter were extrapolated to 3 meters using a factor of (-9.5 dB).
4. The EUT was placed in three orthogonal positions and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 5180 MHz:

Magnitude of Measured Frequency	65.95	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	38.07	dB/m
Corrected Result	104.02	dBuV/m

Test Date: August 13, 2015
Tested By
Signature: Sina Sobhaniyan Name: Sina Sobhaniyan

Table 11. Average Radiated Fundamental & Harmonic Emissions 802.11n with U.FL Antenna

Test: FCC Part 15, Para 15.209, 15.407(a)					**Client:** Inventek Systems			
Project: 15-0108					**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuV)**	**Factor (dB)**	**AF+CA -AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector Mode**
Channel 36								
5180	48.84	-	38.07	86.88		3.0m./Horz	30.1	AVG
No harmonics seen greater than 20 dB from the limit								
Channel 48								
5240	50.04	-	38.31	88.35		3.0m./Horz	27.9	AVG
No harmonics seen greater than 20 dB from the limit								
Channel 149								
5745	54.94	-	38.39	93.33		3.0m./Horz	23.7	AVG
No harmonics seen greater than 20 dB from the limit								
Channel 165								
5825	53.34	-	38.41	91.75		3.0m./Horz	25.2	AVG
No harmonics seen greater than 20 dB from the limit								

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~)Measurements taken at 1 meter were extrapolated to 3 meters using a factor of (-9.5 dB).
4. The EUT was placed in three orthogonal positions and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 5180 MHz:

Magnitude of Measured Frequency	50.00	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	38.31	dB/m
Corrected Result	88.35	dBuV/m

Test Date: August 13, 2015
Tested By
Signature: Sina Sobhaniyan Name: Sina Sobhaniyan

Table 12. Peak Radiated Fundamental & Harmonic Emissions, 802.11a with U.FL Antenna

Test: FCC Part 15, Para 15.209, 15.407(a)					**Client:** Inventek Systems			
Project: 15-0108					**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuV)**	**Factor (dB)**	**AF+CA -AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector Mode**
Channel 36								
5180	66.40	-	38.07	104.47		3.0m./HORZ		PK
No harmonics seen greater than 20 dB from the limit								
Channel 48								
5240	70.73	-	38.31	109.04		3.0m./HORZ		PK
No harmonics seen greater than 20 dB from the limit								
Channel 149								
5745	69.46	-	38.39	107.85		3.0m./HORZ		PK
No harmonics seen greater than 20 dB from the limit								
Channel 165								
5825	70.54	-	38.41	108.95		3.0m./HORZ		PK
No harmonics seen greater than 20 dB from the limit								

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~)Measurements taken at 1 meter were extrapolated to 3 meters using a factor of (-9.5 dB).
4. The EUT was placed in three orthogonal positions and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 5180 MHz:

Magnitude of Measured Frequency	66.40	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	38.07	dB/m
Corrected Result	104.47	dBuV/m

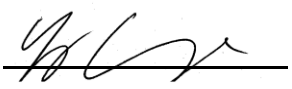
Test Date: October 1-2, 2015
Tested By
Signature:  Name: George Yang

Table 13. Average Radiated Fundamental & Harmonic Emissions 802.11a with U.FL Antenna

Test: FCC Part 15, Para 15.209, 15.407(a)					**Client:** Inventek Systems			
Project: 15-0108					**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuV)**	**Factor (dB)**	**AF+CA -AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector Mode**
Channel 36								
5180	51.62	-	38.07	89.69		3.0m./HORZ		AVG
No harmonics seen greater than 20 dB from the limit								
Channel 48								
5240	53.33	-	38.31	91.64		3.0m./HORZ		AVG
No harmonics seen greater than 20 dB from the limit								
Channel 149								
5745	52.70	-	38.39	91.09		3.0m./HORZ		AVG
No harmonics seen greater than 20 dB from the limit								
Channel 165								
5825	52.74	-	38.41	91.15		3.0m./HORZ		AVG
No harmonics seen greater than 20 dB from the limit								

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~)Measurements taken at 1 meter were extrapolated to 3 meters using a factor of (-9.5 dB).
4. The EUT was placed in three orthogonal positions and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 5180 MHz:

Magnitude of Measured Frequency	51.62	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain – Duty Cycle	38.07	dB/m
Corrected Result	89.69	dBuV/m

Test Date: October 1-2, 2015
Tested By
Signature: _____ Name: George Yang

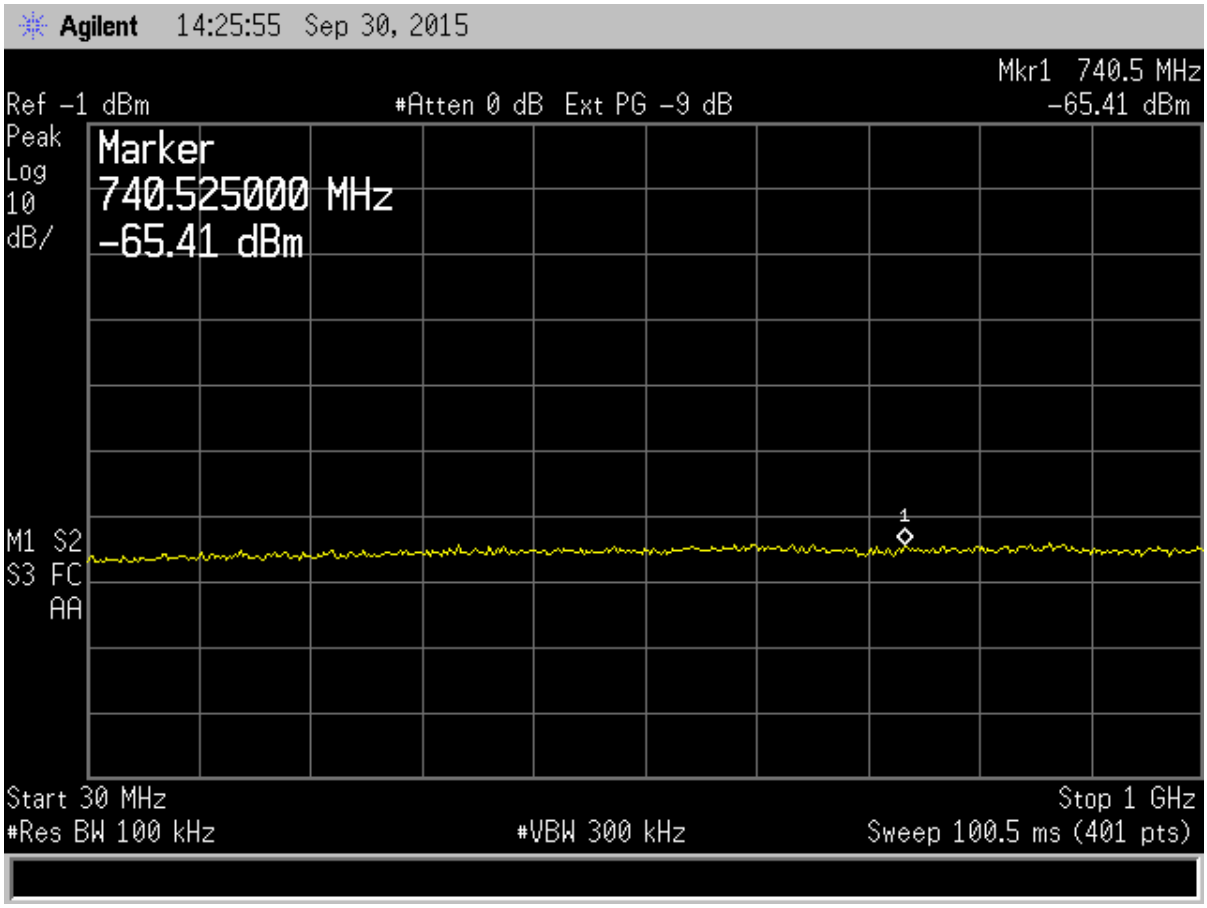


Figure 4. Antenna Conducted Emissions Channel 36 802.11a, Part 1

EIRP= -65.41 dBm) + 3.3 dBi (applied antenna gain) + 4.7 dB (ground reflection factor)= -57.41 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-57.41) dBm/MHz = 30.41 dB

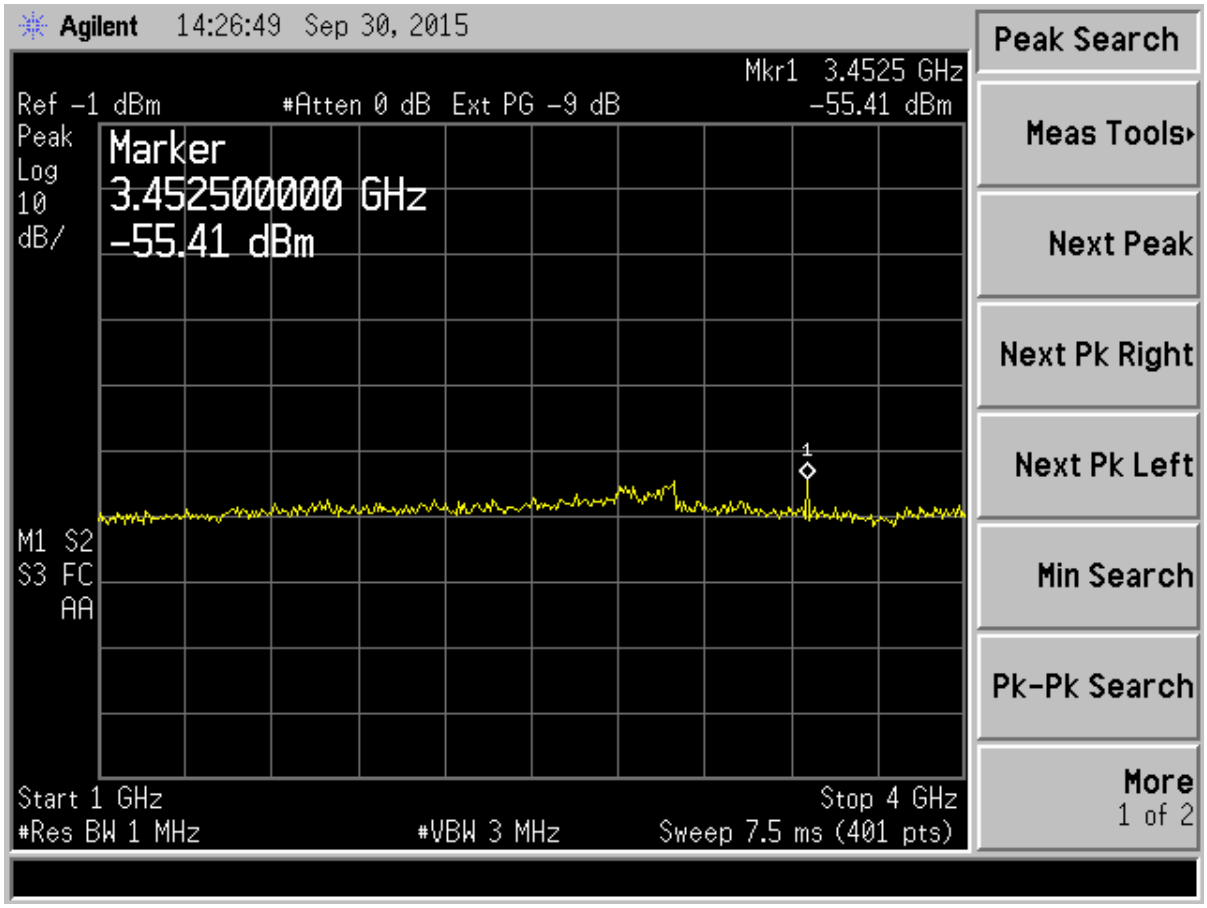


Figure 5. Antenna Conducted Emissions Channel 36 802.11a, Part 2

EIRP= -55.41 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -52.11 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-52.11) dBm/MHz = 25.11 dB

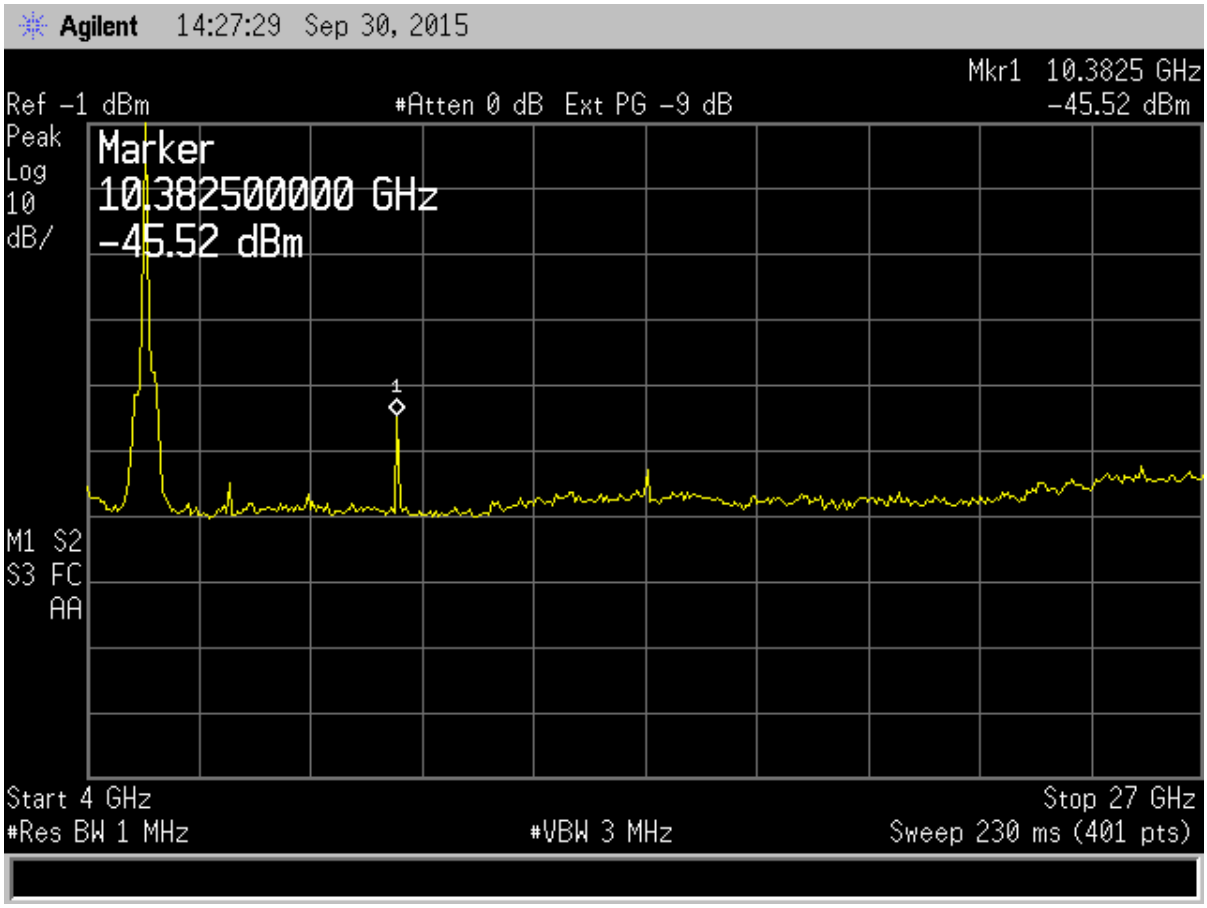


Figure 6. Antenna Conducted Emissions Channel 36 802.11a, Part 3

Note: Large signal seen in the figure above is the fundamental emission.

EIRP= -45.52 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -42.22 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-42.22) dBm/MHz = 15.22 dB

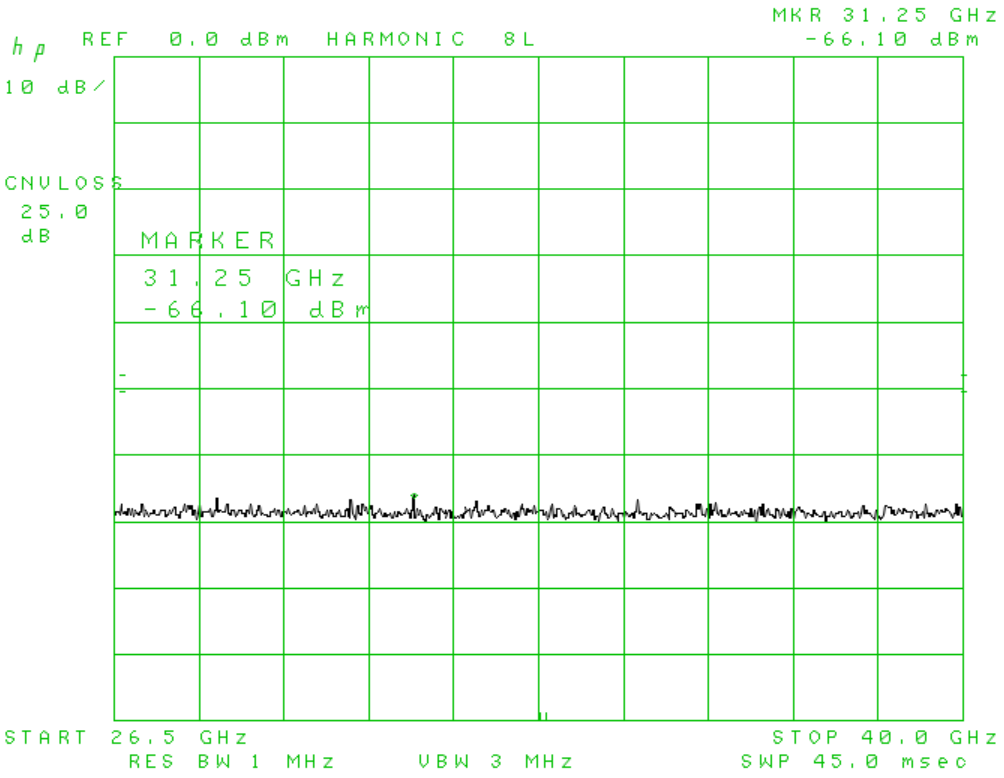


Figure 7. Antenna Conducted Emissions Channel 36 802.11a, Part 4

EIRP= -66.10 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -62.80 dBm

Limit= -27 dBm/MHz (15.407 (b))
Margin= -27 dBm/MHz – (-62.80) dBm/MHz = 35.8 dB

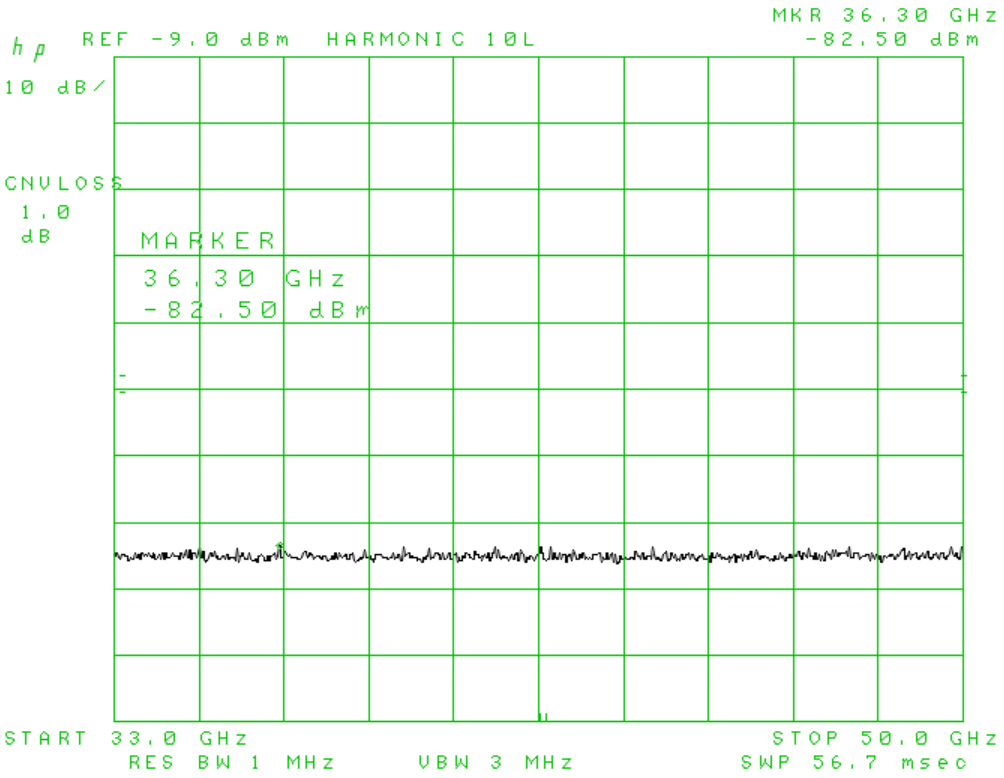


Figure 8. Antenna Conducted Emissions Channel 36 802.11a, Part 5

EIRP= -82.50 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -79.20 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-79.20) dBm/MHz = 52.20 dB

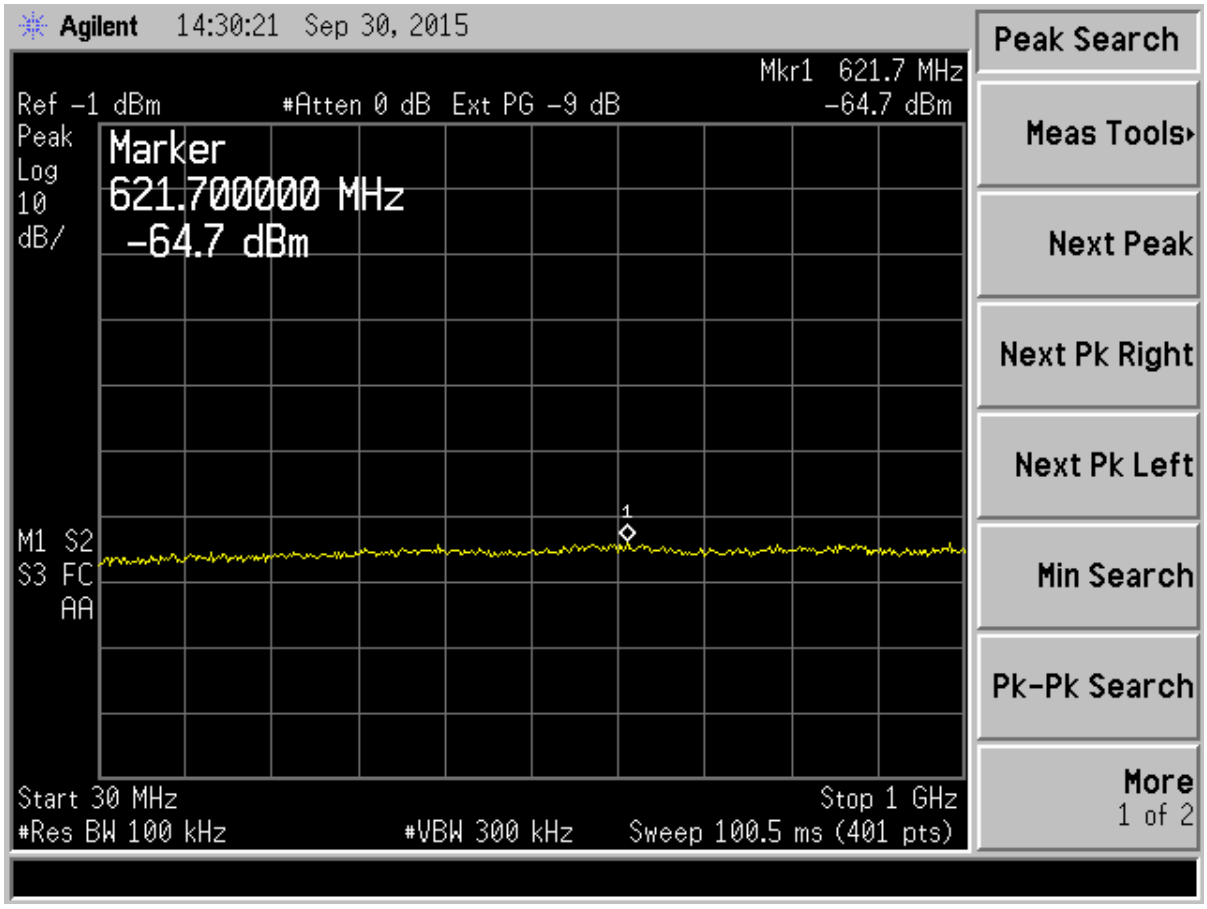


Figure 9. Antenna Conducted Emissions Channel 48 802.11a, Part 1

EIRP= -64.70 dBm + 3.3 dBi (applied antenna gain) + 4.7 dB (ground reflection factor)= -56.70 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-56.70) dBm/MHz = 29.7 dB

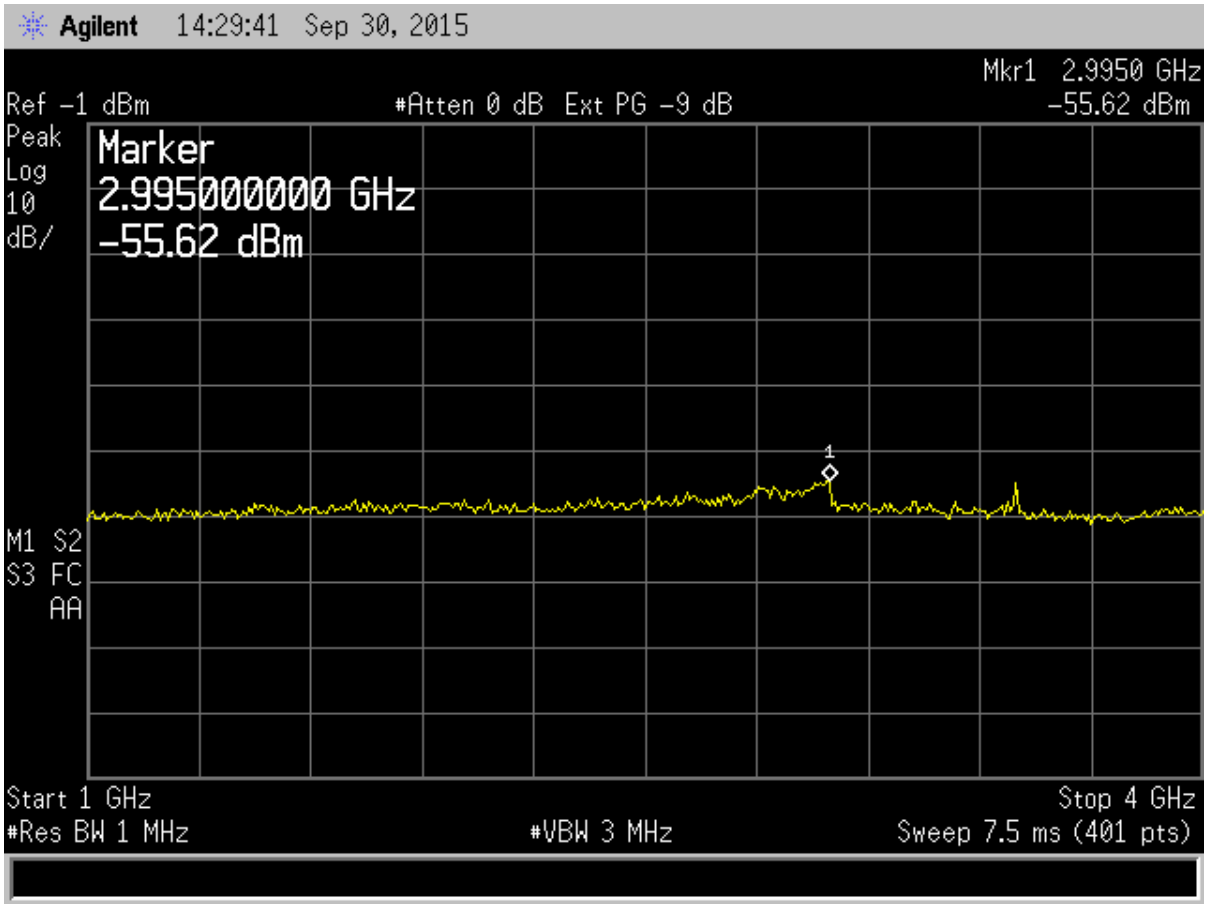


Figure 10. Antenna Conducted Emissions Channel 48 802.11a, Part 2

EIRP= -55.62 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -52.32 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-52.32) dBm/MHz = 25.32 dB

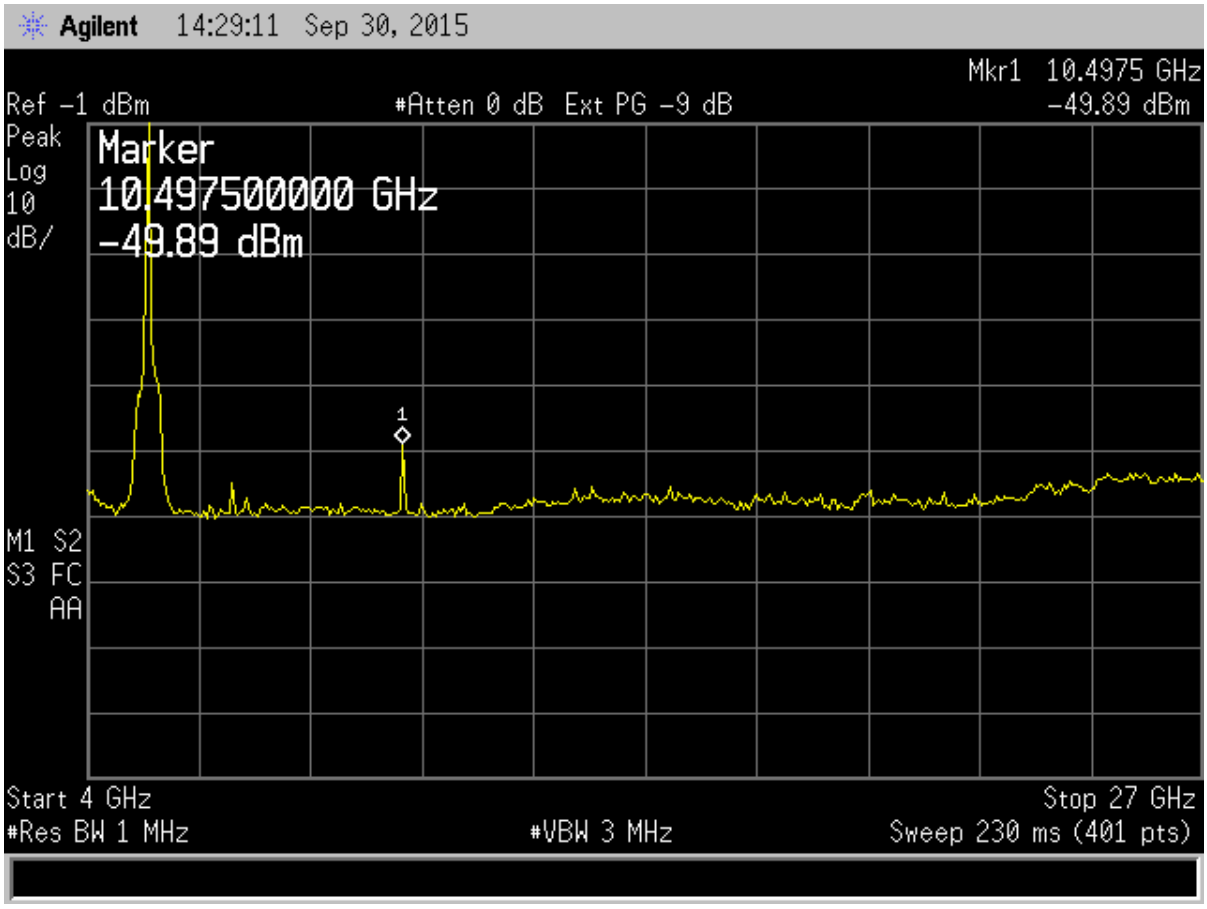


Figure 11. Antenna Conducted Emissions Channel 48 802.11a, Part 3

Note: Large signal seen in the figure above is the fundamental emission.

EIRP= -49.89 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -46.59 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-46.59) dBm/MHz = 19.59 dB

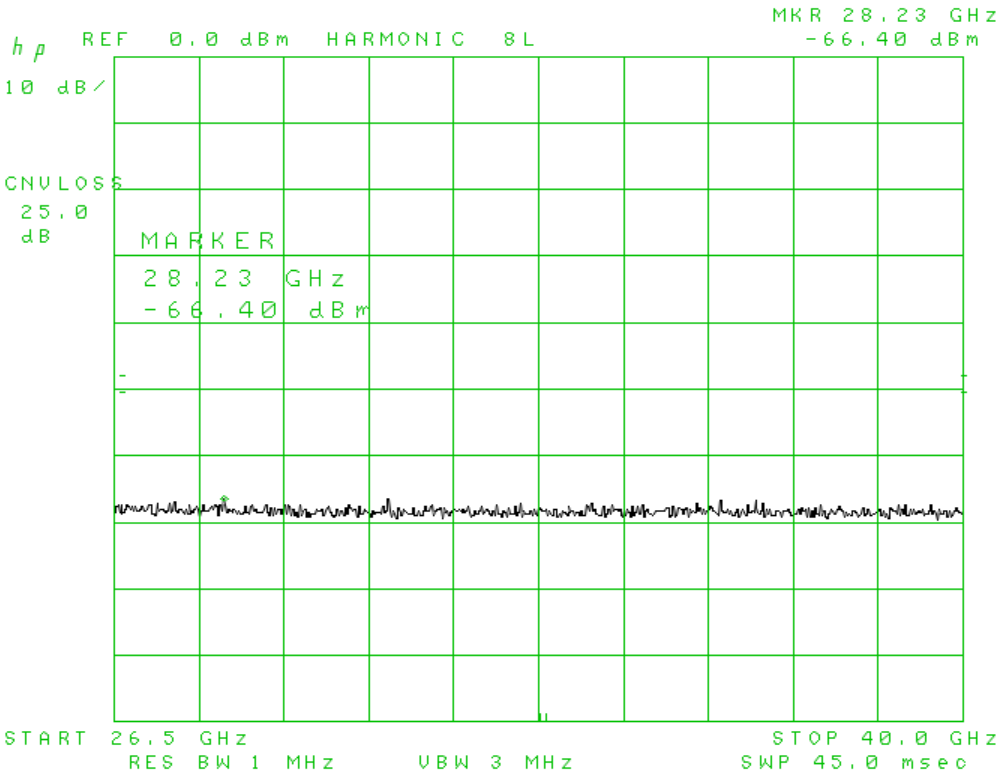


Figure 12. Antenna Conducted Emissions Channel 48 802.11a, Part 4

EIRP= -66.40 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -63.10 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-63.10) dBm/MHz = 36.10 dB

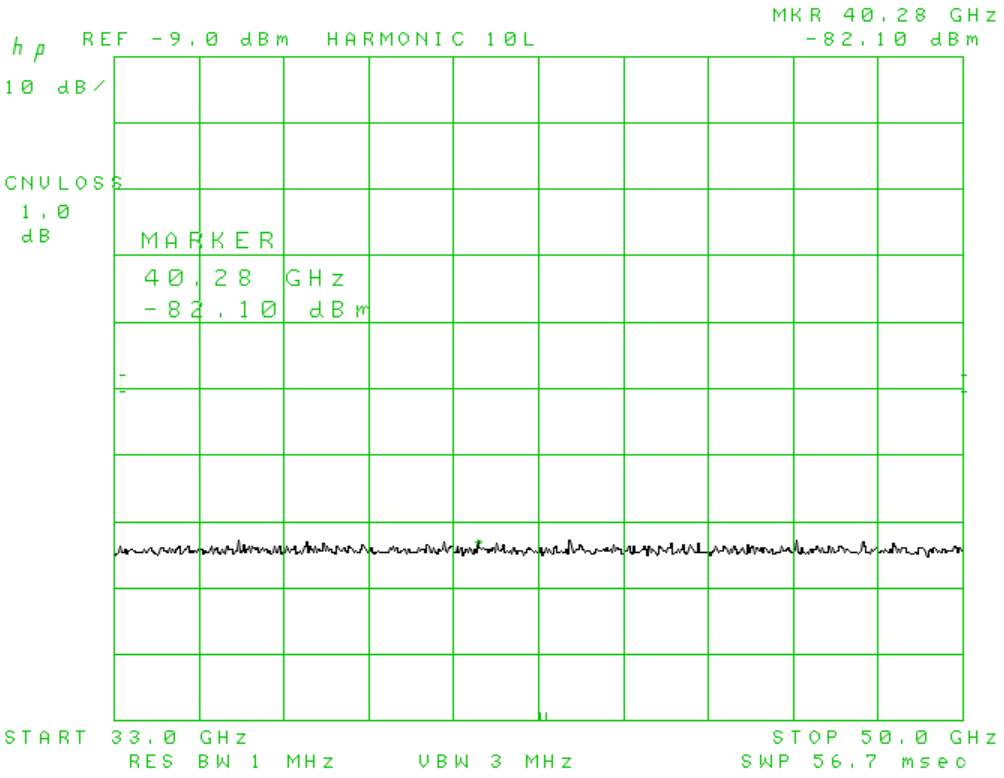


Figure 13. Antenna Conducted Emissions Channel 48 802.11a, Part 5

EIRP= -82.10 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -78.80 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-78.80) dBm/MHz = 51.80 dB

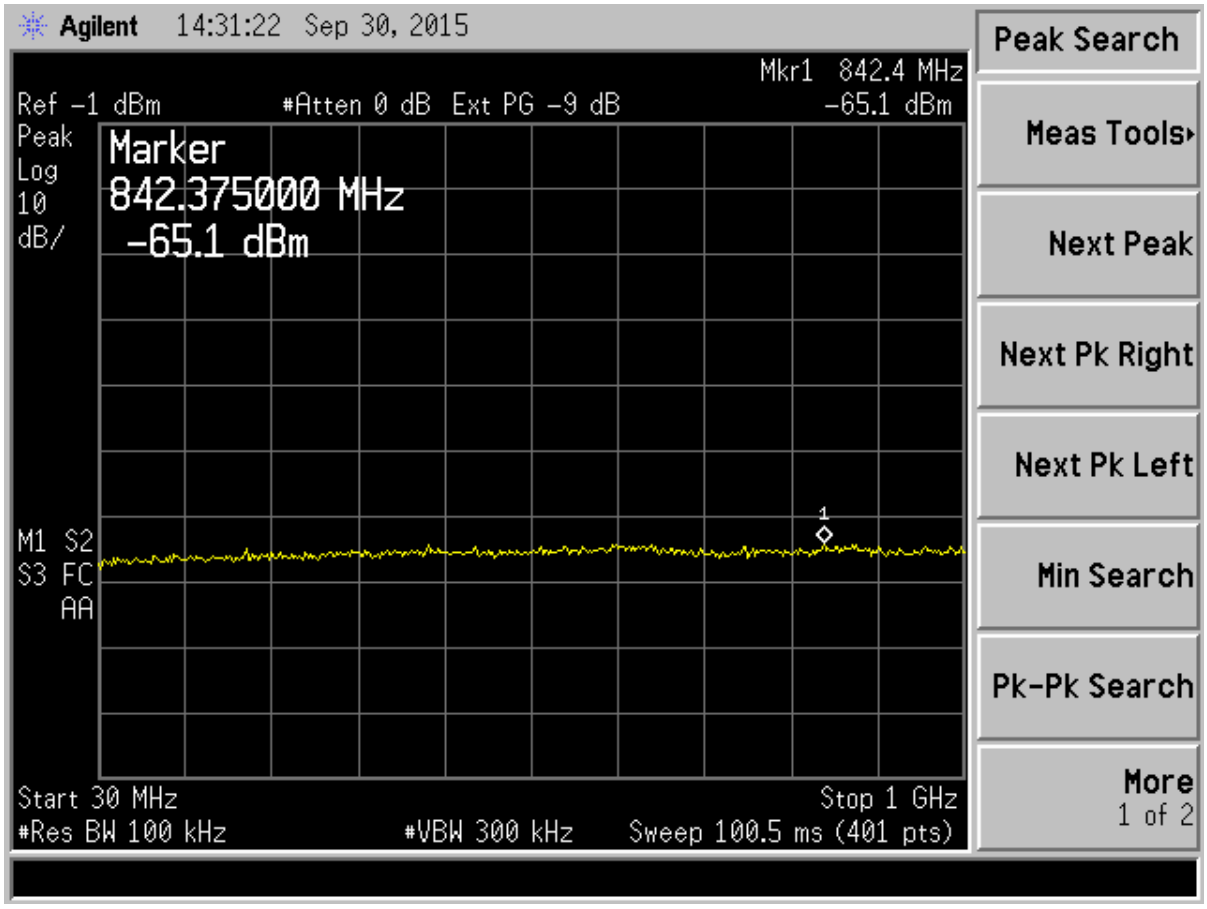


Figure 14. Antenna Conducted Emissions Channel 149 802.11a, Part 1

EIRP= -65.10 dBm+ 3.3 dBi (applied antenna gain) + 4.7 dB (ground reflection factor)= 57.10 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-57.10) dBm/MHz= 30.10 dB

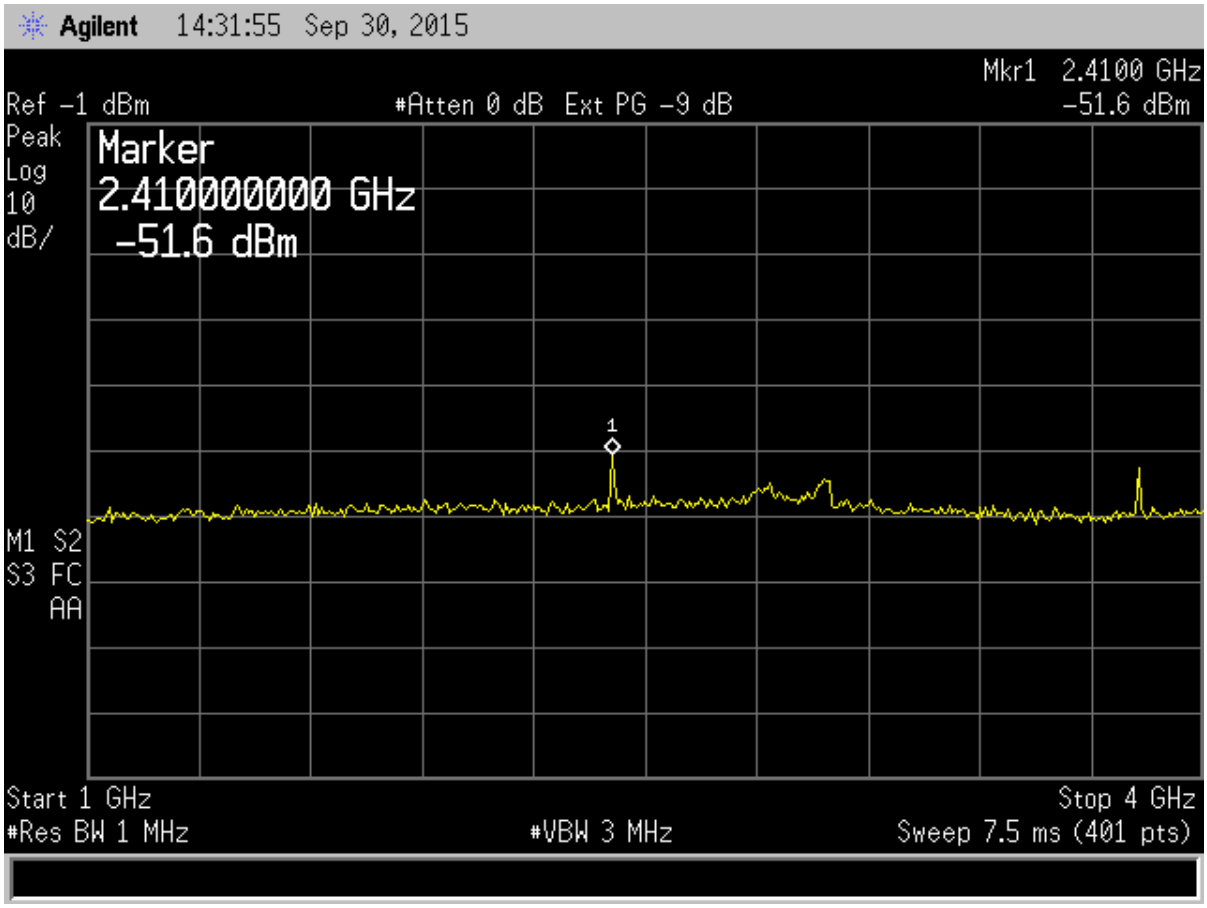


Figure 15. Antenna Conducted Emissions Channel 149 802.11a, Part 2

EIRP= -51.60 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -48.30 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-48.30) dBm/MHz = 21.30 dB

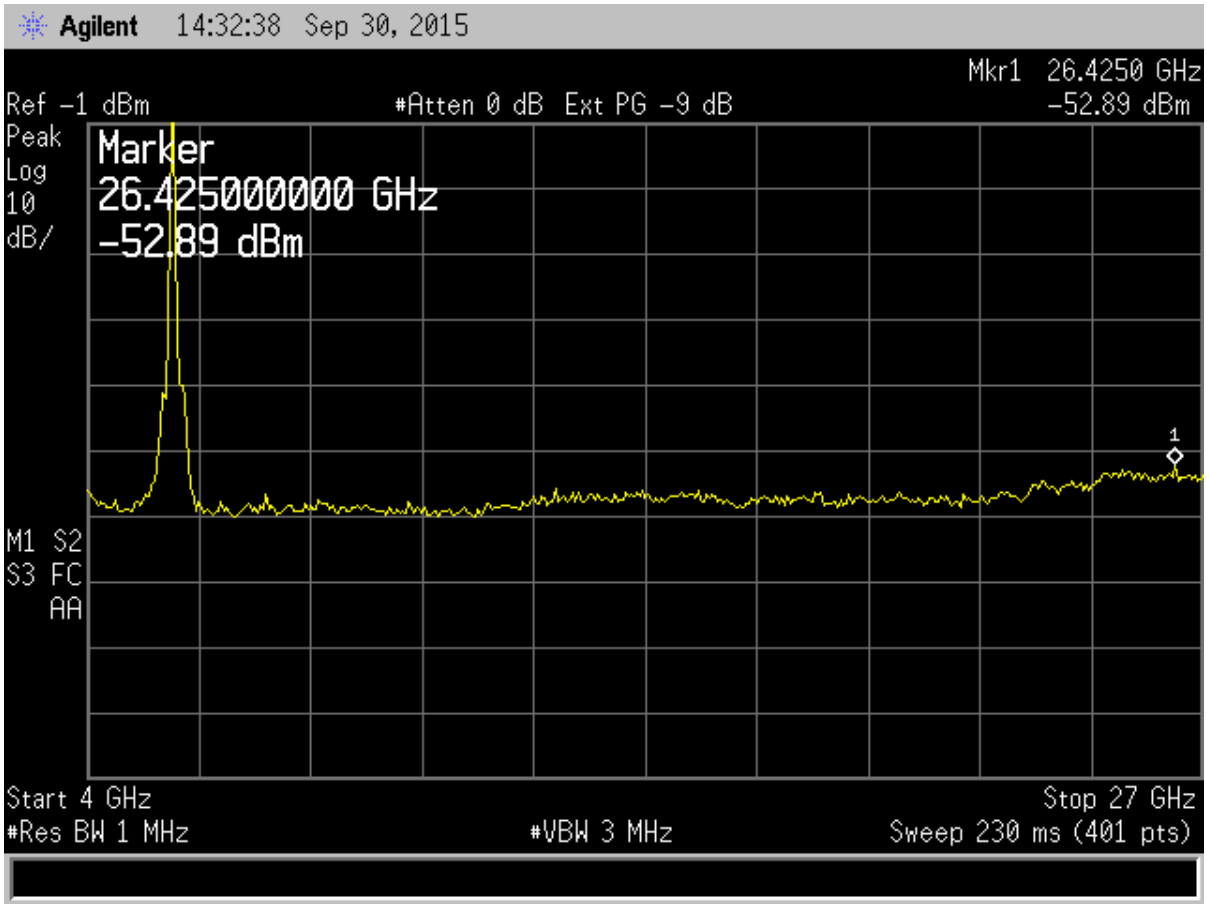


Figure 16. Antenna Conducted Emissions Channel 149 802.11a, Part 3

Note: Large signal seen in the figure above is the fundamental emission

EIRP= -52.89 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -49.59 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-49.59) dBm/MHz= 22.59 dB

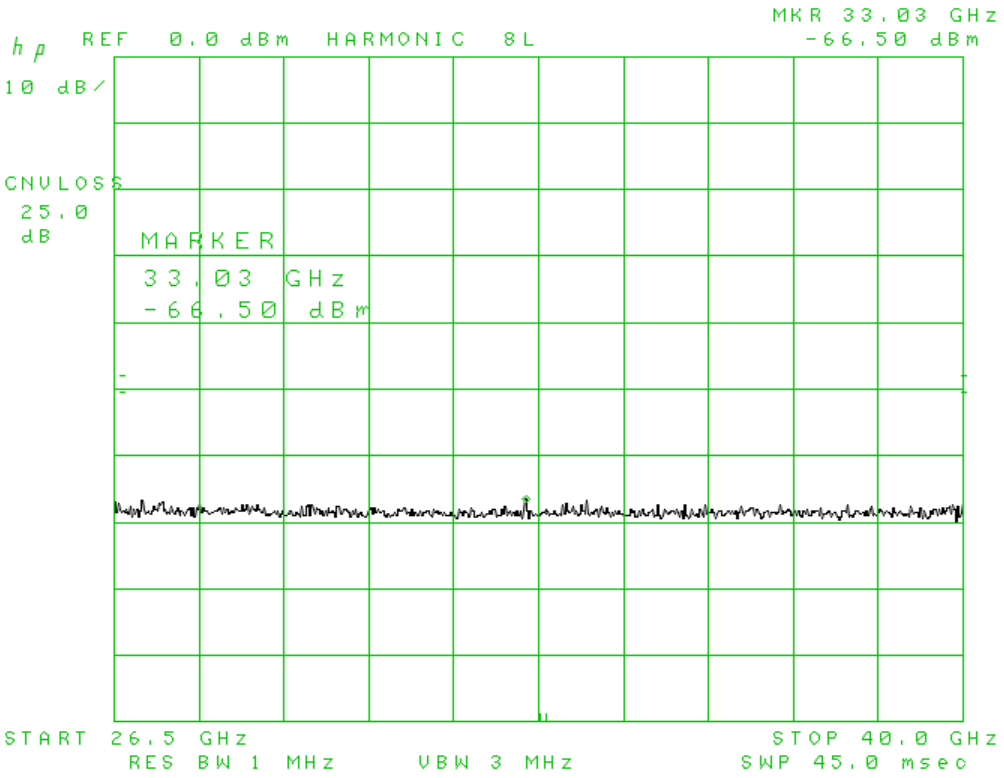


Figure 17. Antenna Conducted Emissions Channel 149 802.11a, Part 4

EIRP= -66.50 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -63.20 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-63.20) dBm/MHz= 36.20 dB

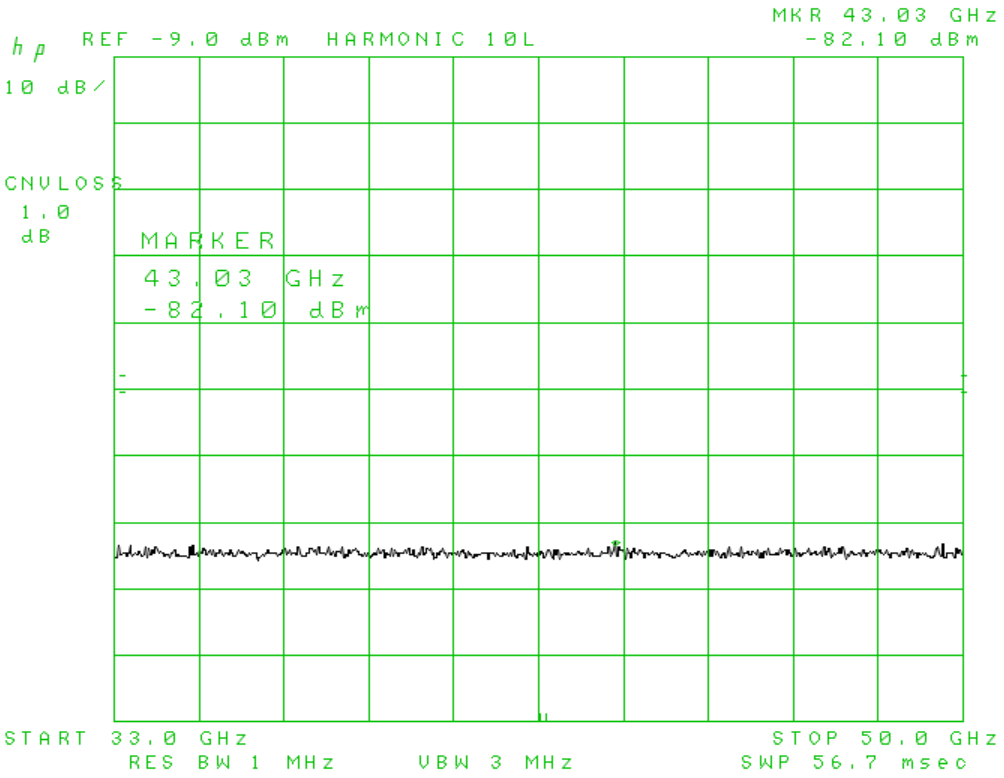


Figure 18. Antenna Conducted Emissions Channel 149 802.11a, Part 5

EIRP= -82.10 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -78.80 dBm

Limit= -27 dBm/MHz (15.407 (b))
Margin= -27 dBm/MHz – (-78.80) dBm/MHz = 51.80 dB

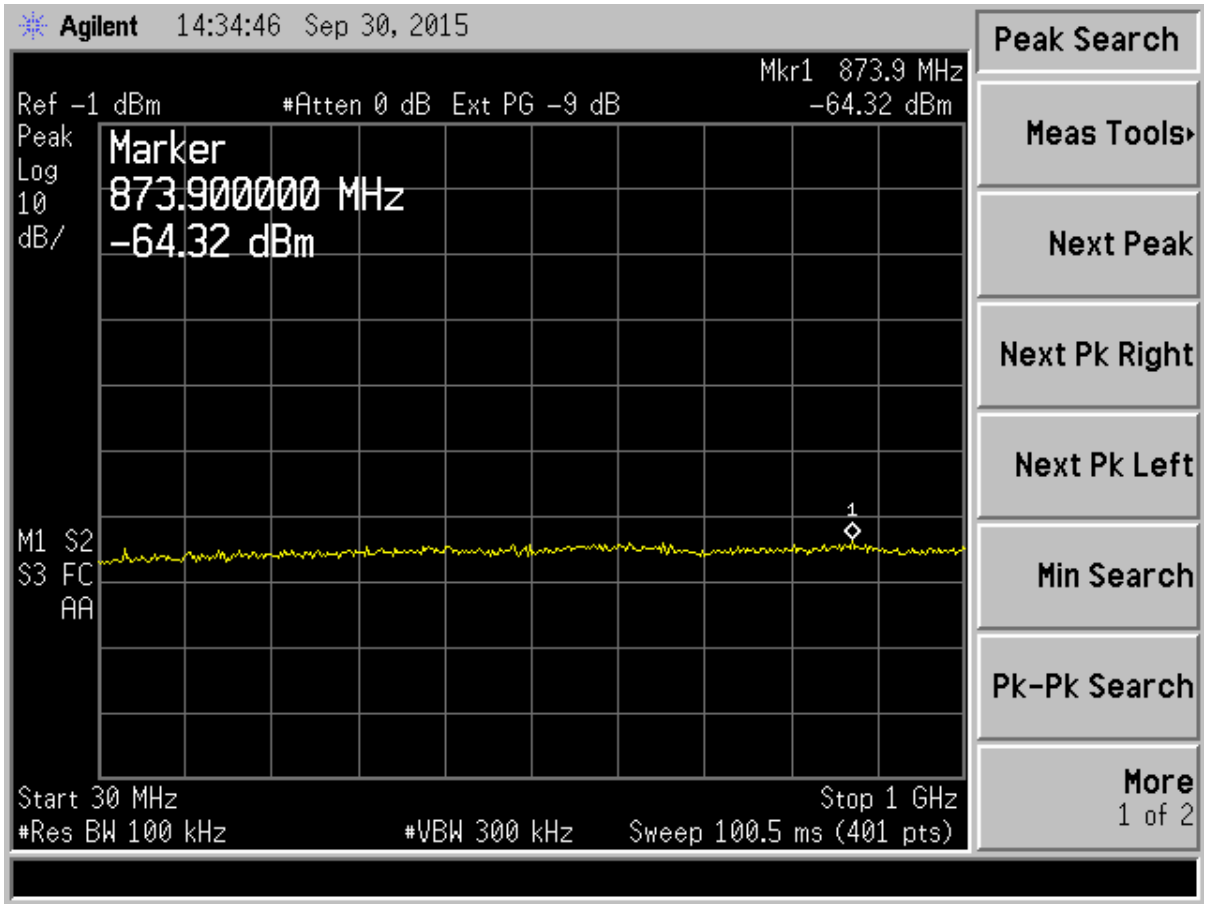


Figure 19. Antenna Conducted Emissions Channel 165 802.11a, Part 1

EIRP= -64.32 dBm + 3.3 dBi (applied antenna gain) + 4.7 dB (ground reflection factor)= -56.32 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-56.32) dBm/MHz= 29.32 dB

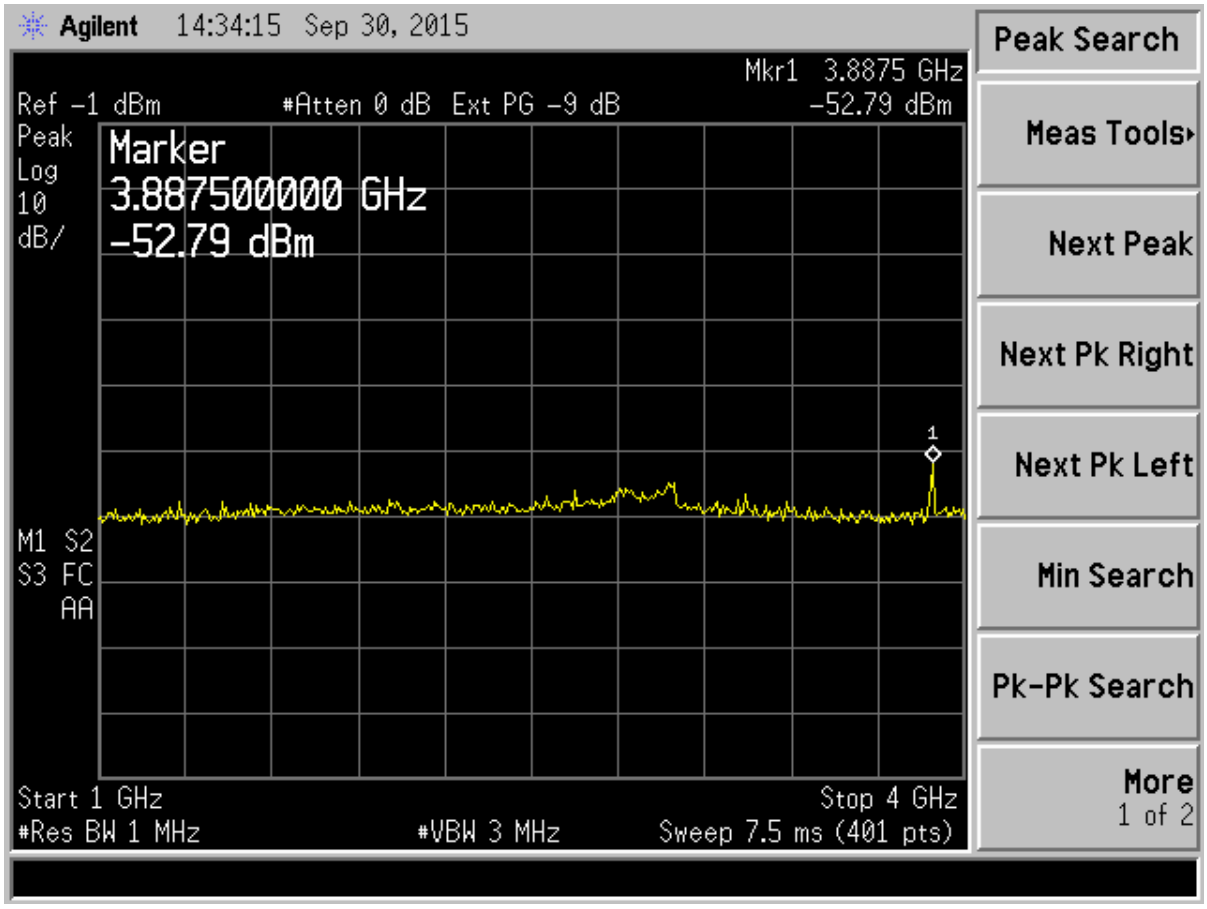


Figure 20. Antenna Conducted Emissions Channel 165 802.11a, Part 2

EIRP= -52.79 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -49.49 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz –(-49.49) dBm/MHz= 22.49 dB

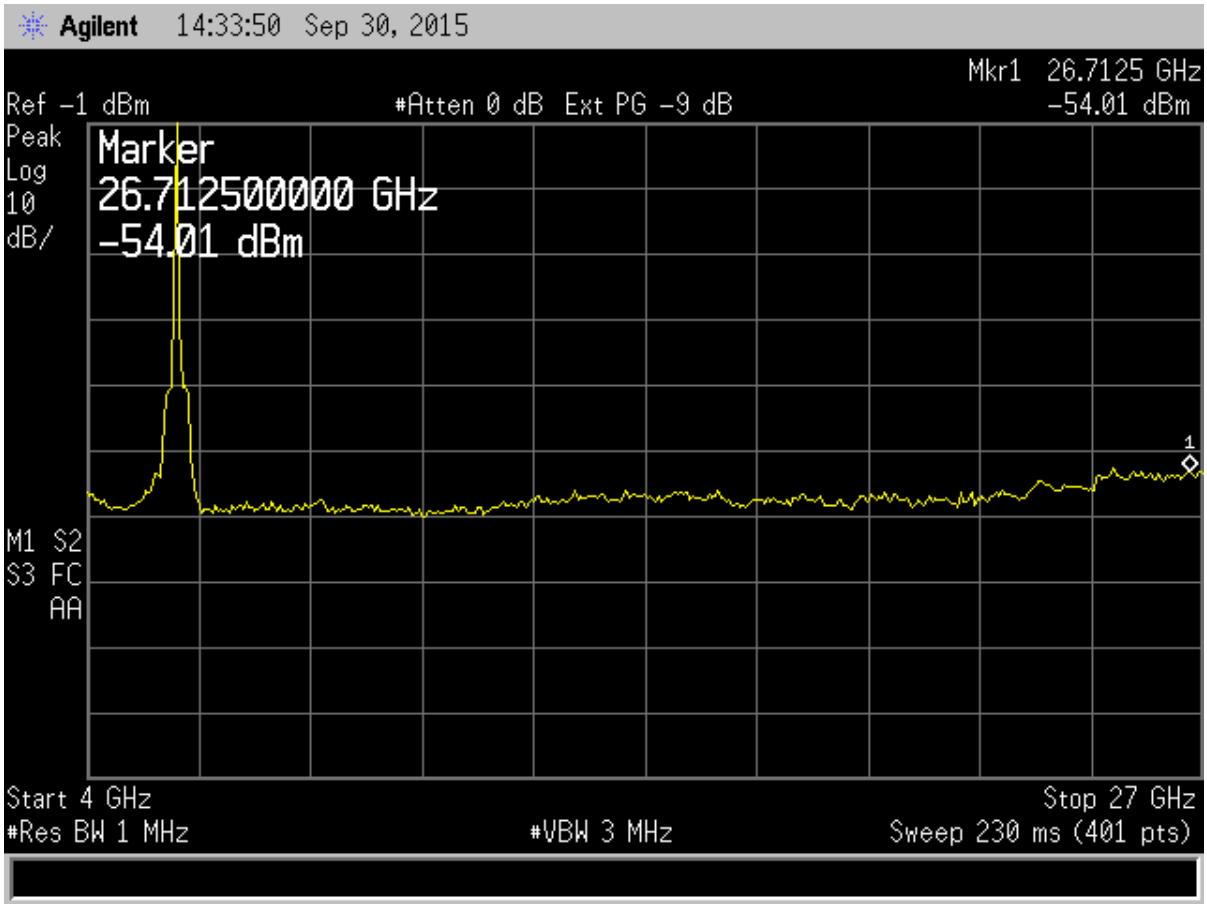


Figure 21. Antenna Conducted Emissions Channel 165 802.11a, Part 3

Note: Large signal seen in the above figure is the fundamental emission

EIRP= -54.01 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -50.71 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-50.71) dBm/MHz= 23.71 dB

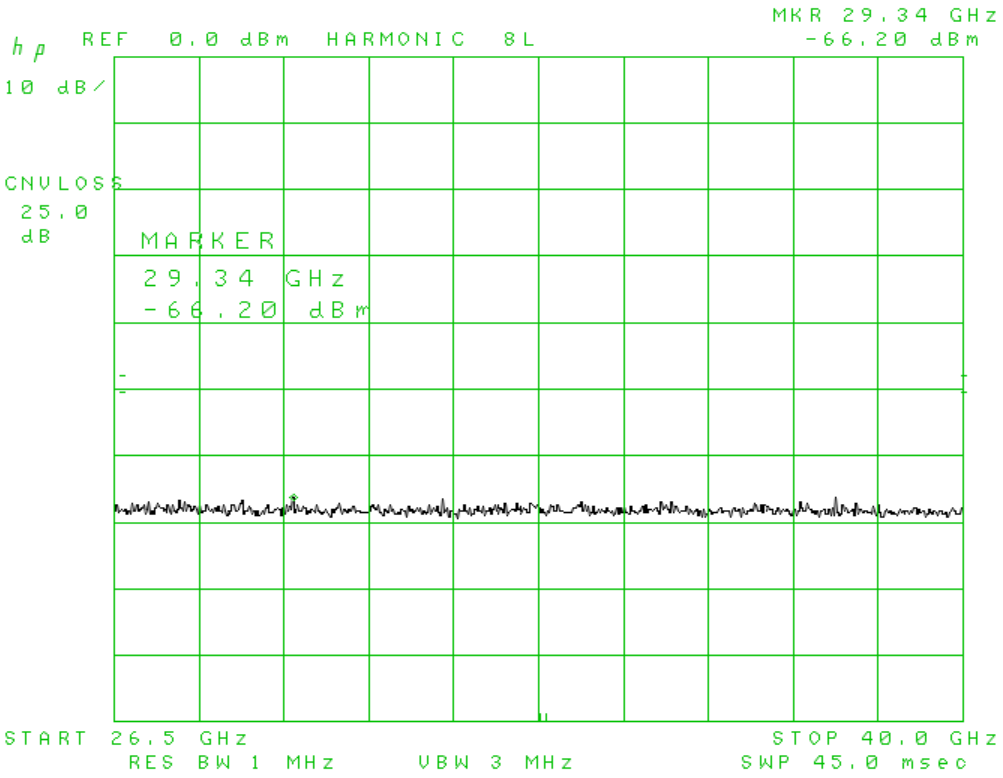


Figure 22. Antenna Conducted Emissions Channel 165 802.11a, Part 4

EIRP= -66.20 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -62.90 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-62.90) dBm/MHz= 35.90 dB

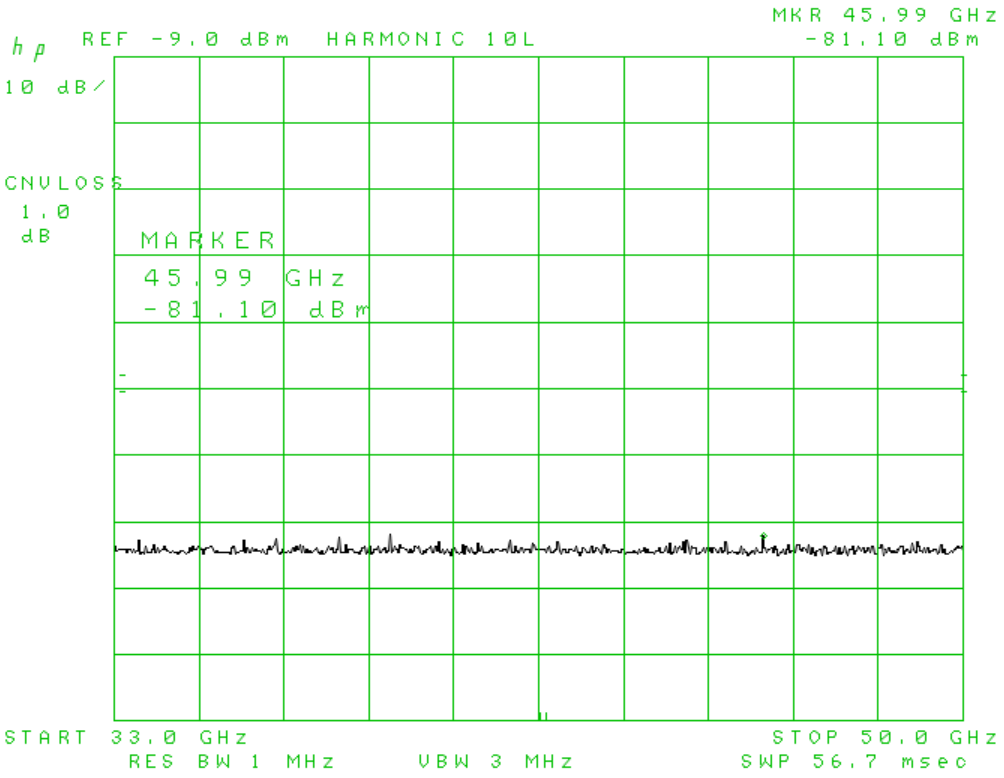


Figure 23. Antenna Conducted Emissions Channel 165 802.11a, Part 5

EIRP= -81.10 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -77.80 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-77.80) dBm/MHz = 50.80 dB

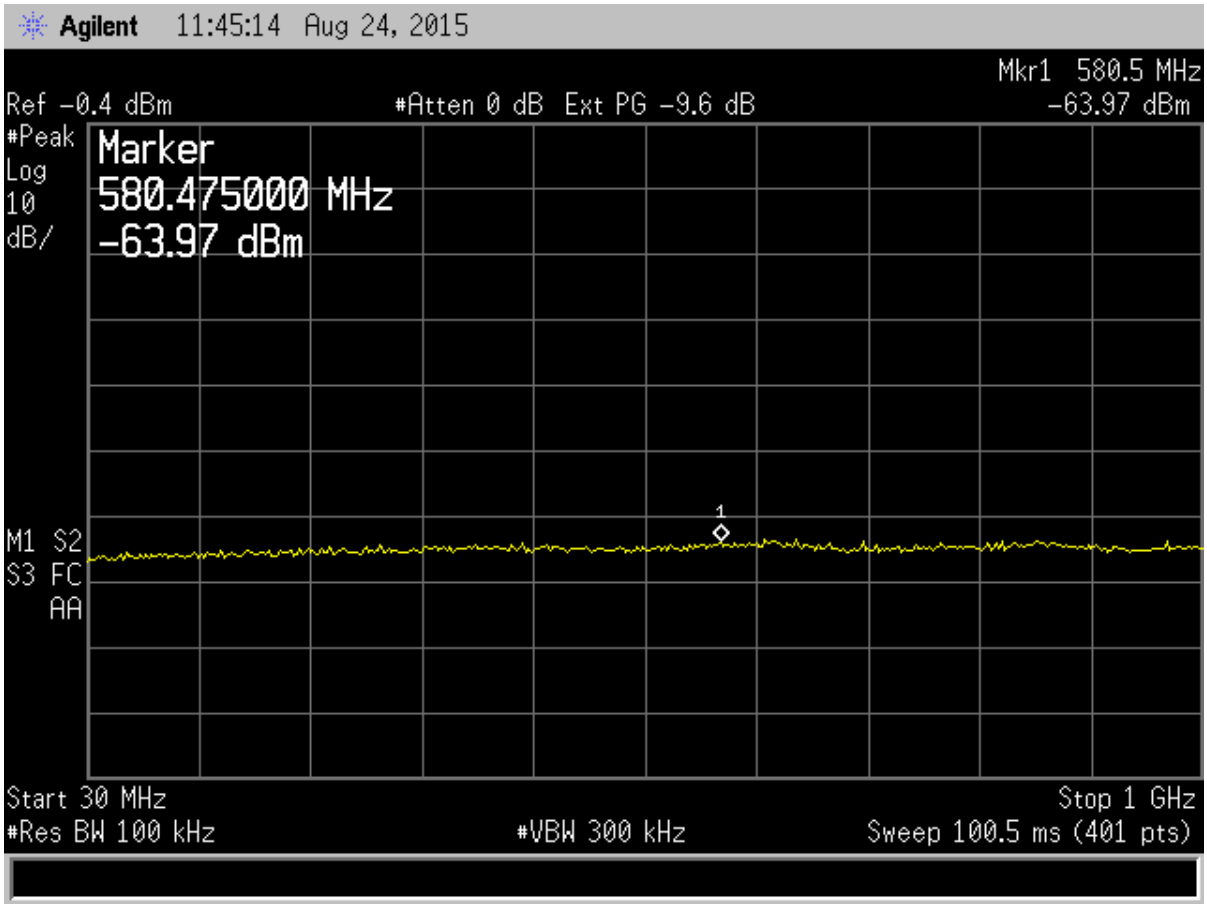


Figure 24. Antenna Conducted Emissions Channel 36 802.11n, Part 1

EIRP= -63.97 dBm + 3.3 dBi (applied antenna gain) + 4.7 dB (ground reflection factor)= -55.97 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-55.97) dBm/MHz= 28.97 dB

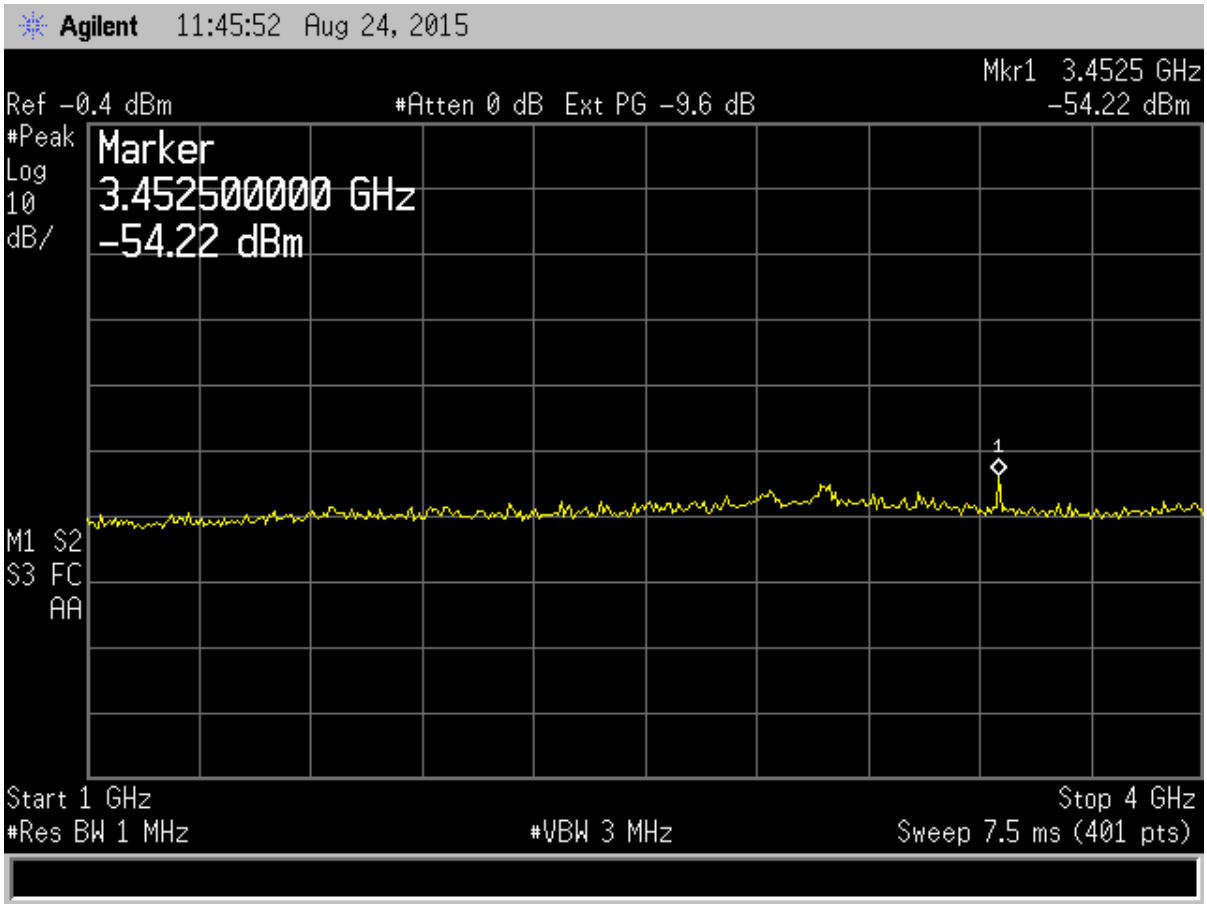


Figure 25. Antenna Conducted Emissions Channel 36 802.11n, Part 2

EIRP= -54.22 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -50.92 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-50.92) dBm/MHz= 23.92 dB

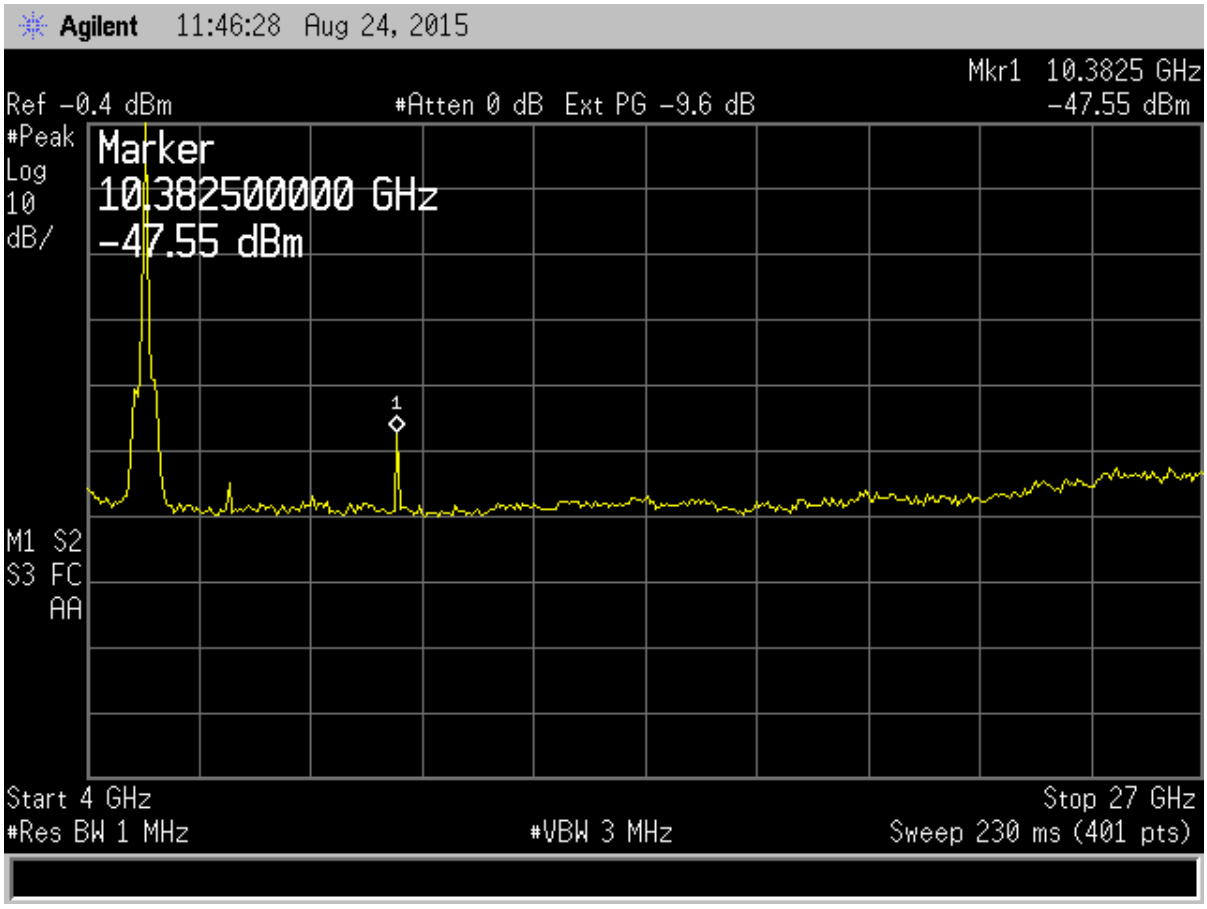


Figure 26. Antenna Conducted Emissions Channel 36 802.11n, Part 3

Note: Large signal seen in the figure above is the fundamental emission

EIRP= -47.55 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -44.25 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-44.25) dBm/MHz= 17.25 dB

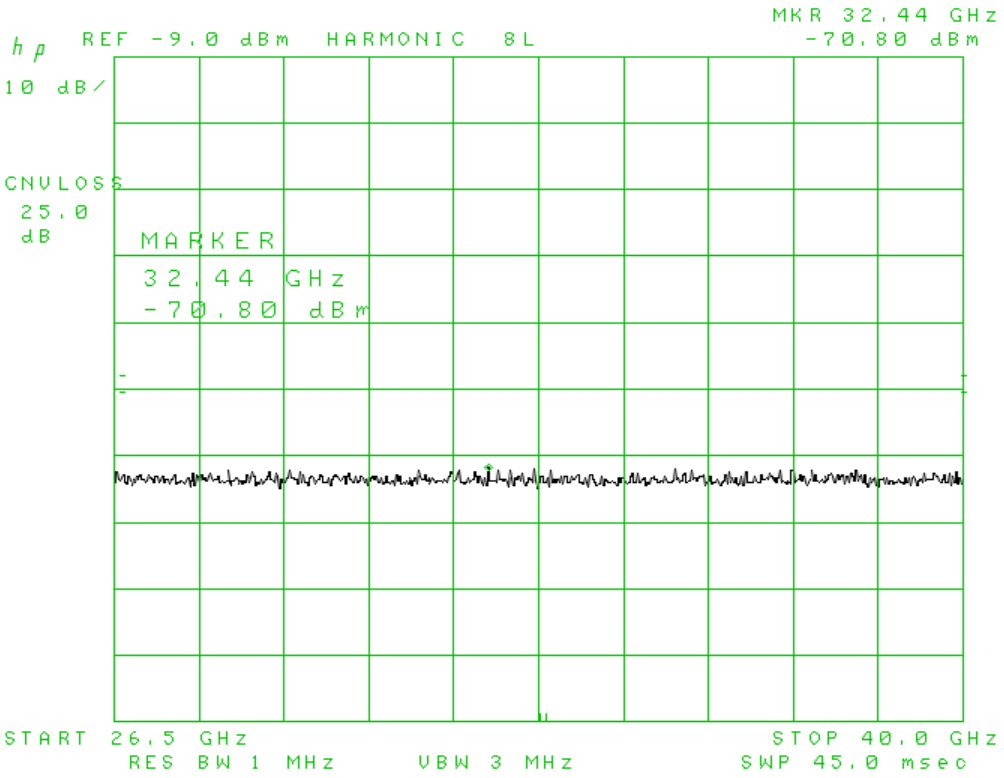


Figure 27. Antenna Conducted Emissions Channel 36 802.11n, Part 4

EIRP= -70.80 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -67.50 dBm

Limit= -27 dBm/MHz (15.407 (b))
Margin= -27 dBm/MHz – (-67.50) dBm/MHz = 40.50 dB

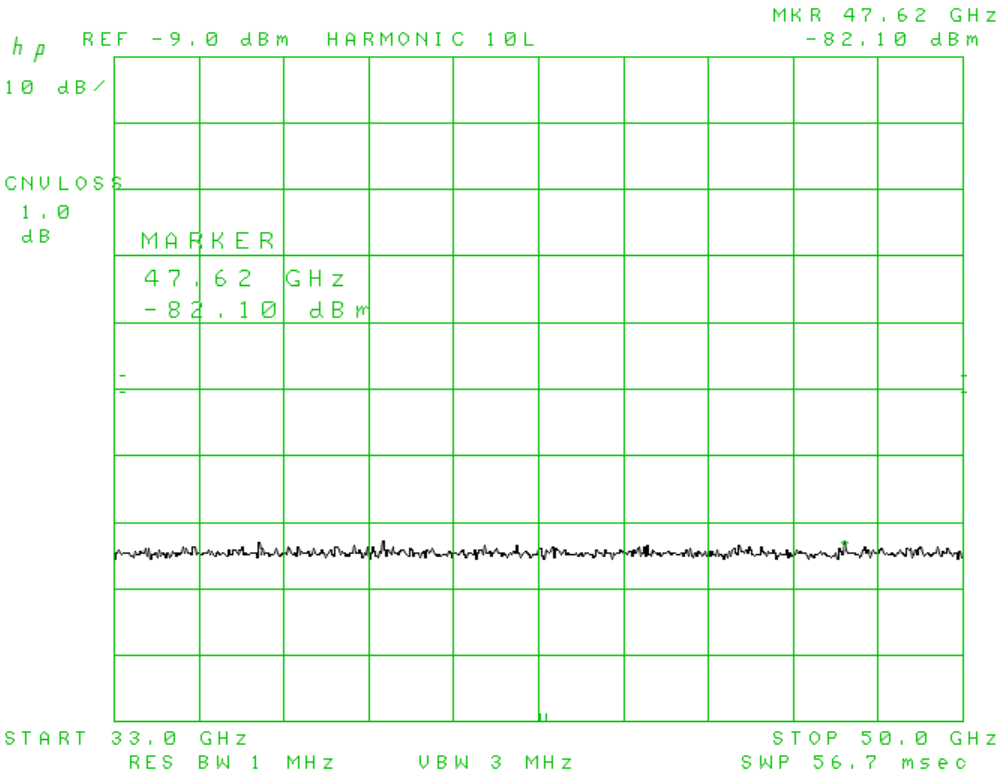


Figure 28. Antenna Conducted Emissions Channel 36 802.11n, Part 5

EIRP= -82.10 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -78.80dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-78.80) dBm/MHz= 51.80 dB

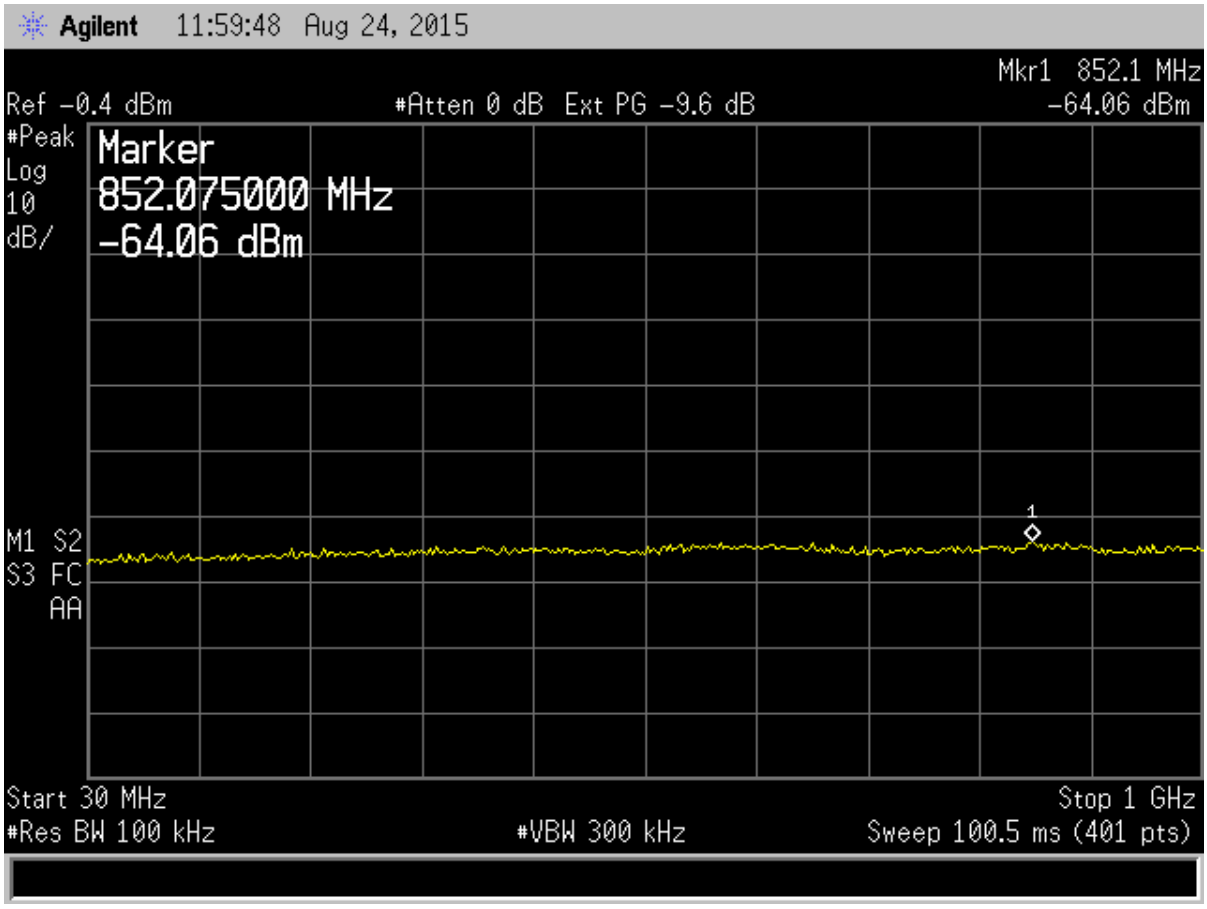


Figure 29. Antenna Conducted Emissions Channel 48 802.11n, Part 1

EIRP= -64.06 dBm + 3.3 dBi (max antenna gain) + 4.7 dB (ground reflection factor)= -56.06 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-56.06) dBm/MHz= 29.06 dB

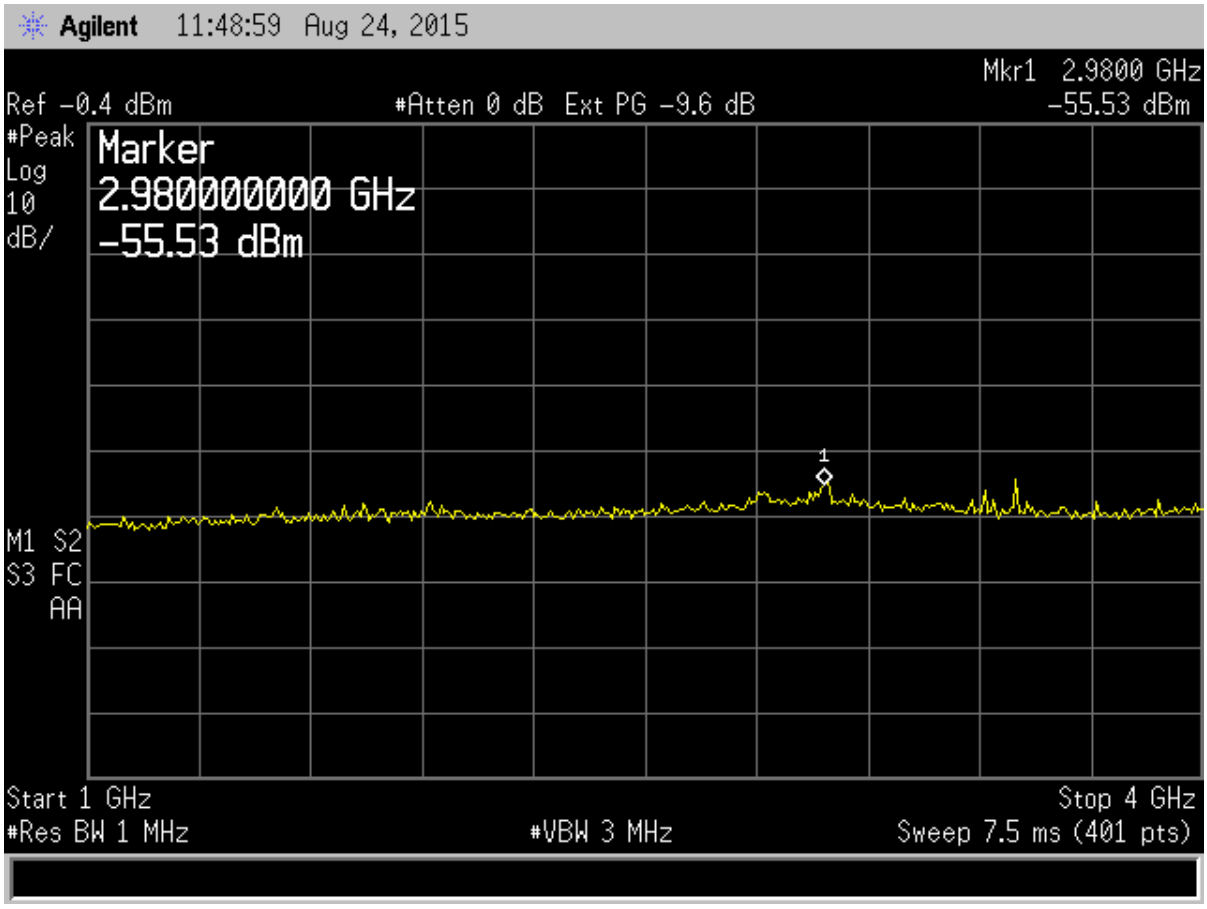


Figure 30. Antenna Conducted Emissions Channel 48 802.11n, Part 2

EIRP= -55.53 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -52.23 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-52.23) dBm/MHz= 25.23 dB

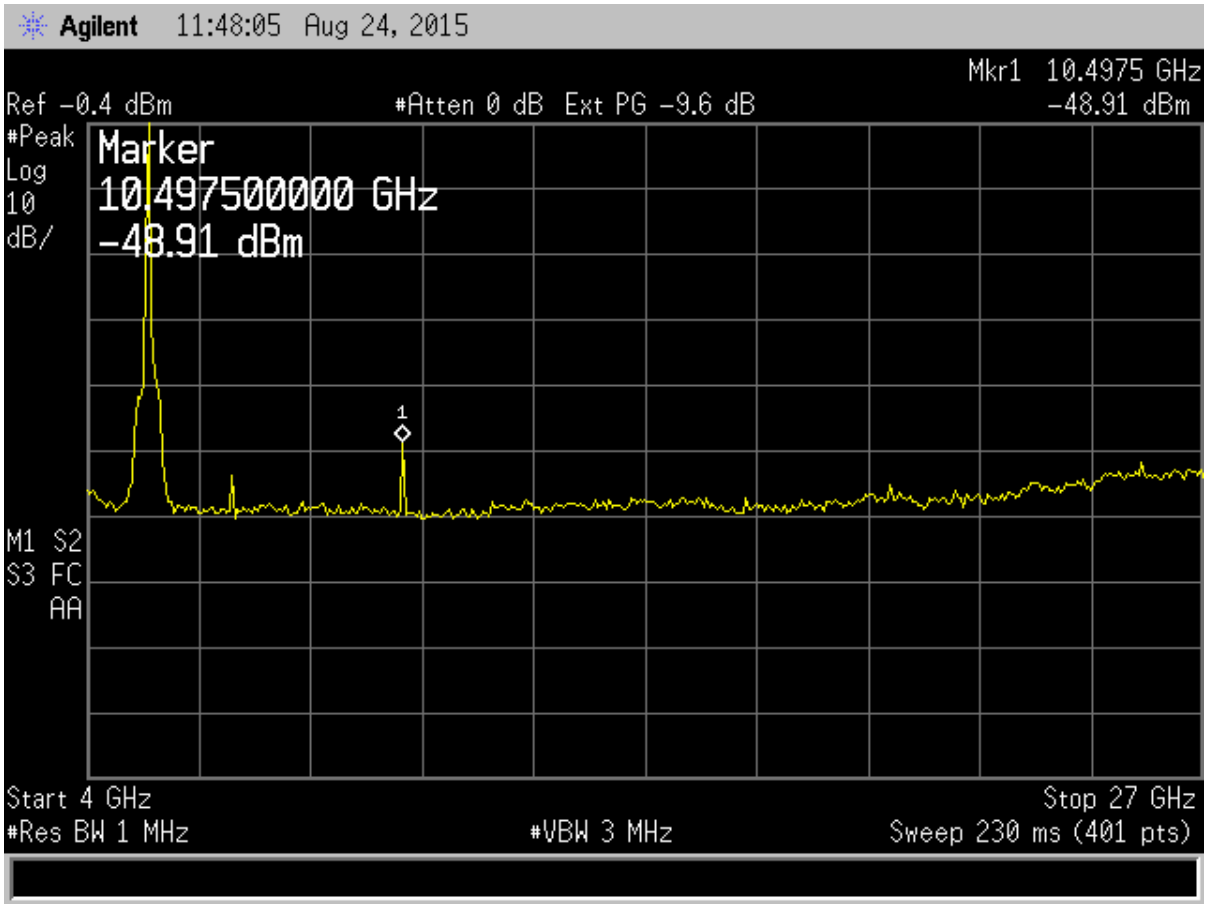


Figure 31. Antenna Conducted Emissions Channel 48 802.11n, Part 3

Note: Large signal seen in the above figure is the fundamental emission

EIRP= -48.91 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -45.61 dBm

Limit= -27 dBm/MHz (15.407 (b))
Margin= -27 dBm/MHz – (-45.61) dBm/MHz= 18.61 dB

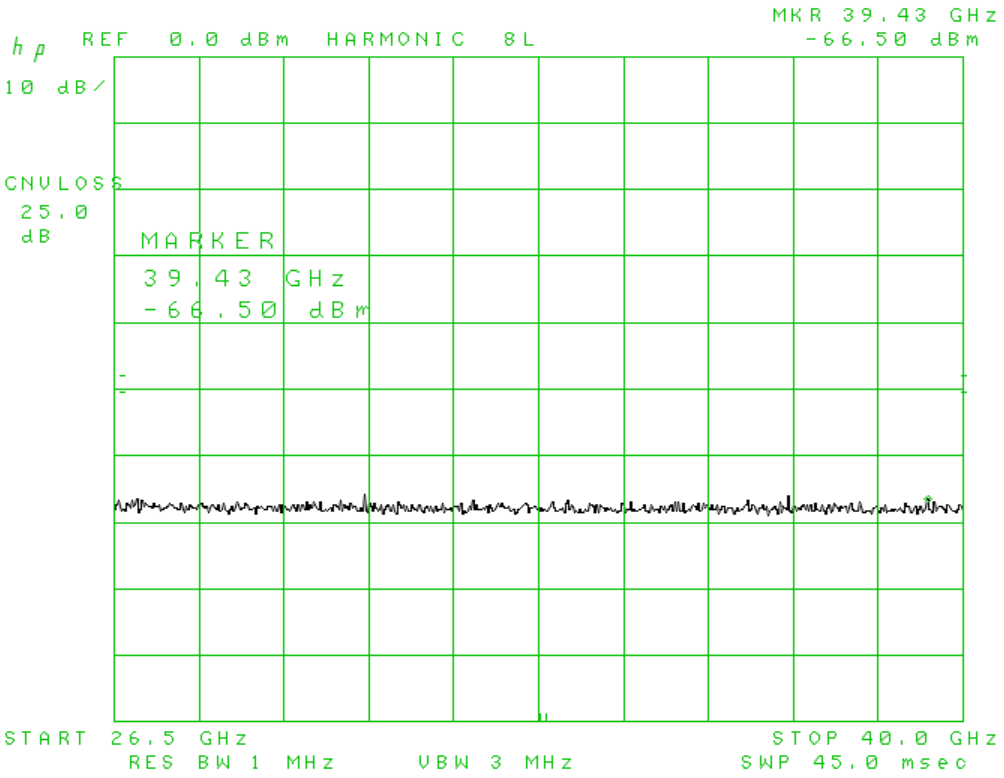


Figure 32. Antenna Conducted Emissions Channel 48 802.11n, Part 4

EIRP= -66.50 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -63.20 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-63.20) dBm/MHz= 36.20 dB

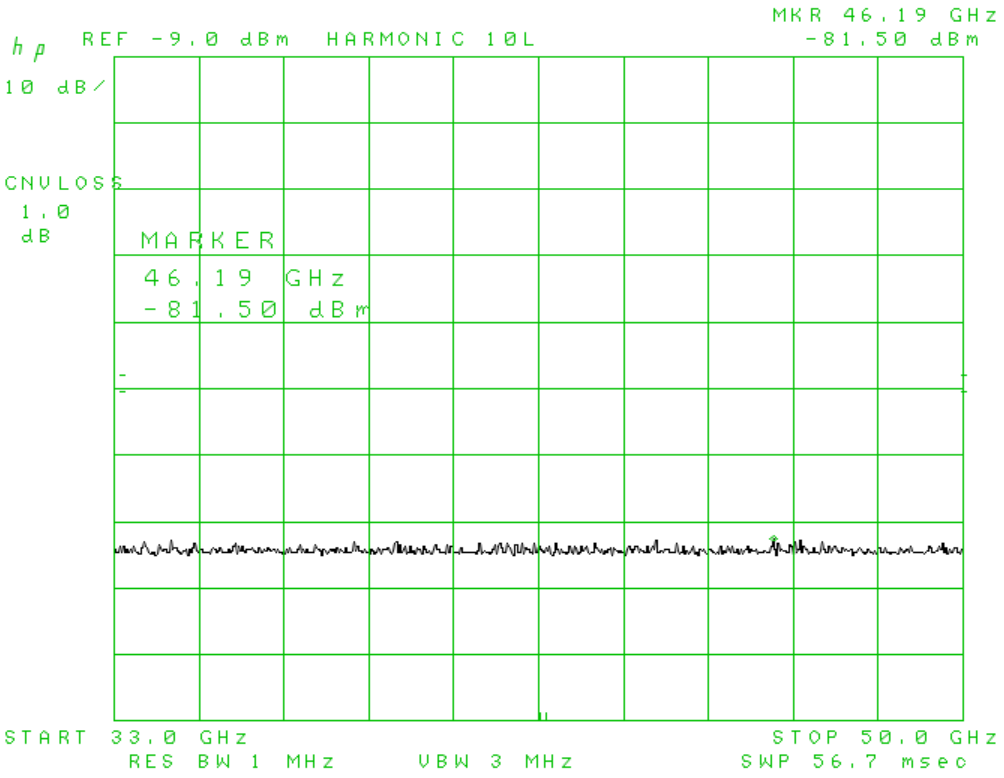


Figure 33. Antenna Conducted Emissions Channel 48 802.11n, Part 5

EIRP= -81.50 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -78.20 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-78.20) dBm/MHz = 51.20 dB

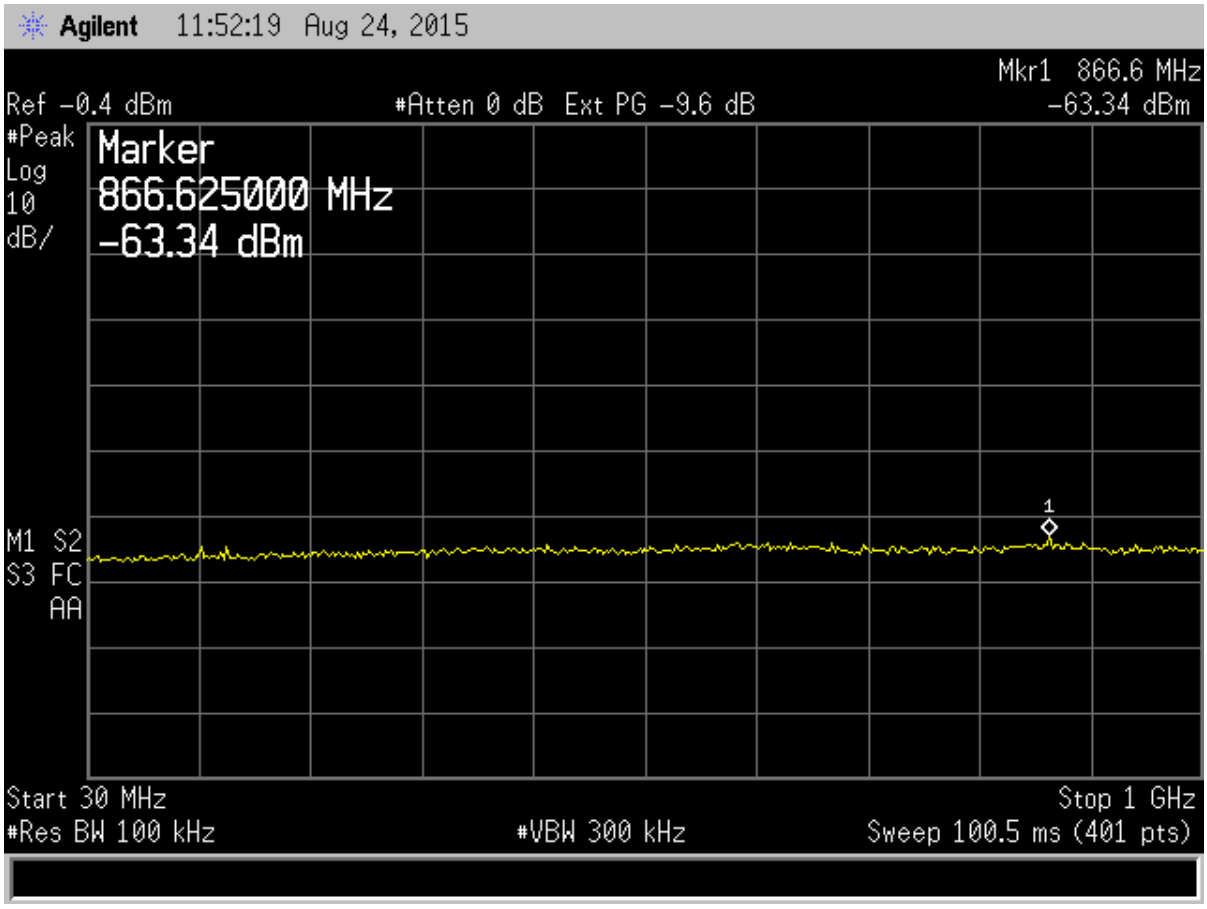


Figure 34. Antenna Conducted Emissions Channel 149 802.11n, Part 1

EIRP= -63.34 dBm + 3.3 dBi (applied antenna gain) + 4.7 dB (ground reflection factor)= -55.34 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-55.34) dBm/MHz= 28.34 dB

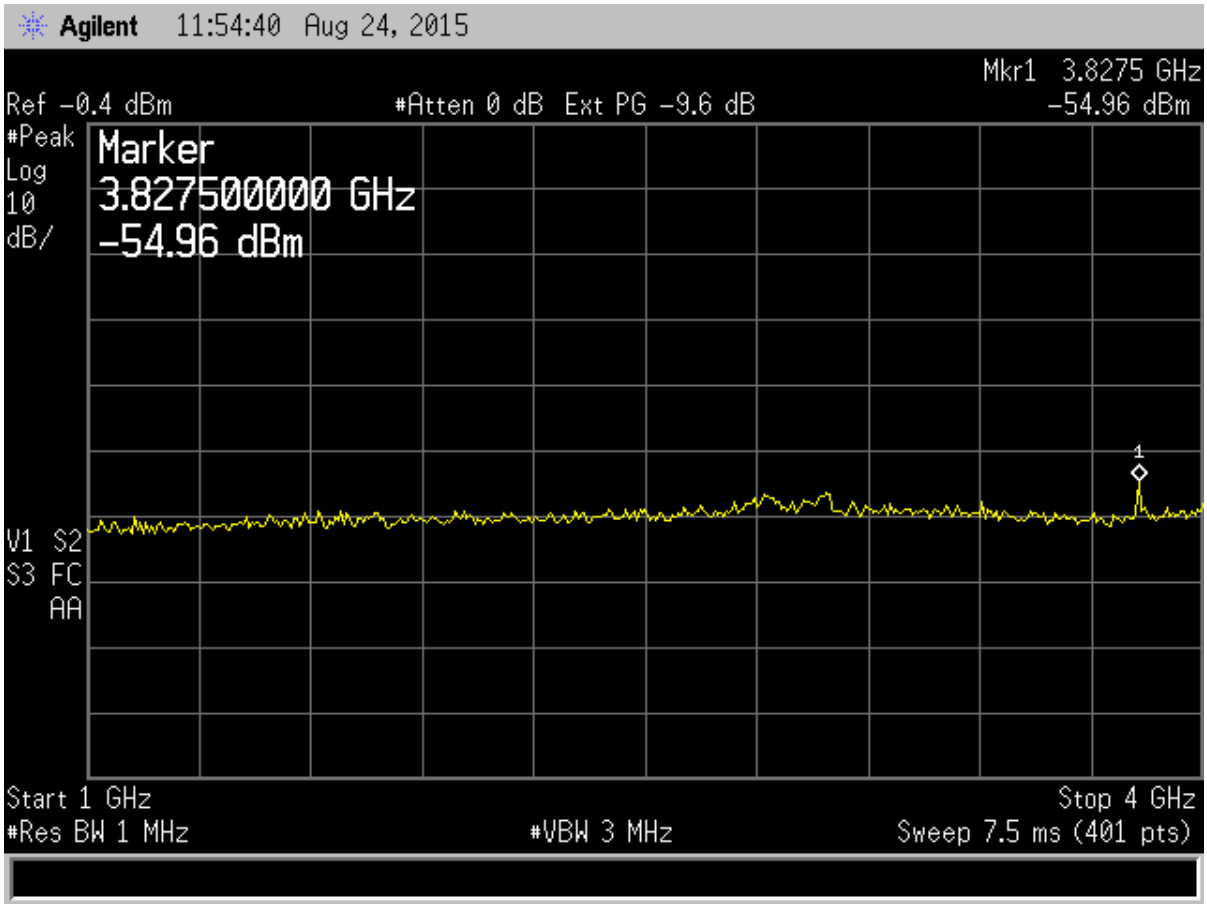


Figure 35. Antenna Conducted Emissions Channel 149 802.11n, Part 2

EIRP= -54.96 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -51.66 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-51.66) dBuV/m= 24.66 dB

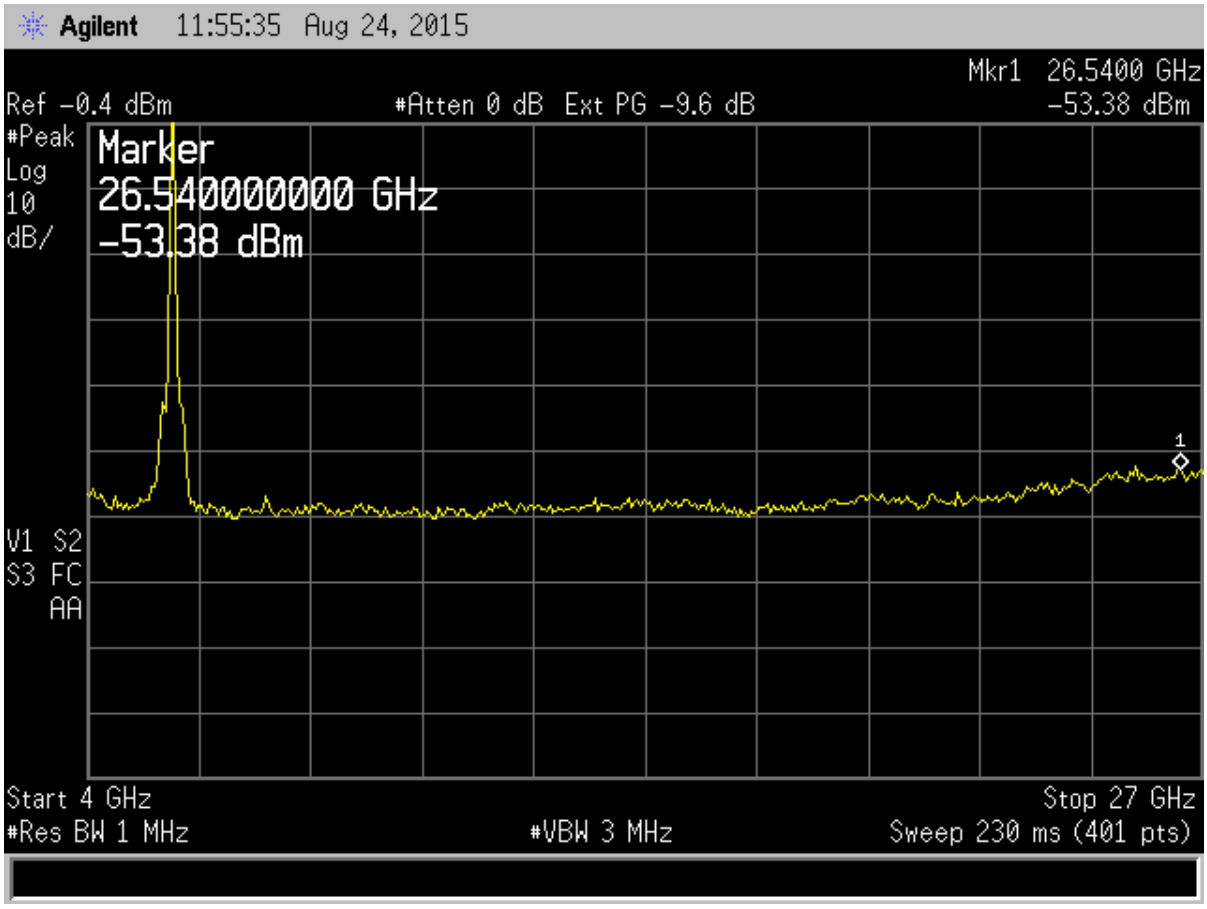


Figure 36. Antenna Conducted Emissions Channel 149 802.11n, Part 3

Note: Large signal seen in the above figure is the fundamental emission

EIRP= -53.38 dBm/MHz + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -50.08 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-50.08) dBm/MHz= 23.08 dB

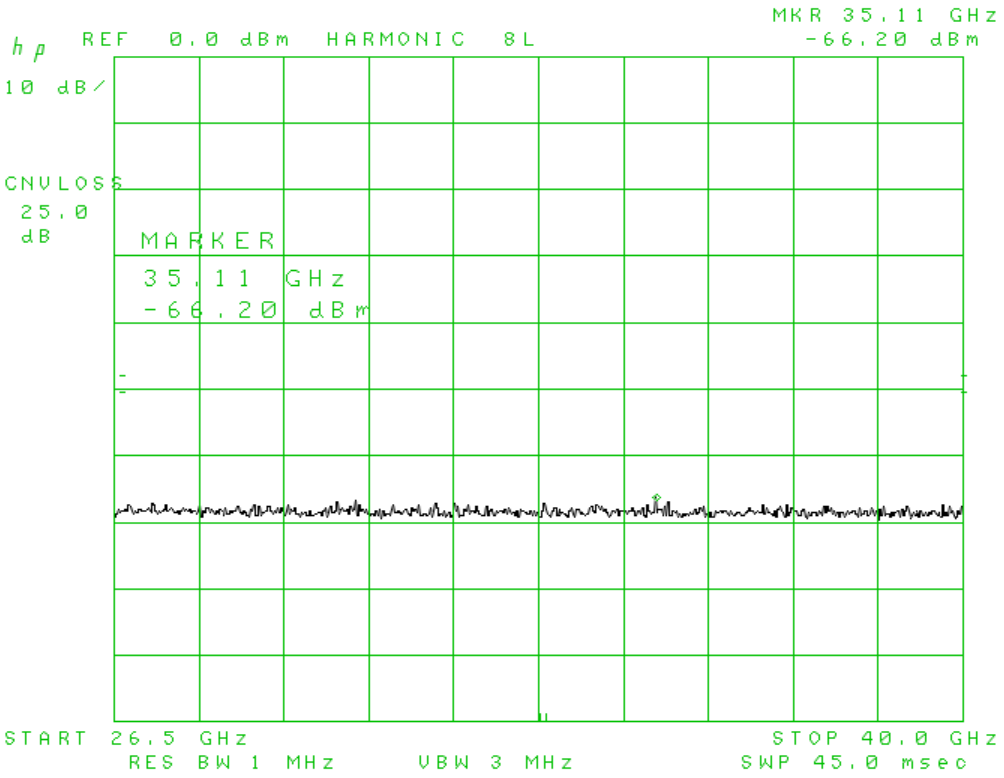


Figure 37. Antenna Conducted Emissions Channel 149 802.11n, Part 4

EIRP= -66.20 dBm/MHz + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -62.90 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz m – (-62.90) dBm/MHz= 35.90 dB

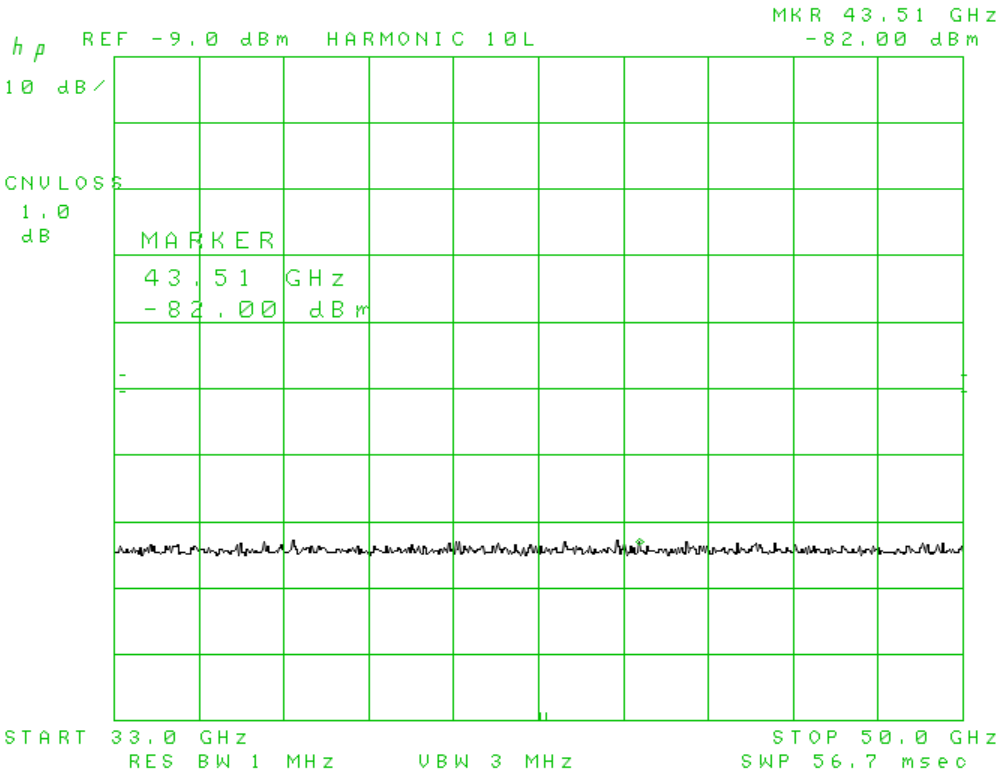


Figure 38. Antenna Conducted Emissions Channel 149 802.11n, Part 5

EIRP= -82.00 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -78.70 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-78.70) dBm/MHz = 51.70 dB

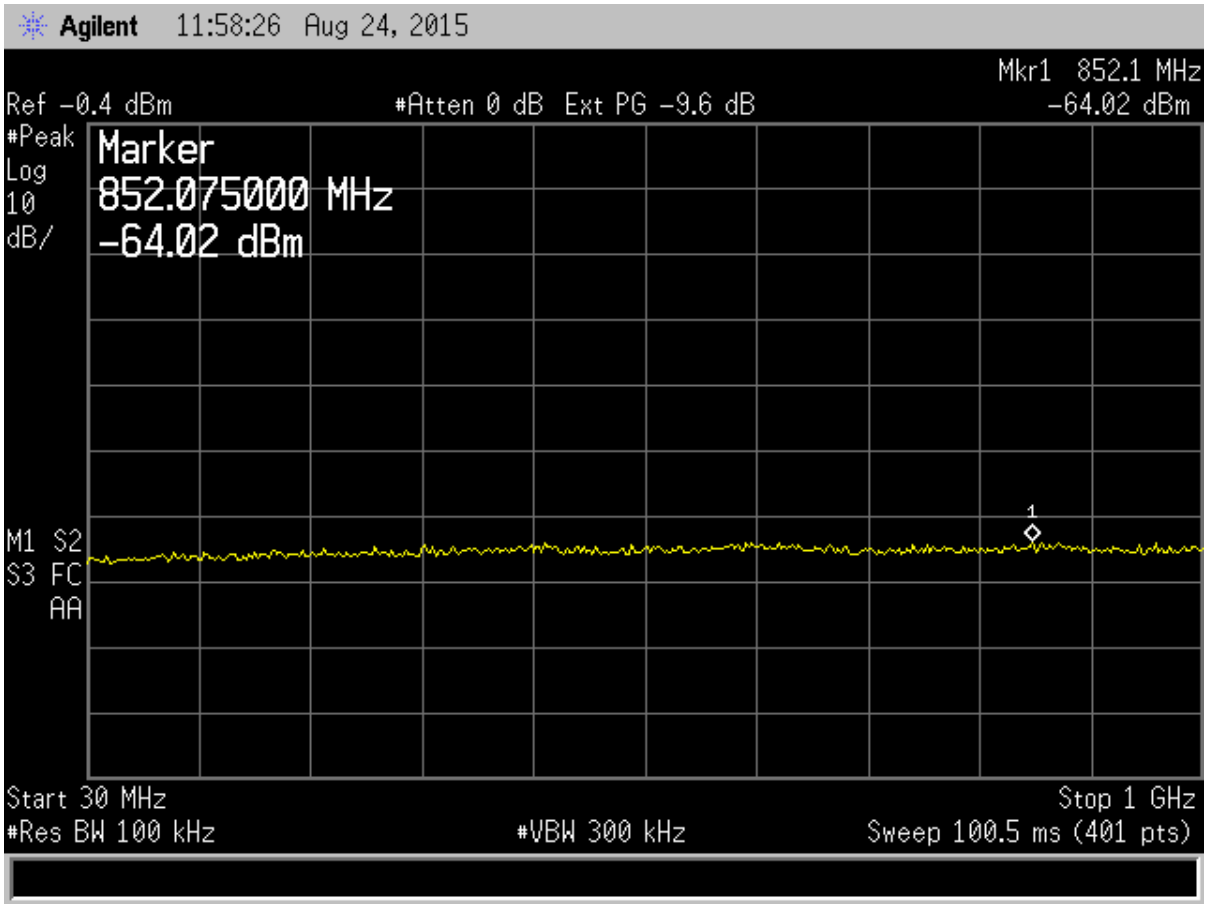


Figure 39. Antenna Conducted Emissions Channel 165 802.11n, Part 1

EIRP= -64.02 dBm/MHz + 3.3 dBi (applied antenna gain) + 4.7 dB (ground reflection factor)= -56.02 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-56.02) dBm/MHz = 29.02 dB

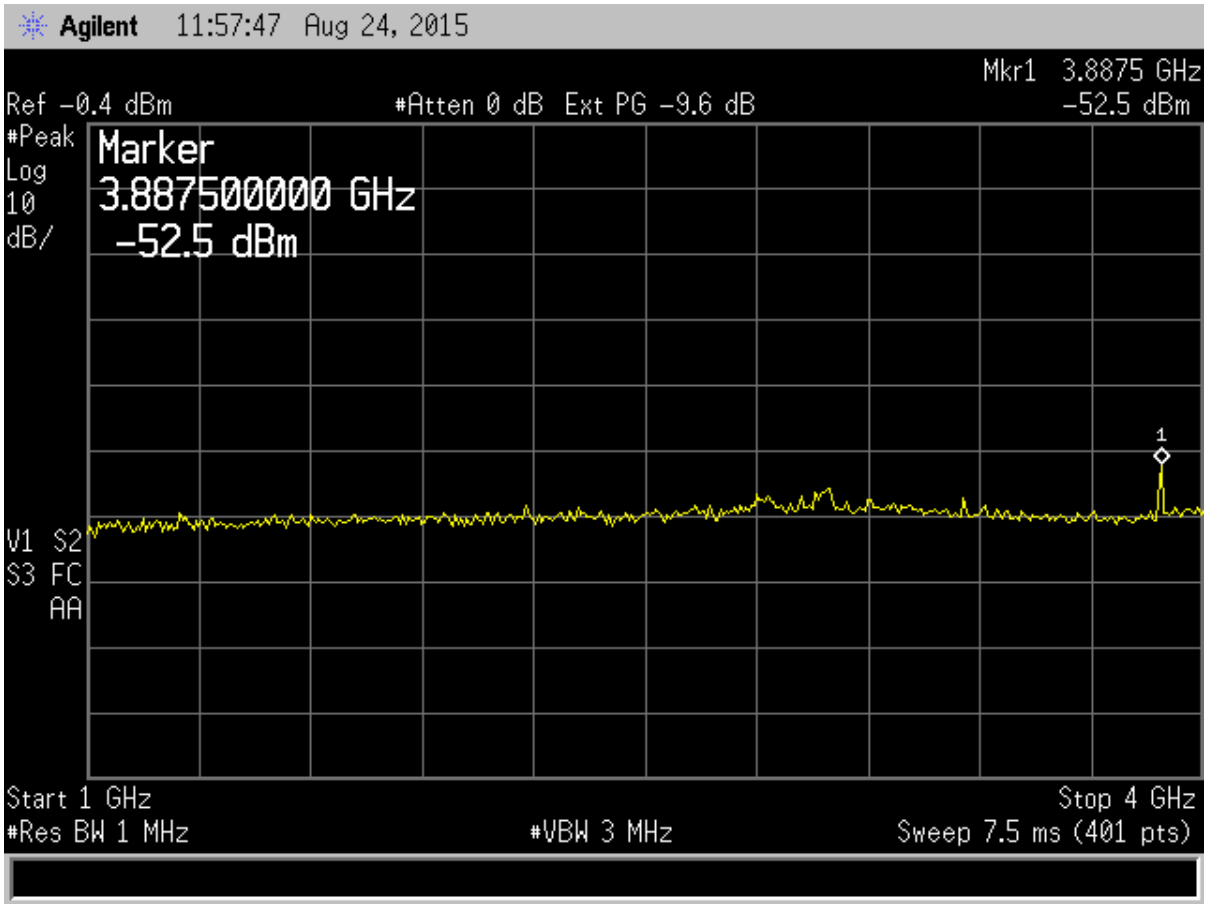


Figure 40. Antenna Conducted Emissions Channel 165 802.11n, Part 2

EIRP= -52.50dBm/MHz + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -49.20 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-49.20) dBm/MHz = 22.20 dB

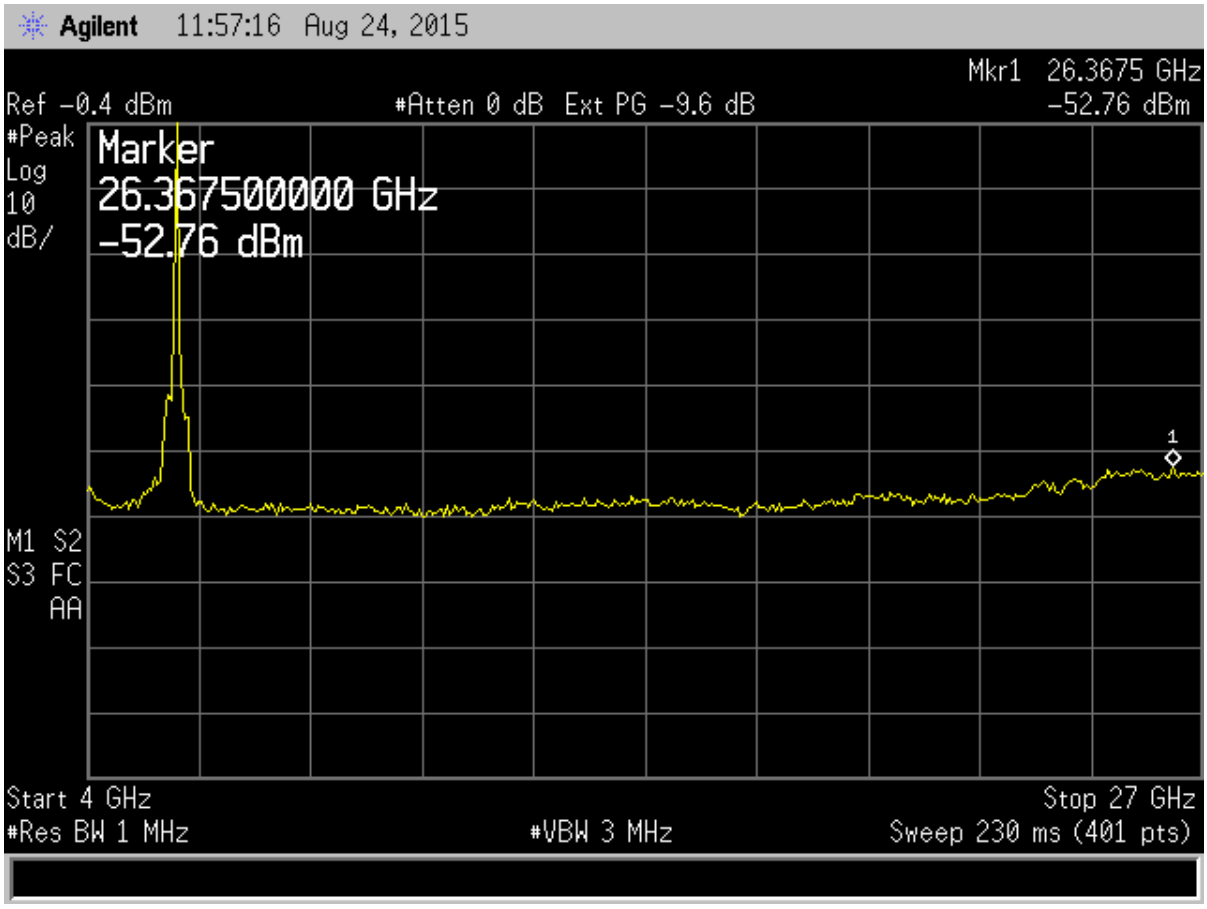


Figure 41. Antenna Conducted Emissions Channel 165 802.11n, Part 3

Note: Large signal seen in the figure above is the fundamental emission

EIRP= -52.76 dBm)/MHz + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -49.46 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-49.46) dBm/MHz = 22.46 dB

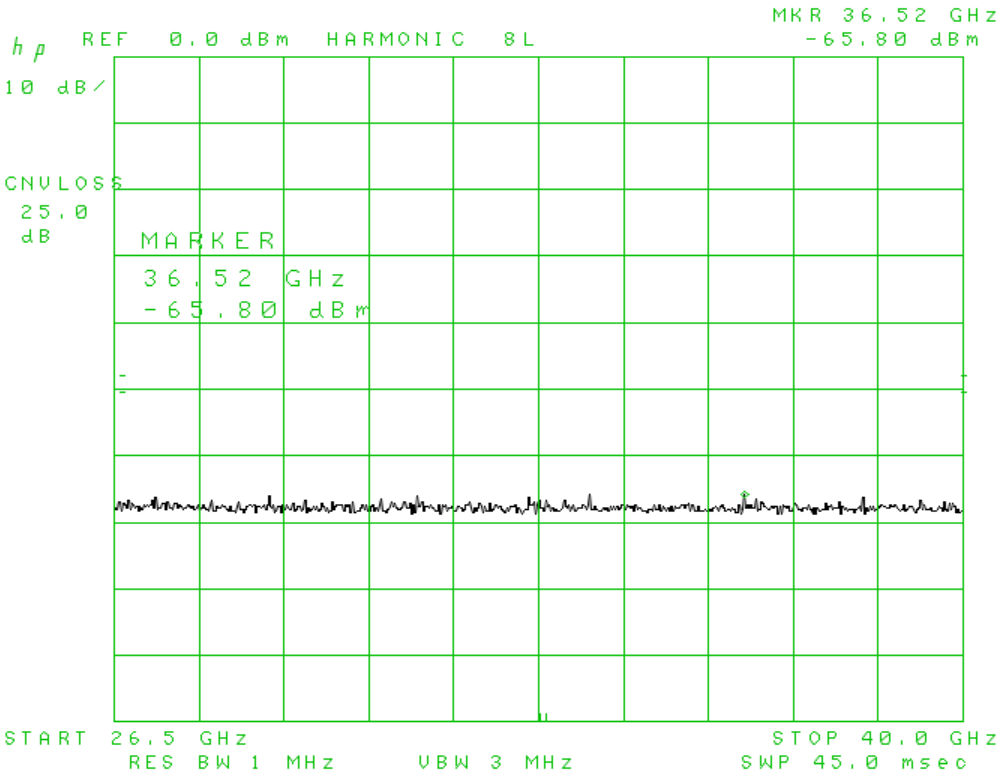


Figure 42. Antenna Conducted Emissions Channel 165 802.11n, Part 4

EIRP= -65.80 dBm/MHz + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -62.50 dBm

Limit= -27 dBm/MHz (15.407 (b))
Margin= -27 dBm/MHz – (-62.50) dBm/MHz = 35.0 dB

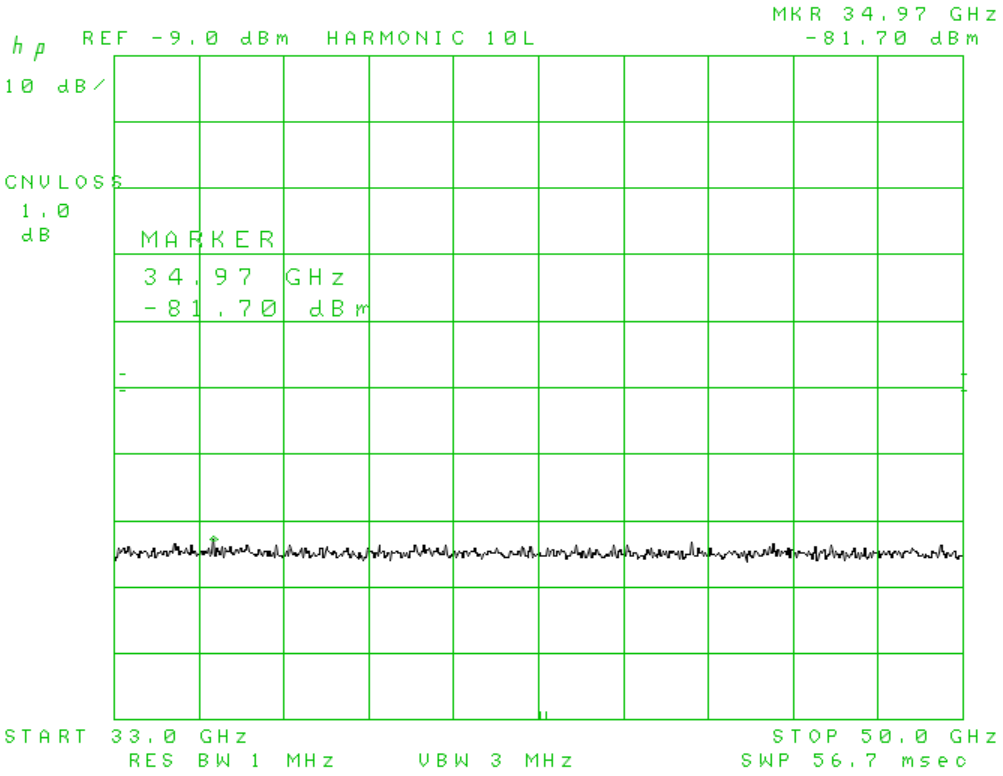


Figure 43. Antenna Conducted Emissions Channel 165 802.11n, Part 5

EIRP= -81.70 dBm + 3.3 dBi (applied antenna gain) + 0 dB (ground reflection factor)= -78.40 dBm

Limit= -27 dBm/MHz (15.407 (b))

Margin= -27 dBm/MHz – (-78.40) dBm/MHz = 51.40 dB

2.11 Band Edge Measurements – (CFR 15.407 (b))

Band Edge measurements are made following the guidelines in FCC KDB Publication No. 789033 D02 v01 with the EUT initially operating on the Lowest Channel and then operating on the Highest Channel within its band of operation for all modes of operation. Antenna port conducted measurements are performed to demonstrate compliance with the requirement of 15.407(b) that all emissions outside of the band edges do not exceed an e.i.r.p of -27 dBm/MHz.

The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

To capture the band edge the Spectrum Analyzer frequency span was set to 2.5 MHz to capture the peak level of the emission operating on the channel closest to the band edge as well as any modulation products falling outside of the authorized band of operation. Conducted measurements are performed with RBW = 100 kHz. In all cases, the VBW is set ≥ 3*RBW. The integration function on the spectrum analyzer was used to calculate the Band edge measurement over 1 MHz. See figure and calculations below for more detail.

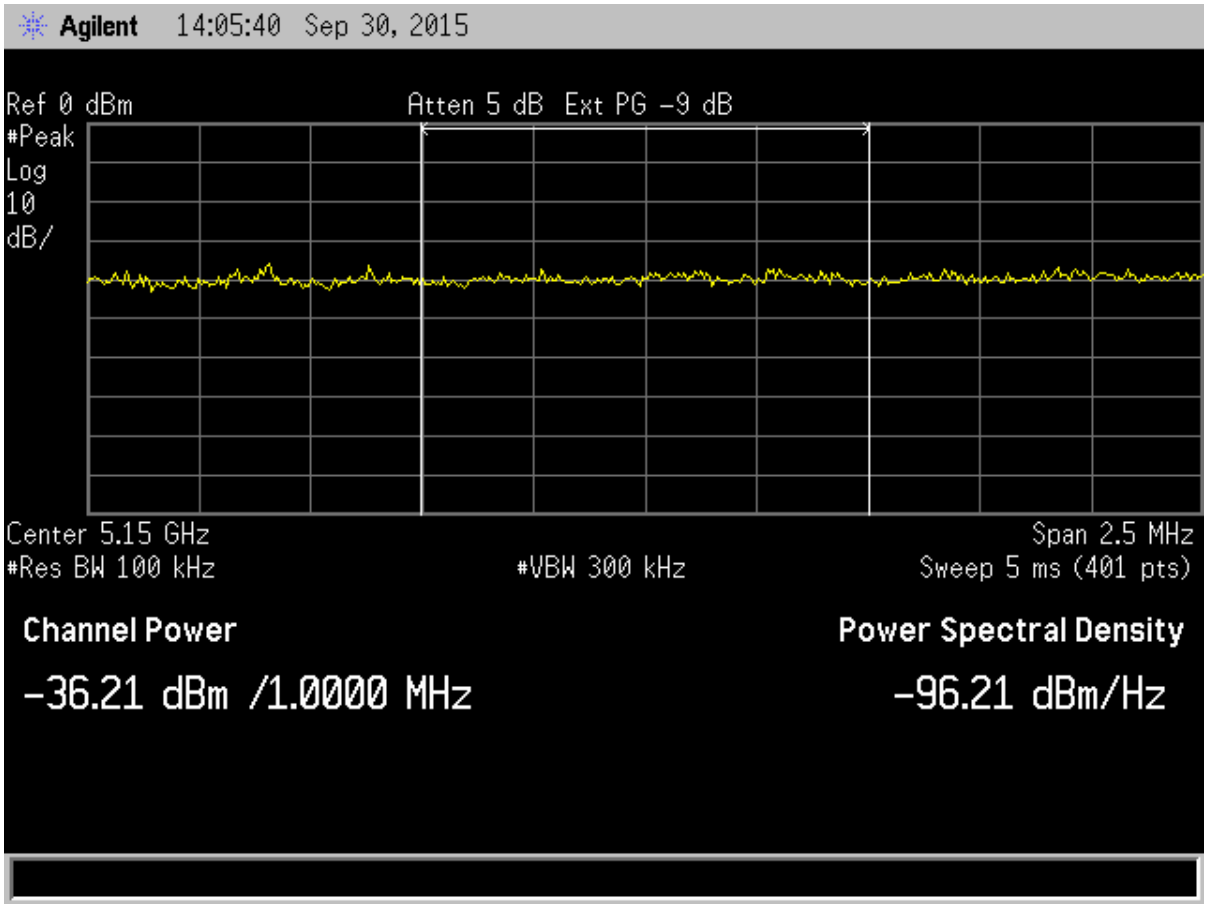


Figure 44. 5.15 GHz Band Edge Compliance, 802.11a - Peak

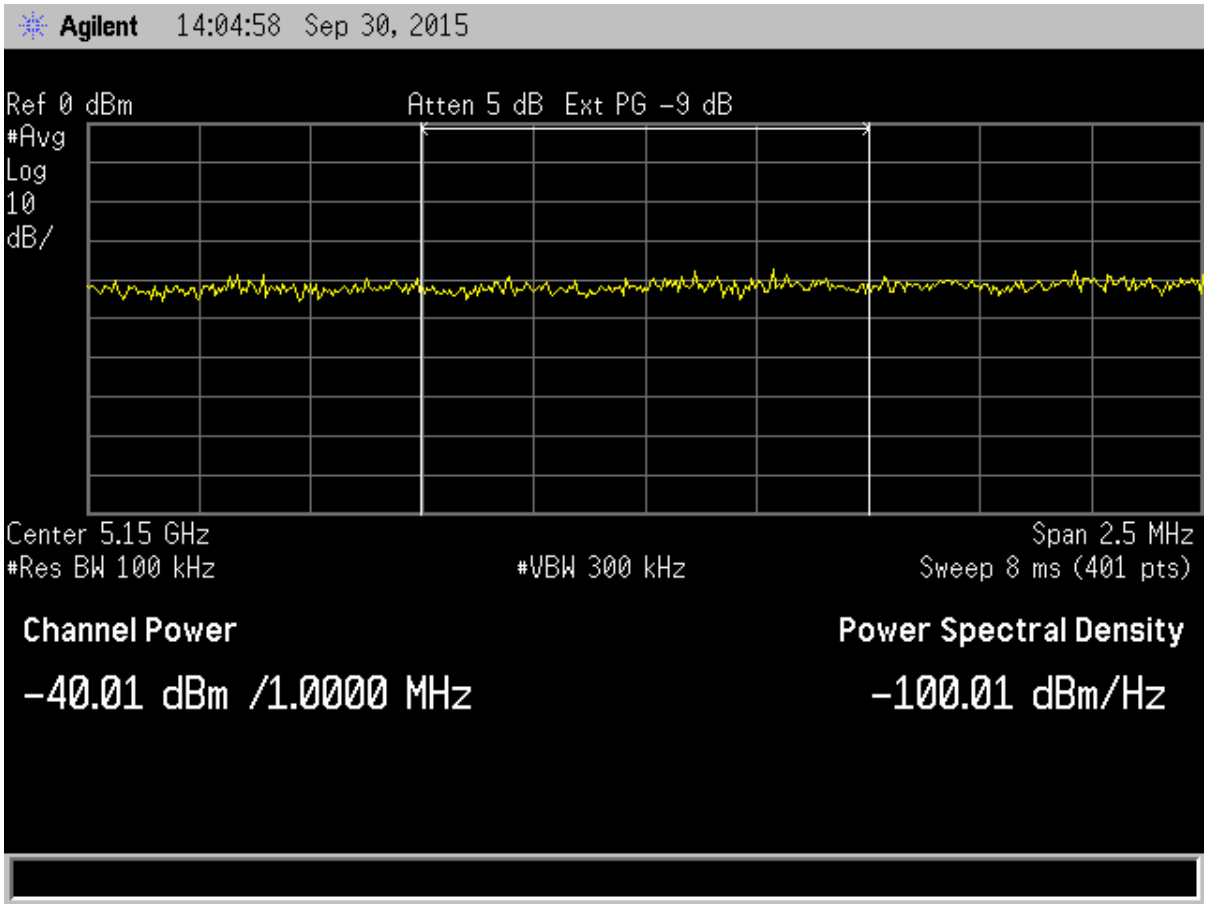


Figure 45. 5.15 GHZ Band Edge Compliance, 802.11a - Average

Calculation of worst case lower band edge measurement:

Band Edge Limit	-27.00dBm/MHz	
-Calculated Result	-40.01dBm/MHz	
Band Edge Margin	13.01	dB

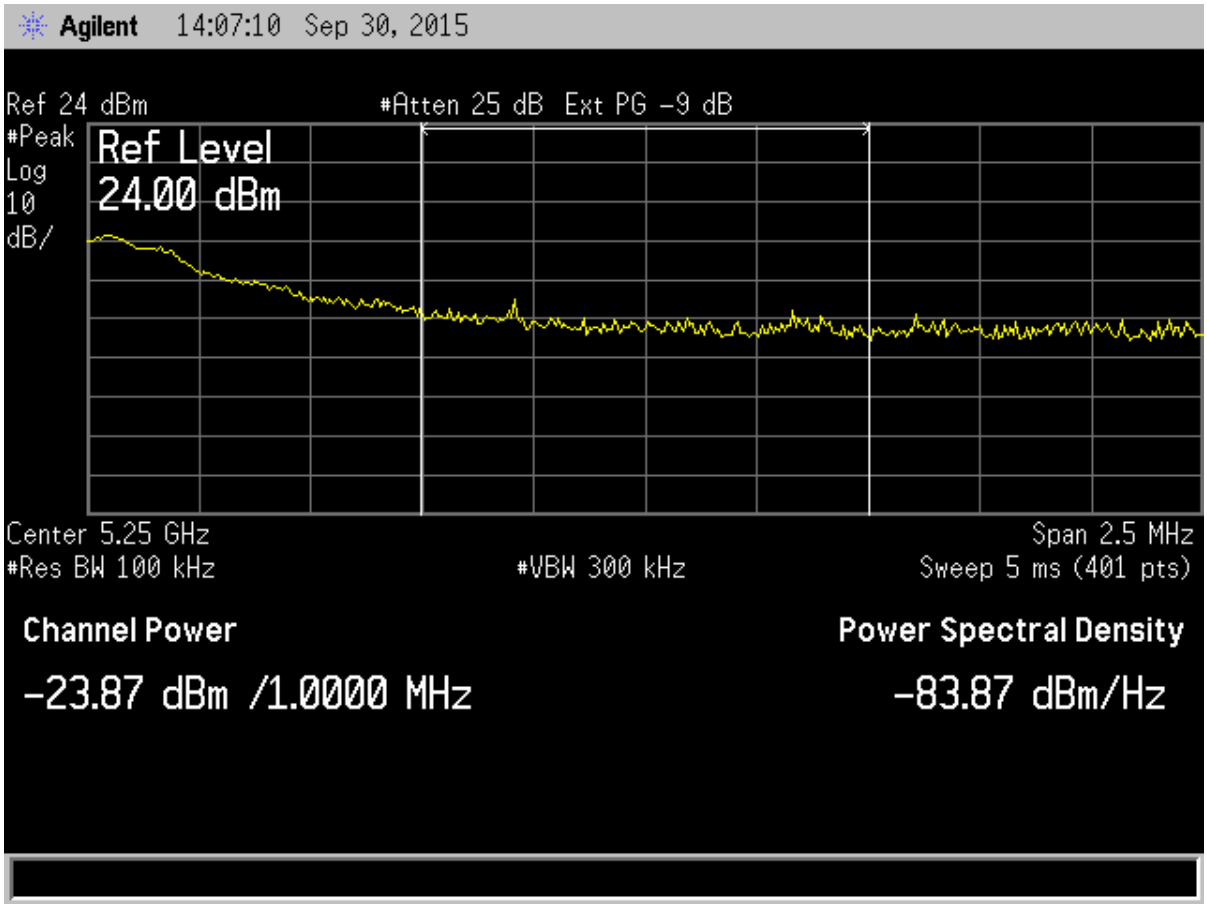


Figure 46. 5.25 GHZ Band Edge Compliance, 802.11a - Peak

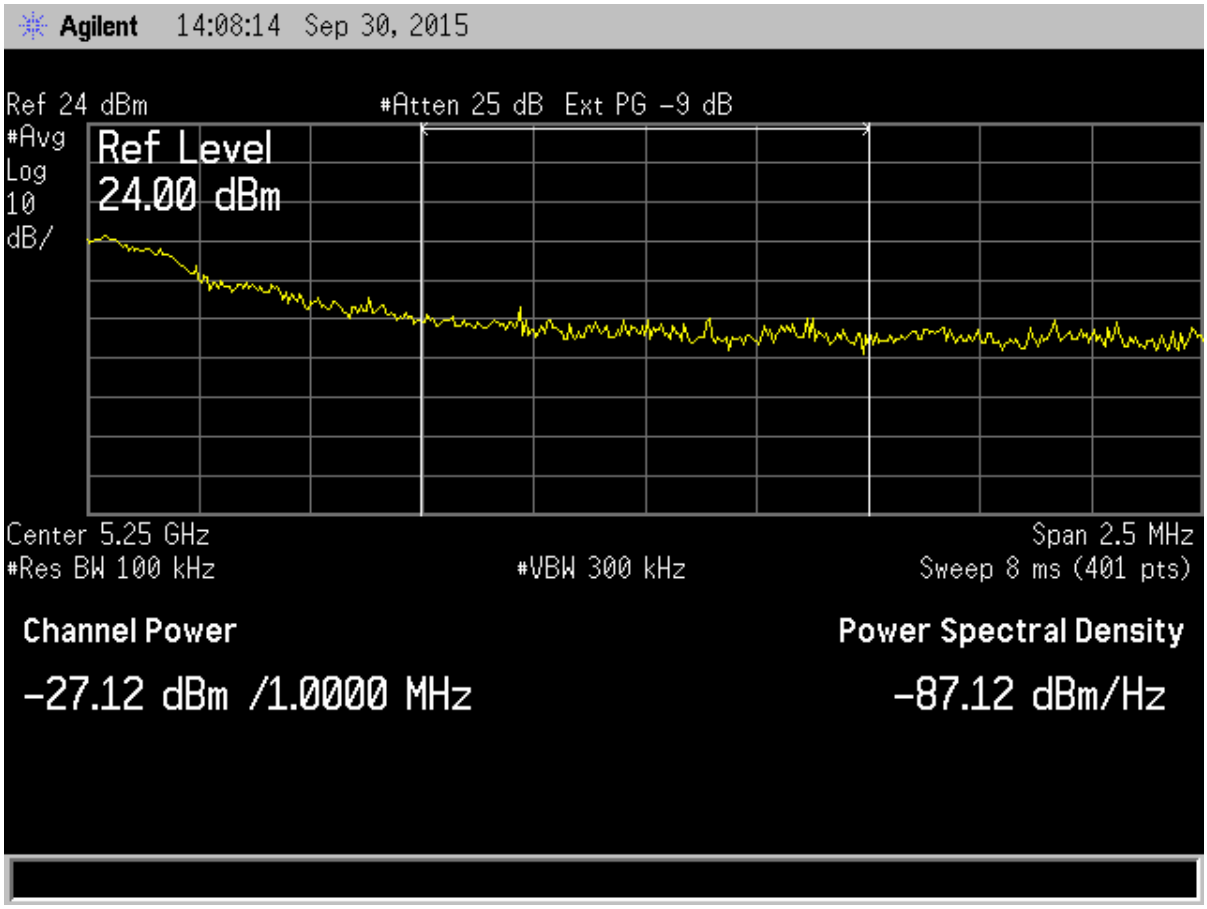


Figure 47. 5.25 GHZ Band Edge Compliance, 802.11a - Average

Calculation of worst case lower band edge measurement:

Band Edge Limit	-27.00	dBm/MHz
-Calculated Result	-27.12	dBm/MHz
Band Edge Margin	0.12	dB

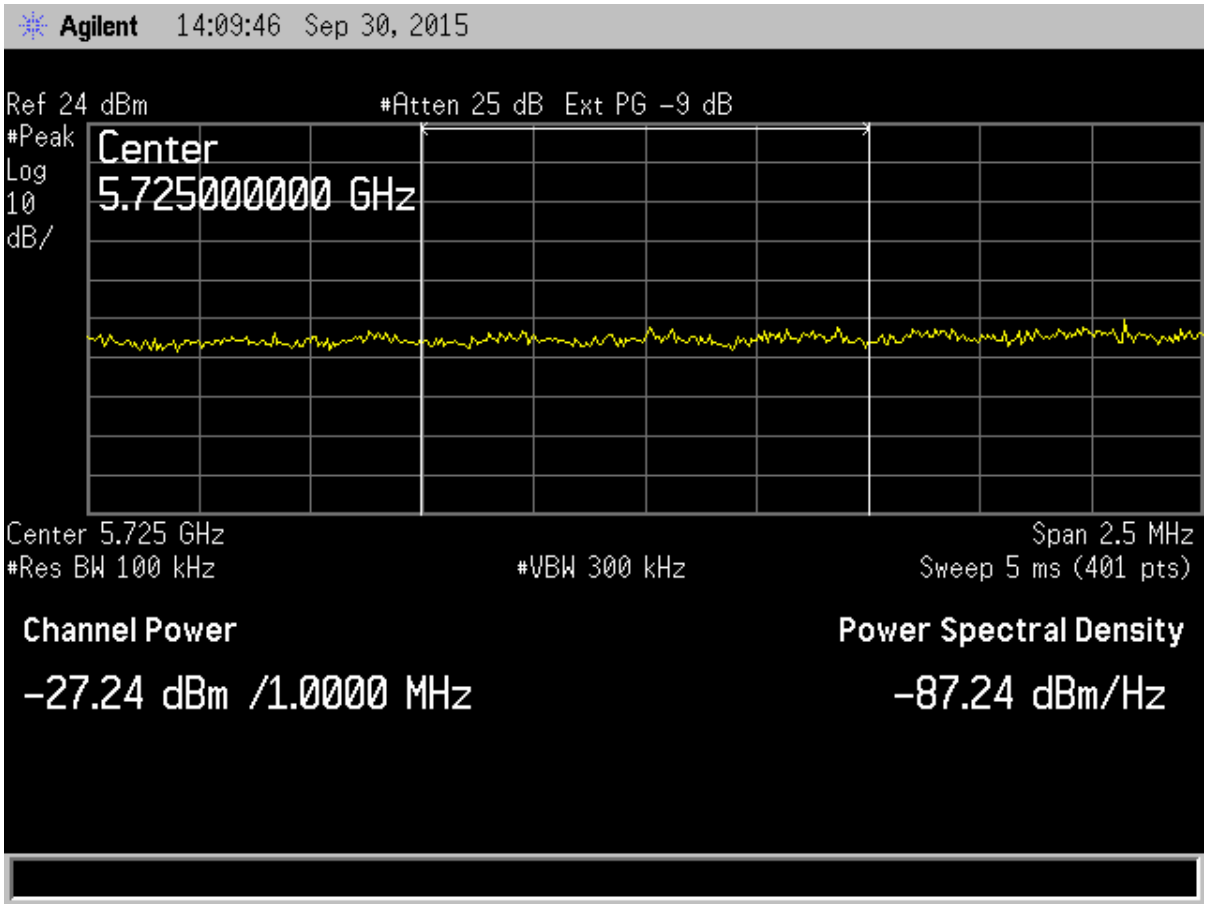


Figure 48. 5.725 GHZ Band Edge Compliance, 802.11a – Peak

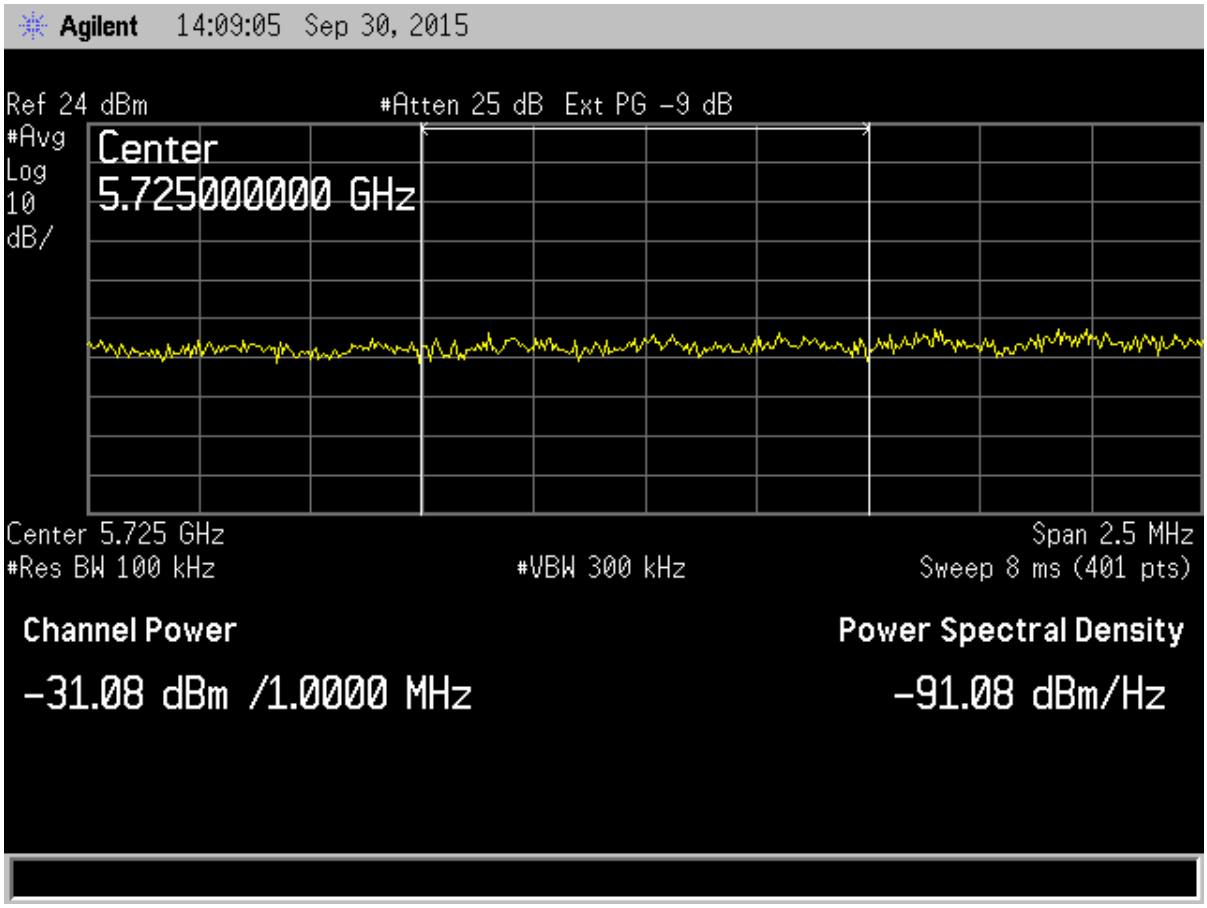


Figure 49. 5.725 GHZ Band Edge Compliance, 802.11a - Average

Calculation of worst case lower band edge measurement:

Band Edge Limit	-27.00	dBm/MHz
-Calculated Result	-31.08	dBm/MHz
Band Edge Margin	4.08	dB

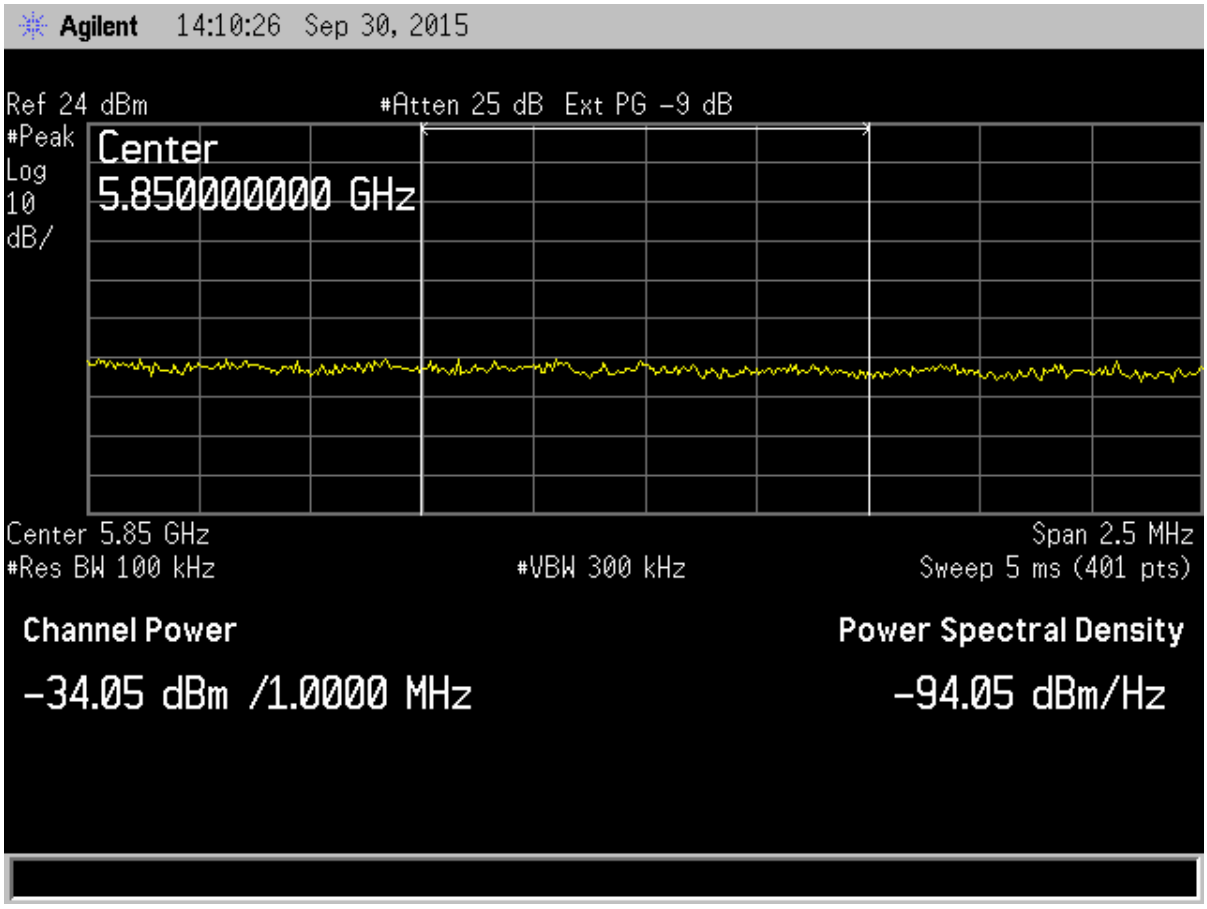


Figure 50. 5.825 GHZ Band Edge Compliance, 802.11a - Peak

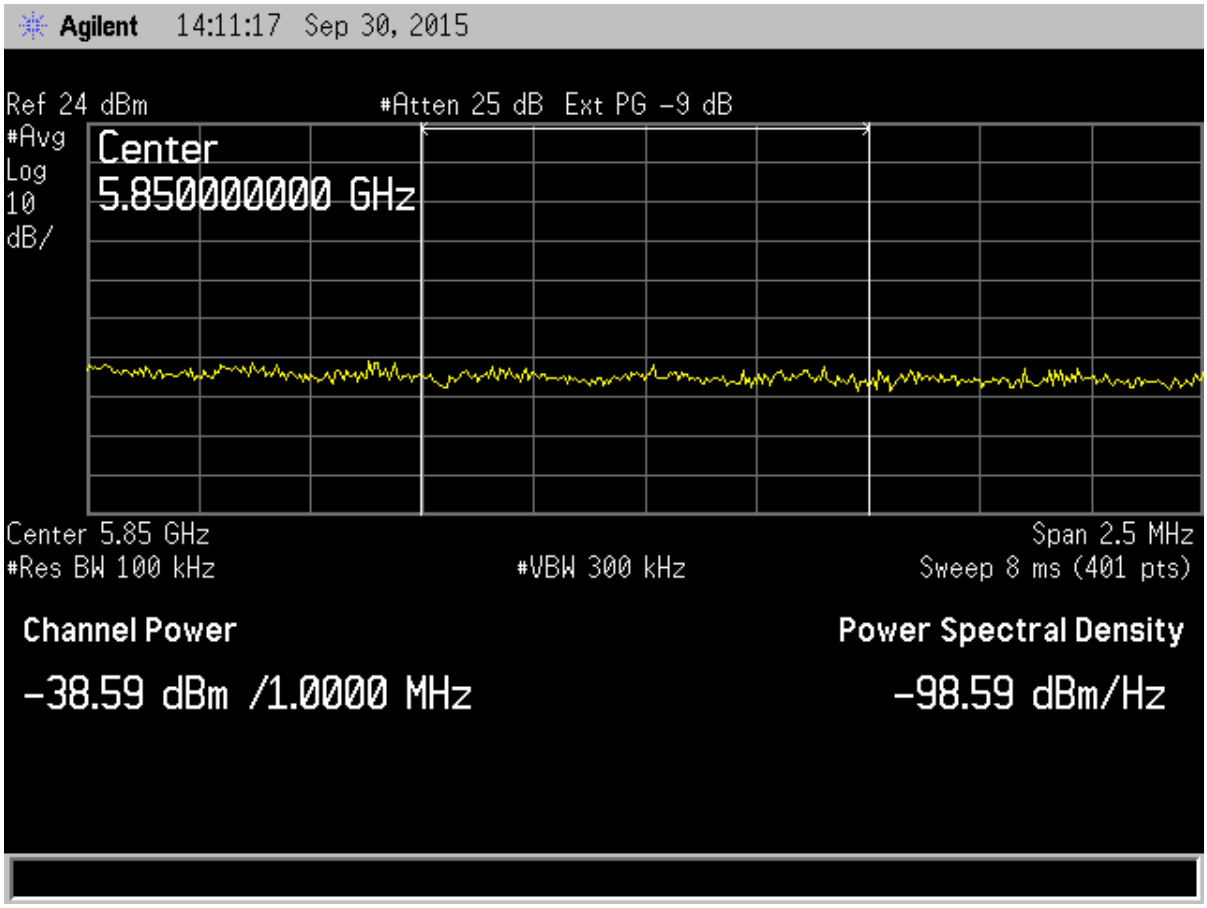


Figure 51. 5.825 GHZ Band Edge Compliance, 802.11a - Average

Calculation of worst case lower band edge measurement:

Band Edge Limit	-27.00dBm/MHz	
-Calculated Result	-38.59dBm/MHz	
Band Edge Margin	11.59	dB

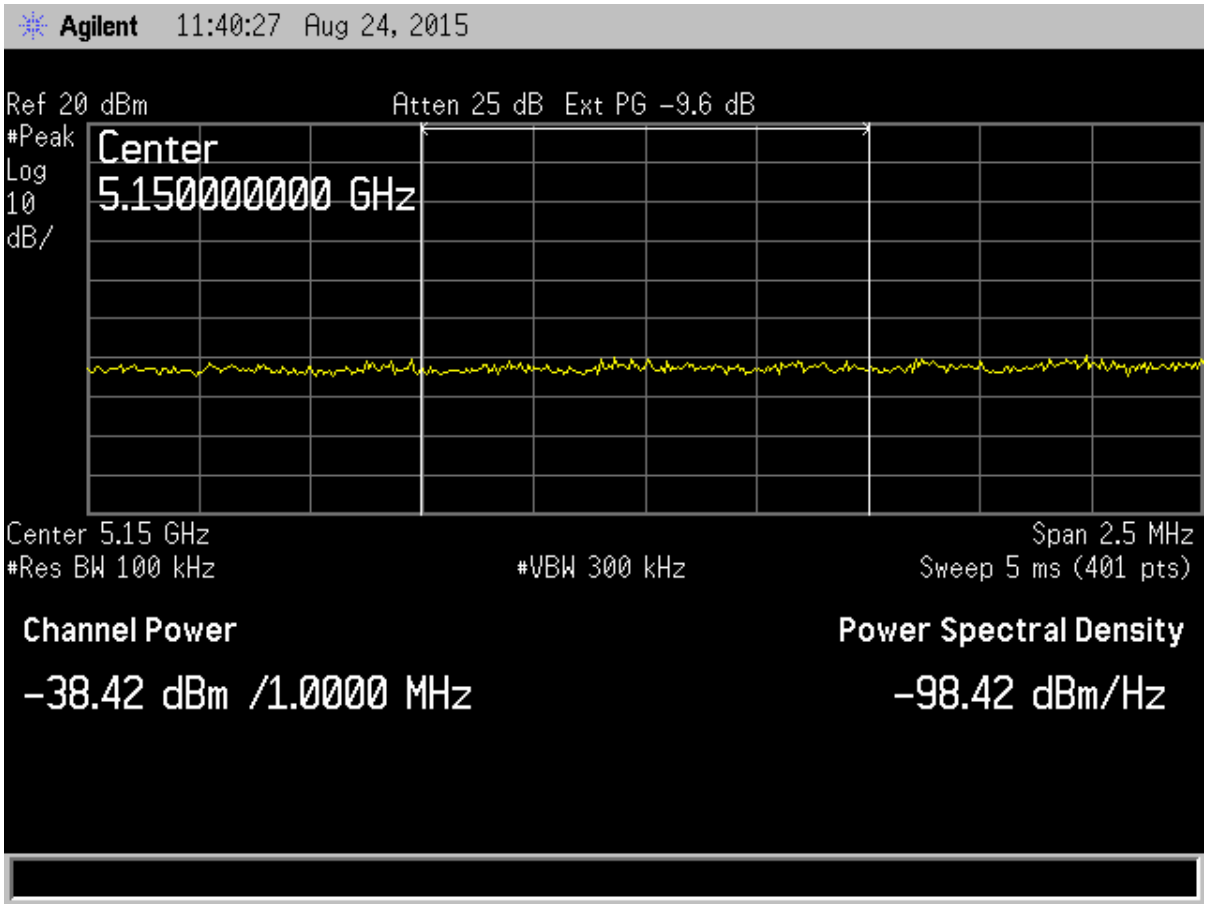


Figure 52. 5.15 GHz Band Edge Compliance, 802.11n - Peak

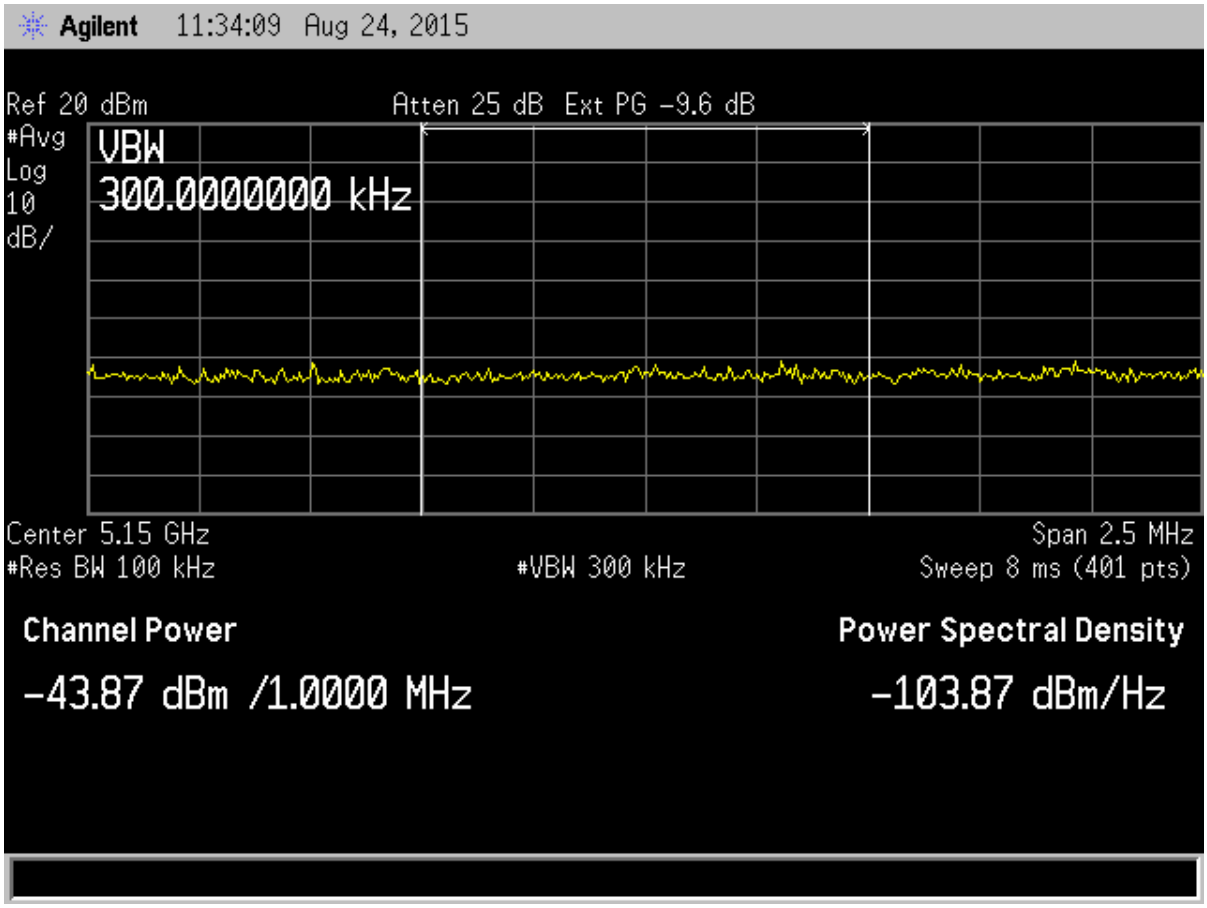


Figure 53. 5.15 GHZ Band Edge Compliance, 802.11n - Average

Calculation of worst case lower band edge measurement:

Band Edge Limit	-27.00dBm/MHz	
-Calculated Result	-43.87dBm/MHz	
Band Edge Margin	16.87	dB

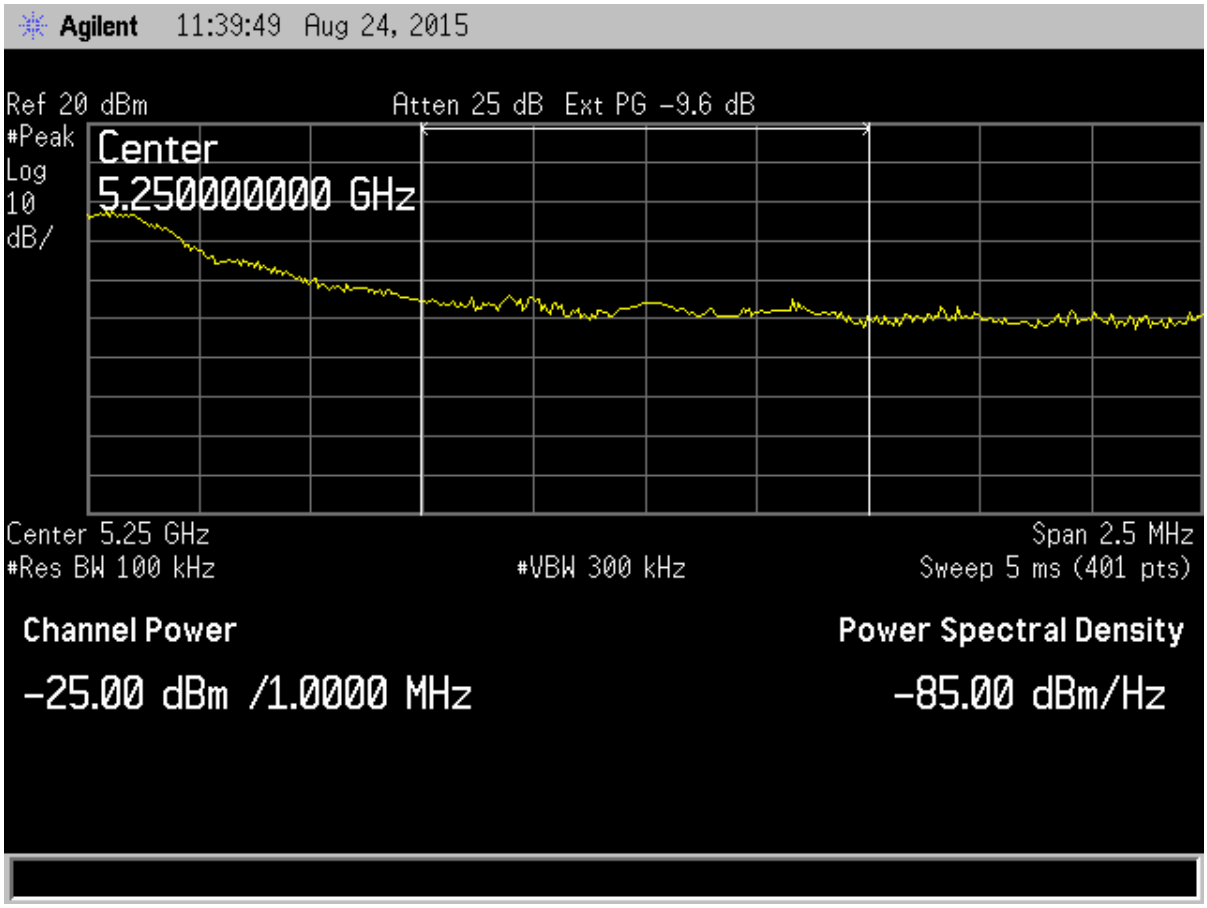


Figure 54. 5.25 GHZ Band Edge Compliance, 802.11n - Peak

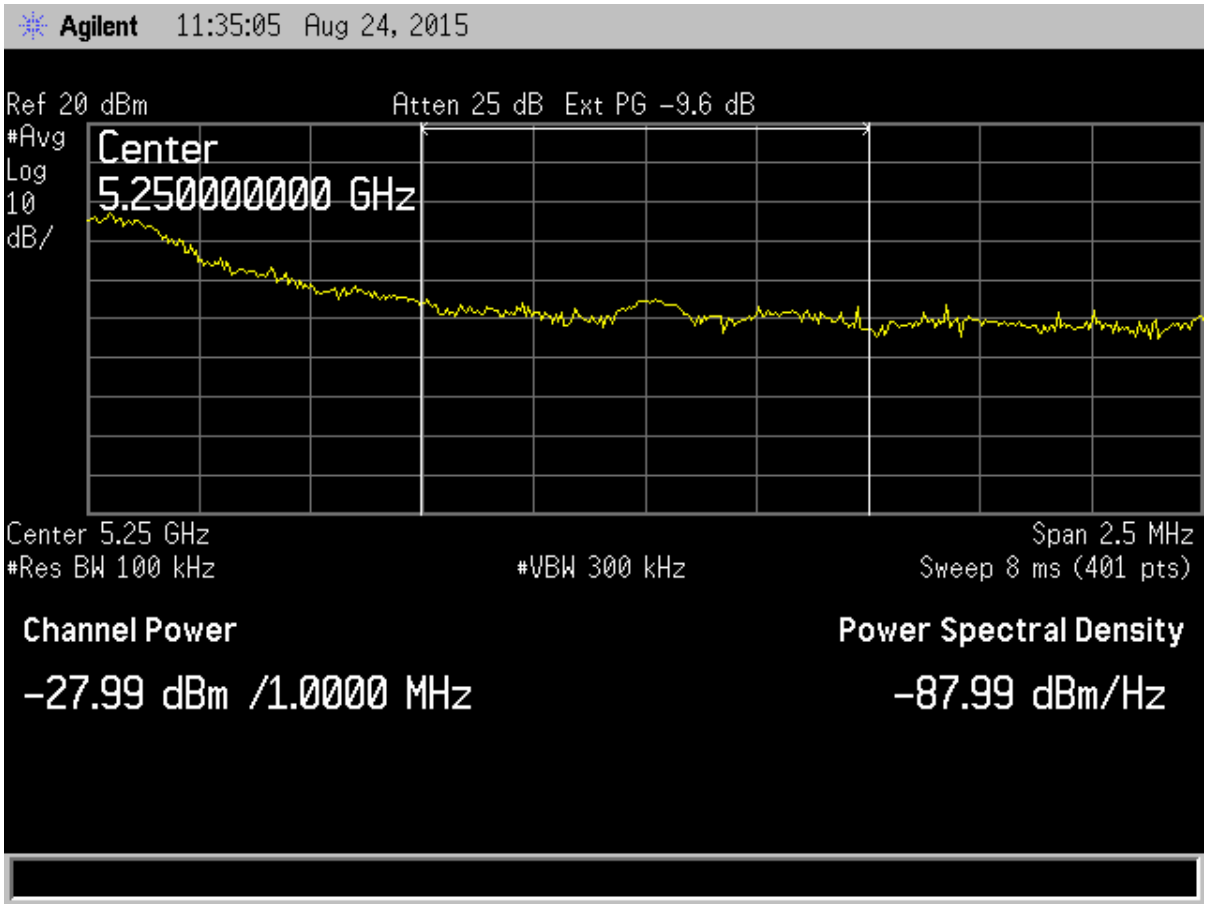


Figure 55. 5.25 GHZ Band Edge Compliance, 802.11n - Average

Calculation of worst case lower band edge measurement:

Band Edge Limit	-27.00dBm/MHz	
-Calculated Result	-27.99dBm/MHz	
Band Edge Margin	0.99	dB

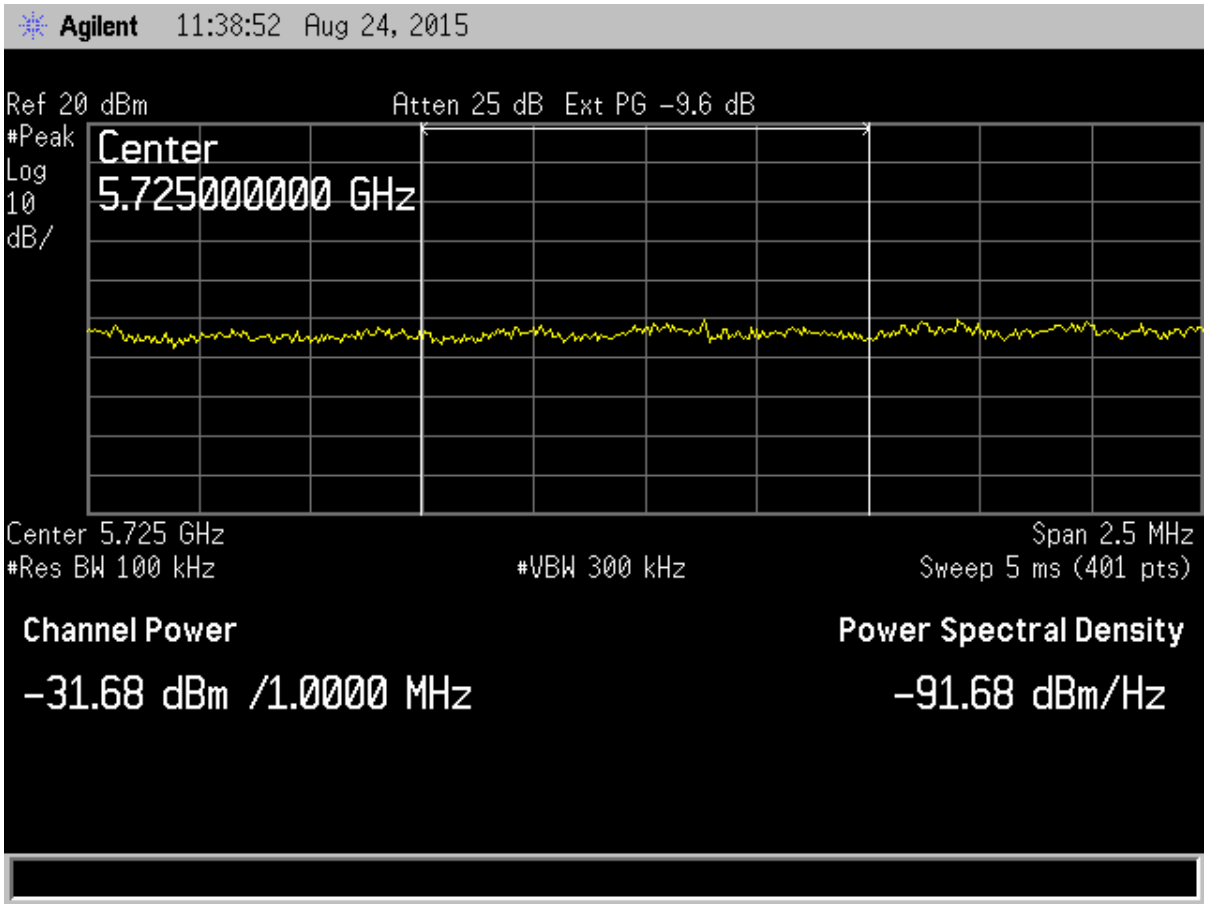


Figure 56. 5.725 GHZ Band Edge Compliance, 802.11n – Peak

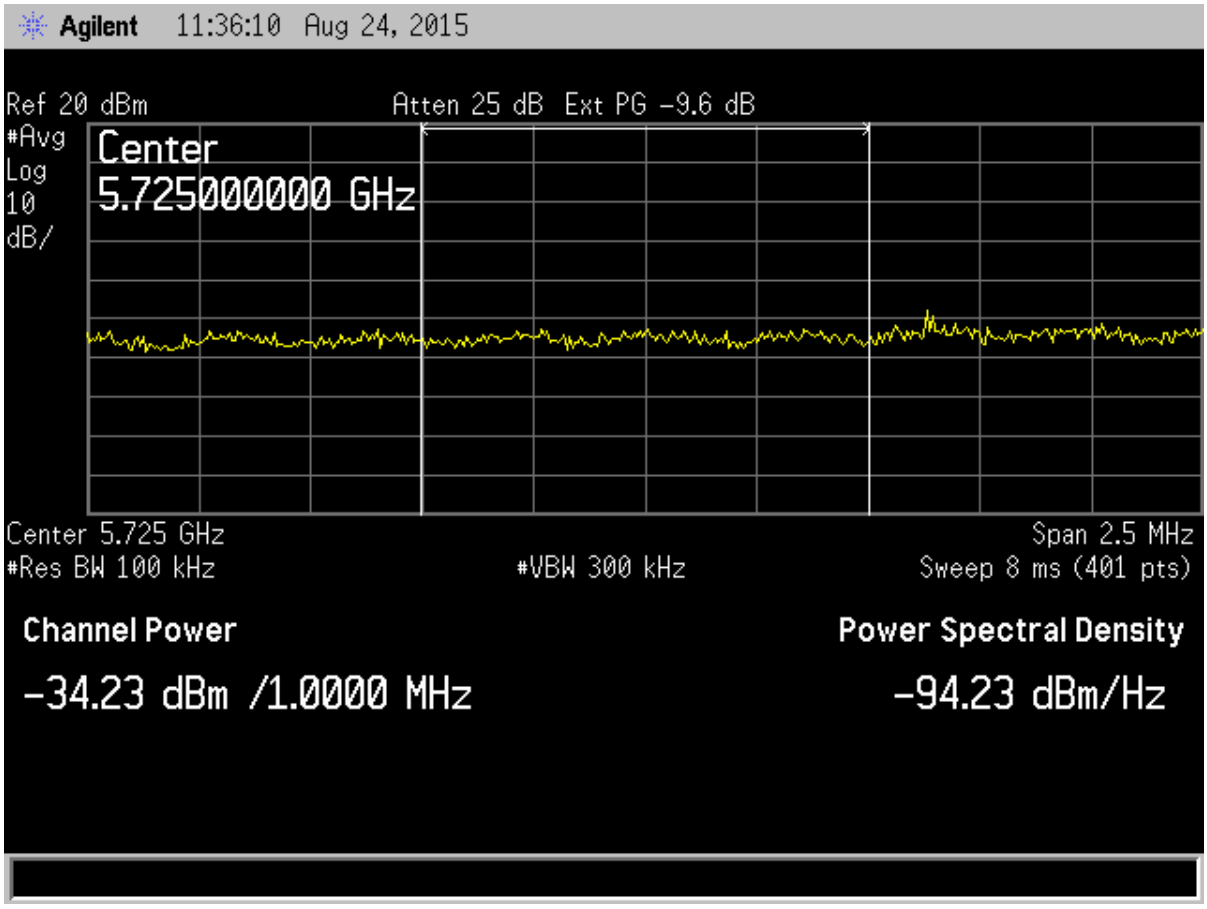


Figure 57. 5.725 GHZ Band Edge Compliance, 802.11n - Average

Calculation of worst case lower band edge measurement:

Band Edge Limit	-27.00dBm/MHz	
-Calculated Result	-34.23dBm/MHz	
Band Edge Margin	7.23	dB

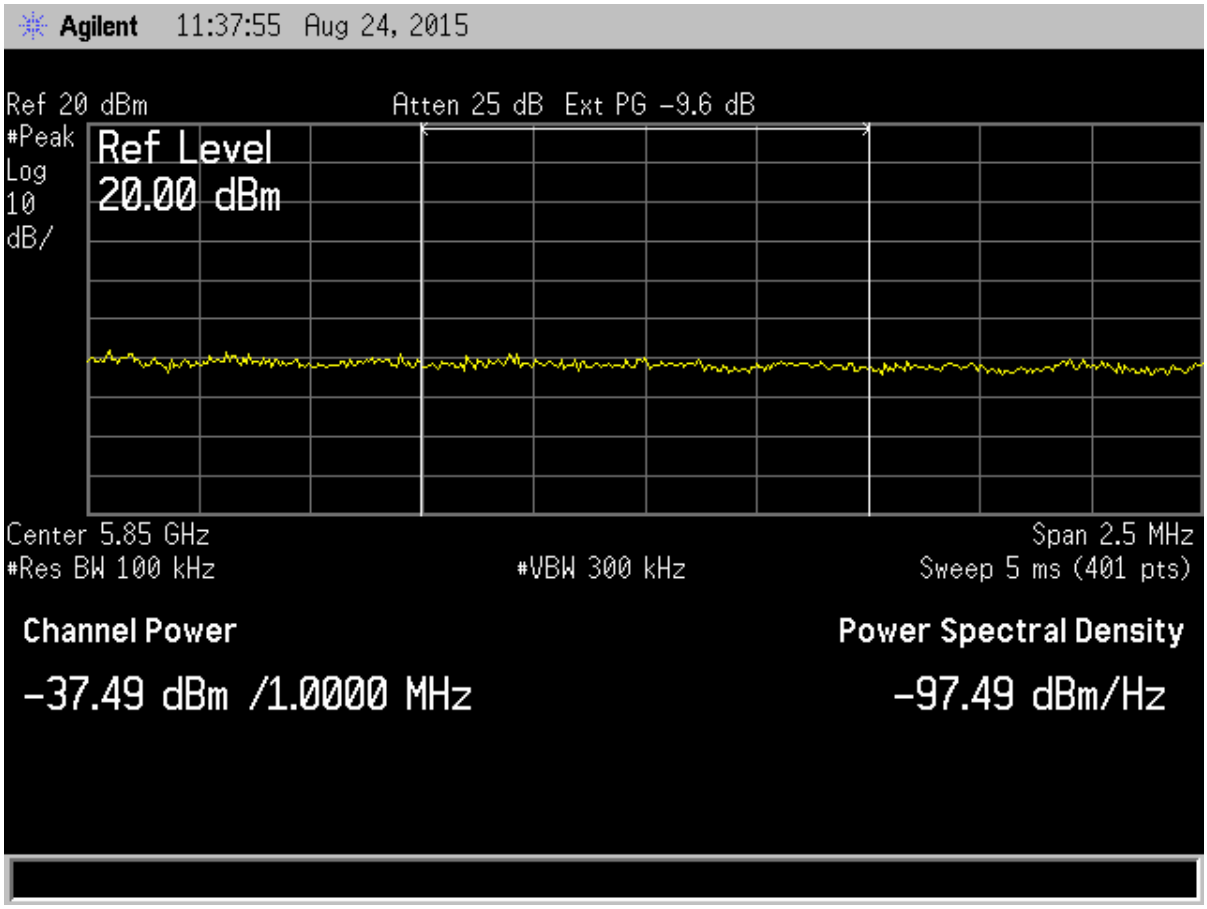


Figure 58. 5.825 GHZ Band Edge Compliance, 802.11n - Peak

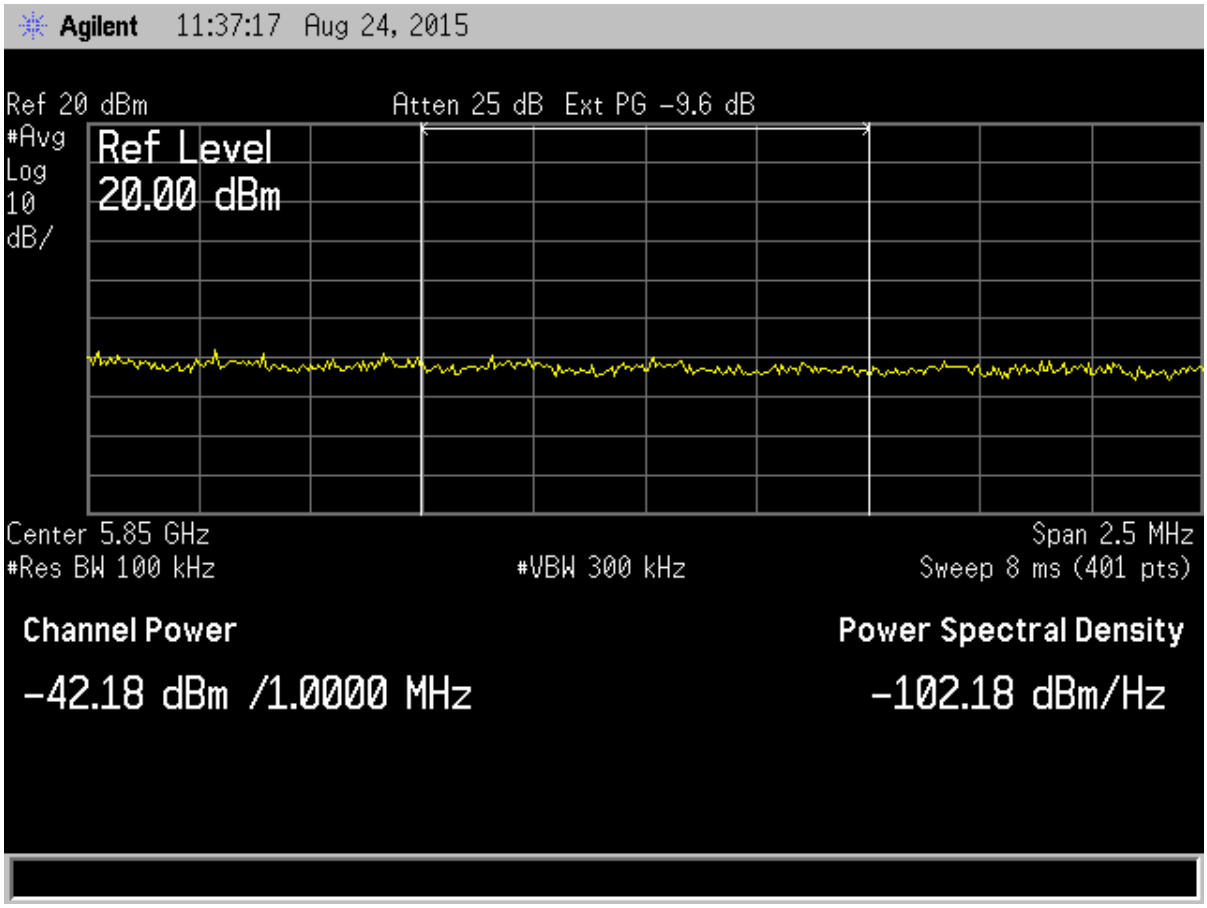


Figure 59. 5.825 GHZ Band Edge Compliance, 802.11n - Average

Calculation of worst case lower band edge measurement:

Band Edge Limit	-27.00dBm/MHz	
-Calculated Result	-42.18dBm/MHz	
Band Edge Margin	15.18	dB

2.12 Unwanted Emissions in the Restricted Bands (CFR 15.205, 15.209)

Unwanted Emissions in the Restricted Bands were made following the guidelines in FCC KDB Publication No. 789033 D02 v01 with the EUT operating on the channels closest to the restricted bands of operation. These measurements were performed with the EUT transmitting at <98% duty Cycle.

To capture the unwanted emissions the Spectrum Analyzer frequency span set cover the full restricted band. Radiated measurements are performed with RBW = 1 MHz. In all cases, the VBW is set ≥ 3*RBW.

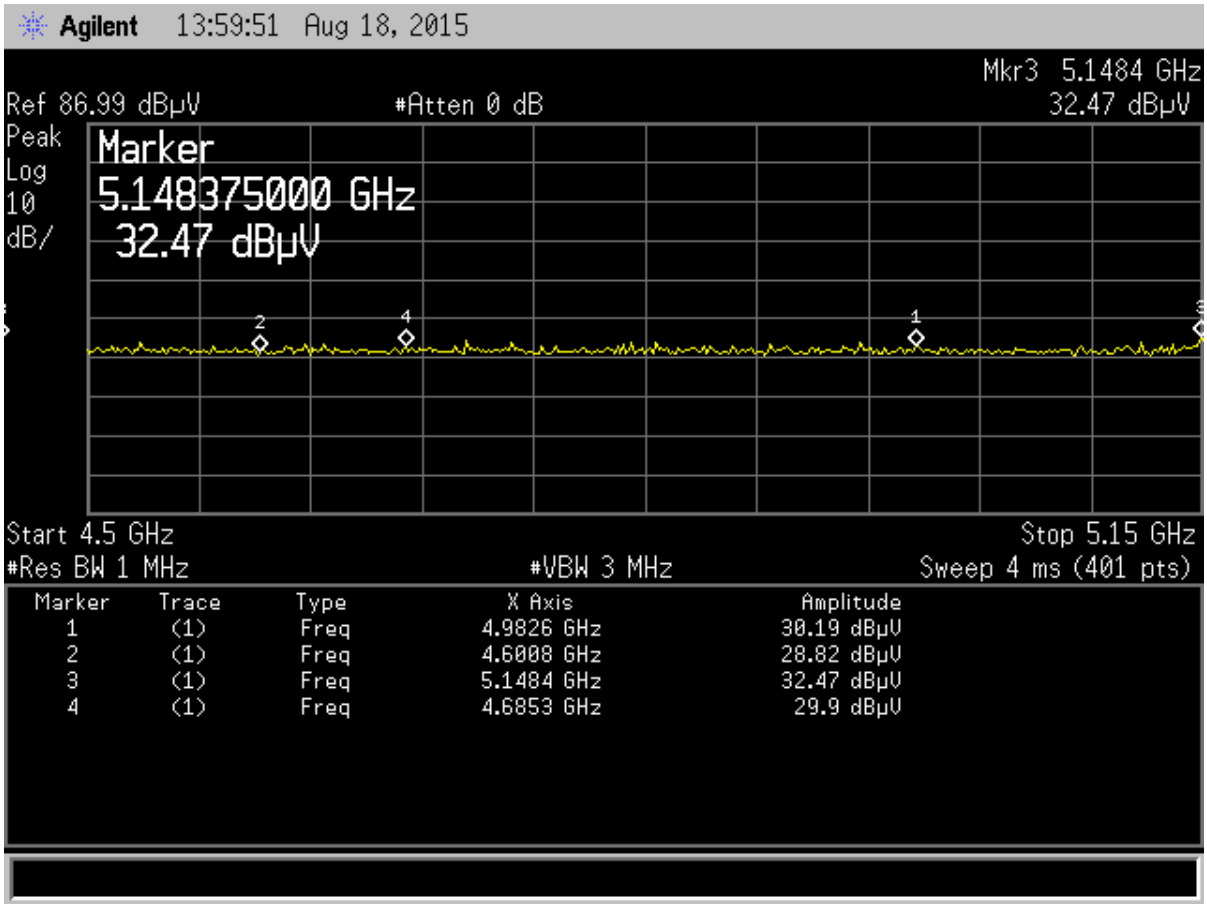


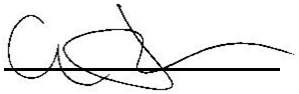
Figure 60. Restricted Band 4.5 - 5.15 GHz operating on Channel 36, 802.11n – Peak on Chip Antenna

Table 14. Radiated Restricted Band 4.5 GHz to 5.15 GHz, 802.11n – Peak on Chip Antenna

4.5 GHz to 5.15 GHz Restricted Band Peak Measurements							
Test: Radiated Emissions				**Client:** Inventek Systems			
Project: 15-0108				**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**PK Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
4982.60	30.19	38.82	59.51	74.0	1.0m./HORZ	14.5	**PK**
4600.80	28.82	37.90	57.22	74.0	1.0m./HORZ	16.8	**PK**
5148.40	32.47	39.65	62.62	74.0	1.0m./HORZ	11.4	**PK**
4685.30	29.90	38.00	58.40	74.0	1.0m./HORZ	15.6	**PK**

Note: extrapolation factor of -9.5 dB applied to the results.

Sample calculation: at 4982.60 MHz, 30.19 dBuV + 38.82 (dB) + -9.5 dB (extrapolation factor) = 59.51 dBuV/m

Test Date: August 18, 2015
Tested By
Signature:  Name: Carrie Ingram

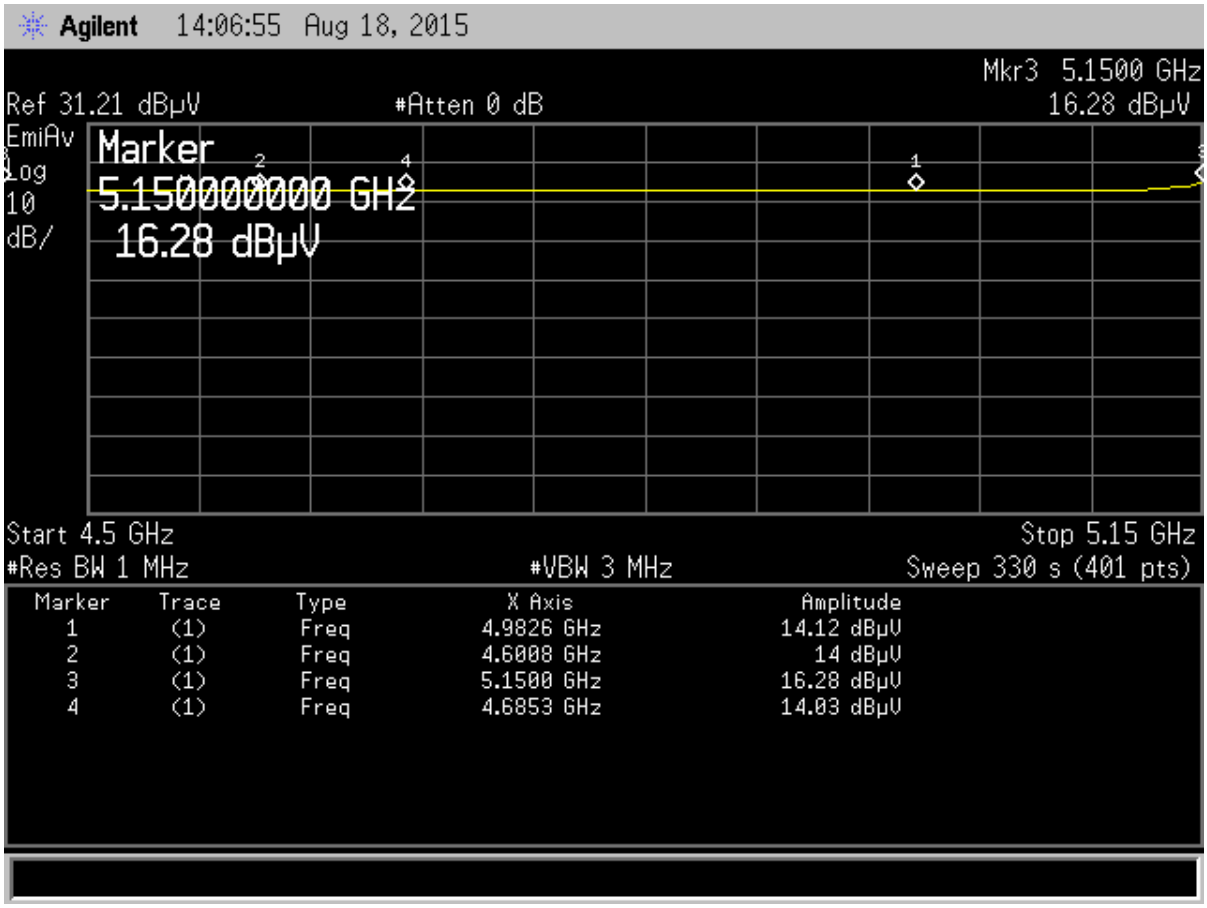


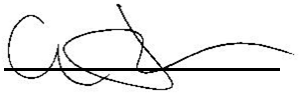
Figure 61. Restricted Band 4.5 - 5.15 GHz operating on Channel 36, 802.11n - Average on Chip Antenna

Table 15. Radiated Restricted Band 4.5 GHz to 5.15 GHz, 802.11n – Average on Chip Antenna

4.5 GHz to 5.15 GHz Restricted Band AVG Measurements							
Test: Radiated Emissions				**Client:** Inventek Systems			
Project: 15-0108				**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**AVG Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
4982.60	14.12	38.82	43.44	54.0	1.0m./HORZ	10.6	**AVG**
4600.80	14.00	37.90	42.40	54.0	1.0m./HORZ	11.6	**AVG**
5150.00	16.28	39.65	46.43	54.0	1.0m./HORZ	7.6	**AVG**
4685.30	14.03	38.00	42.53	54.0	1.0m./HORZ	11.5	**AVG**

Note: extrapolation factor of -9.5 dB applied to the results.

Sample calculation: at 4982.60 MHz, 14.12 dBuV + 38.82 (dB) + -9.5 dB (extrapolation factor) = 43.44 dBuV/m

Test Date: August 18, 2015
Tested By
Signature:  Name: Carrie Ingram

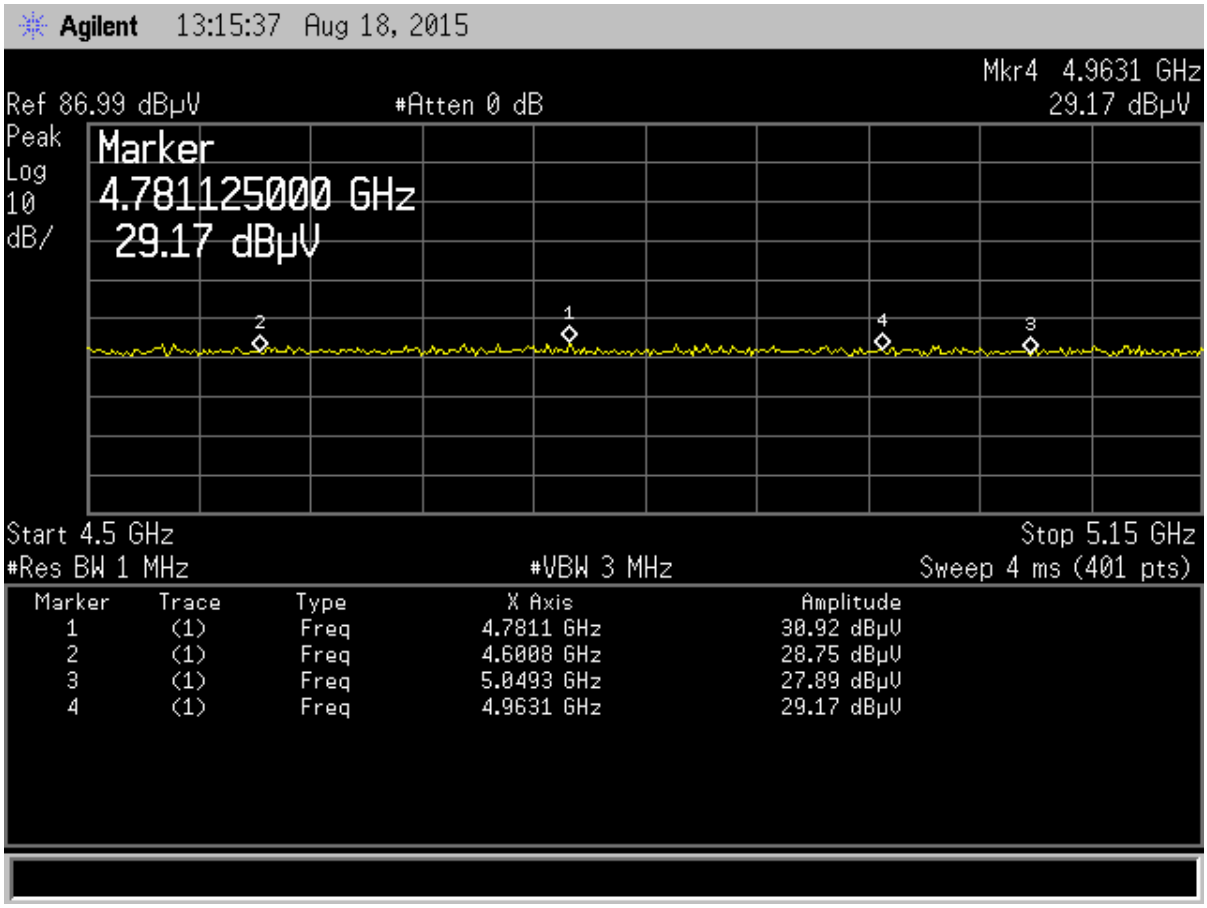


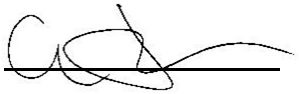
Figure 62. Restricted Band 4.5 - 5.15 GHz operating on Channel 36, 802.11a - Peak on Chip Antenna

Table 16. Radiated Restricted Band 4.5 GHz to 5.15 GHz, 802.11a – Peak on Chip Antenna

4.5 GHz to 5.15 GHz Restricted Band Peak Measurements							
Test: Radiated Emissions				**Client:** Inventek Systems			
Project: 15-0108				**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**PK Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
4781.10	30.92	38.25	59.67	74.0	1.0m./HORZ	14.3	**PK**
4600.80	28.75	37.90	57.15	74.0	1.0m./HORZ	16.9	**PK**
5049.30	27.89	39.26	57.65	74.0	1.0m./HORZ	16.3	**PK**
4963.10	29.17	38.82	58.49	74.0	1.0m./HORZ	15.5	**PK**

Note: extrapolation factor of -9.5 dB applied to the results.

Sample calculation: at 4781.10 MHz, 30.92 dBuV + 38.25 (dB) + -9.5 dB (extrapolation factor) = 59.67 dBuV/m

Test Date: August 18, 2015
Tested By
Signature:  Name: Carrie Ingram

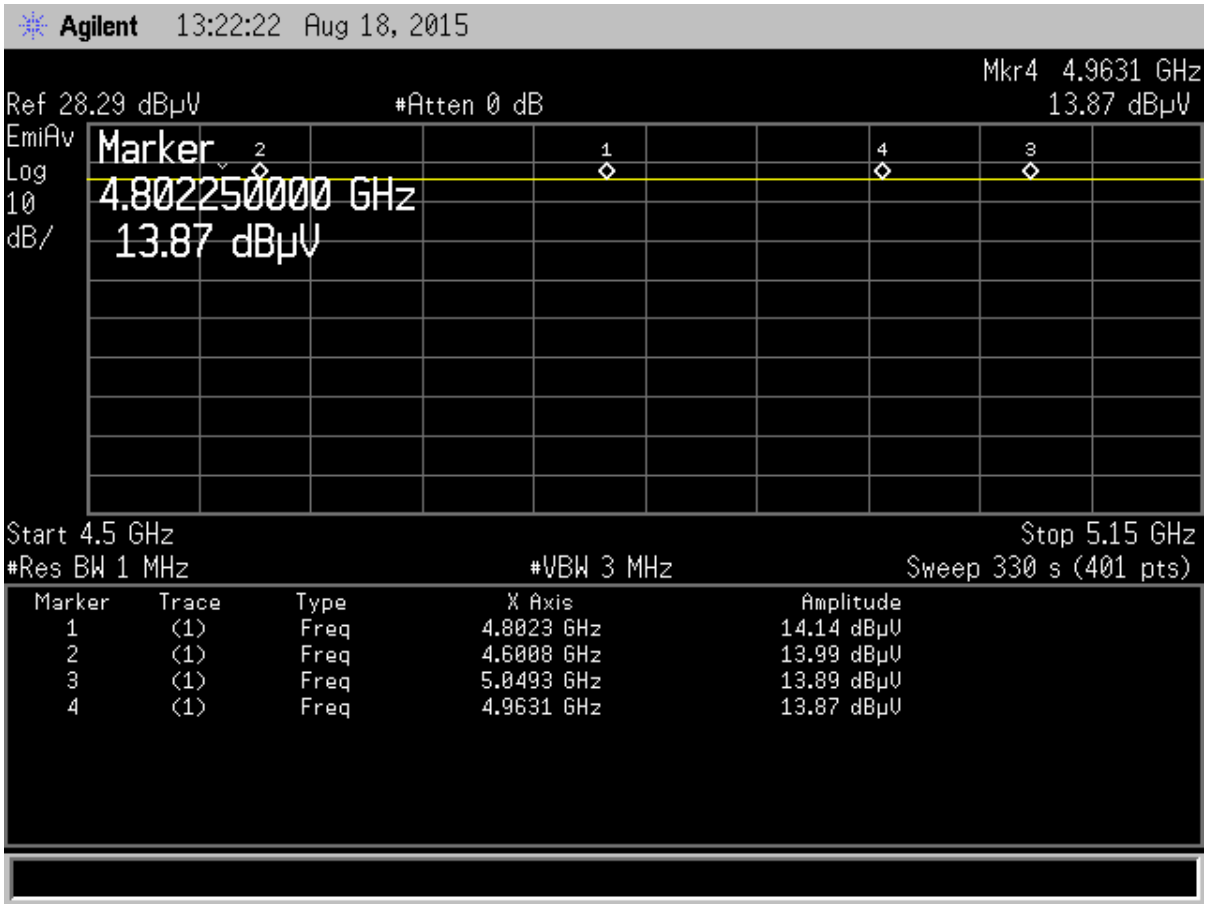


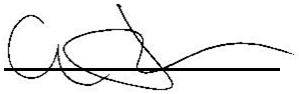
Figure 63. Restricted Band 4.5 - 5.15 GHz operating on Channel 36, 802.11a – Average on Chip Antenna

Table 17. Radiated Restricted Band 4.5 GHz to 5.15 GHz, 802.11a – Average on Chip Antenna

4.5 GHz to 5.15 GHz Restricted Band Average Measurements							
Test: Radiated Emissions				**Client:** Inventek Systems			
Project: 15-0108				**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**AVG Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
4802.30	14.14	38.51	43.15	54.0	1.0m./HORZ	10.8	**AVG**
4600.80	13.99	37.90	42.39	54.0	1.0m./HORZ	11.6	**AVG**
5049.30	13.89	39.26	43.65	54.0	1.0m./HORZ	10.3	**AVG**
4963.10	13.87	38.82	43.19	54.0	1.0m./HORZ	10.8	**AVG**

Note: extrapolation factor of -9.5 dB applied to the results.

Sample calculation: at 4802.30 MHz, 14.14 dBuV + 38.51 (dB) + -9.5 dB (extrapolation factor) = 43.15 dBuV/m

Test Date: August 18, 2015
Tested By
Signature:  Name: Carrie Ingram

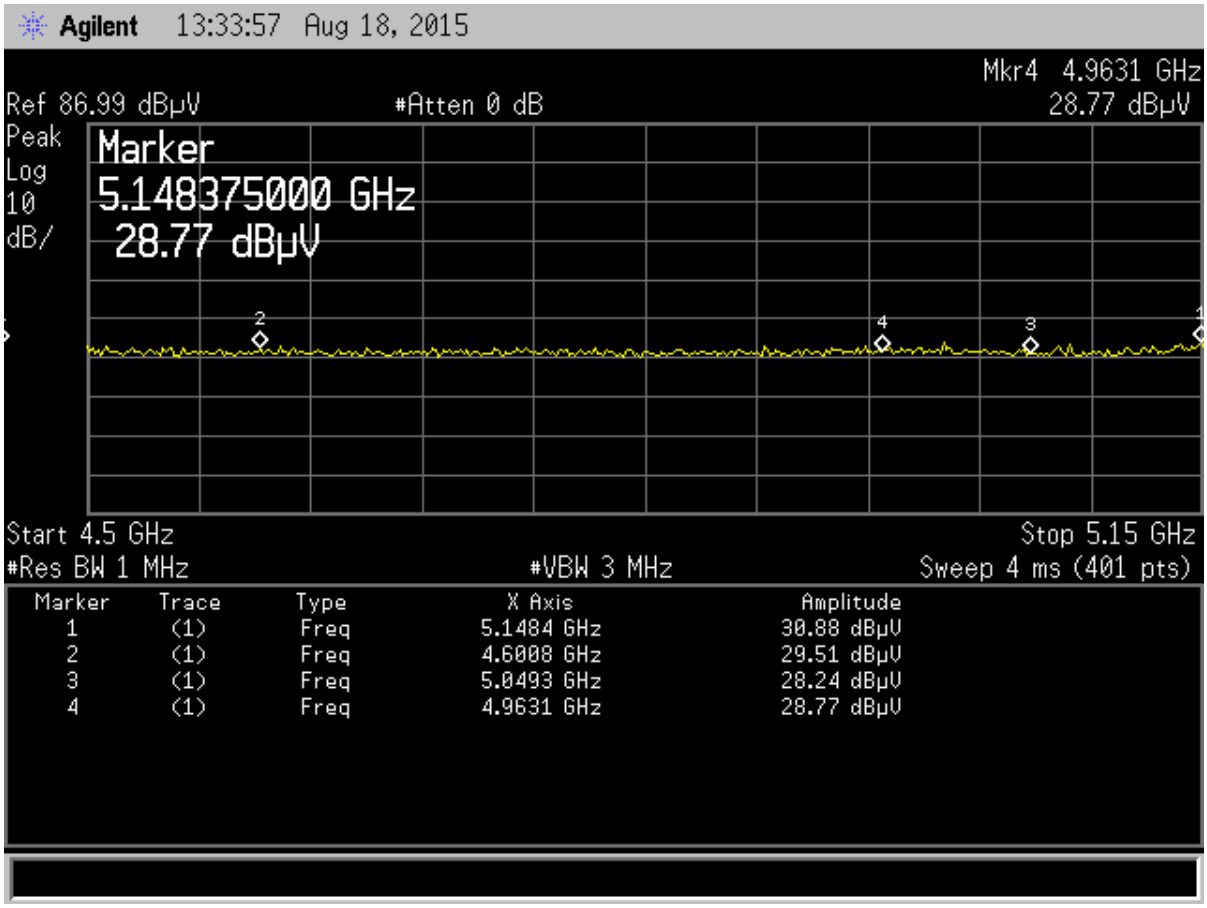


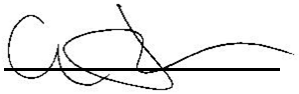
Figure 64. Restricted Band 4.5 - 5.15 GHz operating on Channel 36, 802.11n – Peak on U.FL Antenna

Table 18. Radiated Restricted Band 4.5 GHz to 5.15 GHz, 802.11n – Peak on U.FL Antenna

4.5 GHz to 5.15 GHz Restricted Band Peak Measurements							
Test: Radiated Emissions				**Client:** Inventek Systems			
Project: 15-0108				**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**PK Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
5148.40	30.88	39.65	61.03	74.0	1.0m./HORZ	13.0	**PK**
4600.80	29.51	37.90	57.91	74.0	1.0m./HORZ	16.1	**PK**
5049.30	28.24	39.26	58.00	74.0	1.0m./HORZ	16.0	**PK**
4963.10	28.77	38.82	58.09	74.0	1.0m./HORZ	15.9	**PK**

Note: extrapolation factor of -9.5 dB applied to the results.

Sample calculation: at 5148.40 MHz, 30.88 dBuV + 39.65 (dB) + -9.5 dB (extrapolation factor) = 61.03 dBuV/m

Test Date: August 18, 2015
Tested By
Signature:  Name: Carrie Ingram

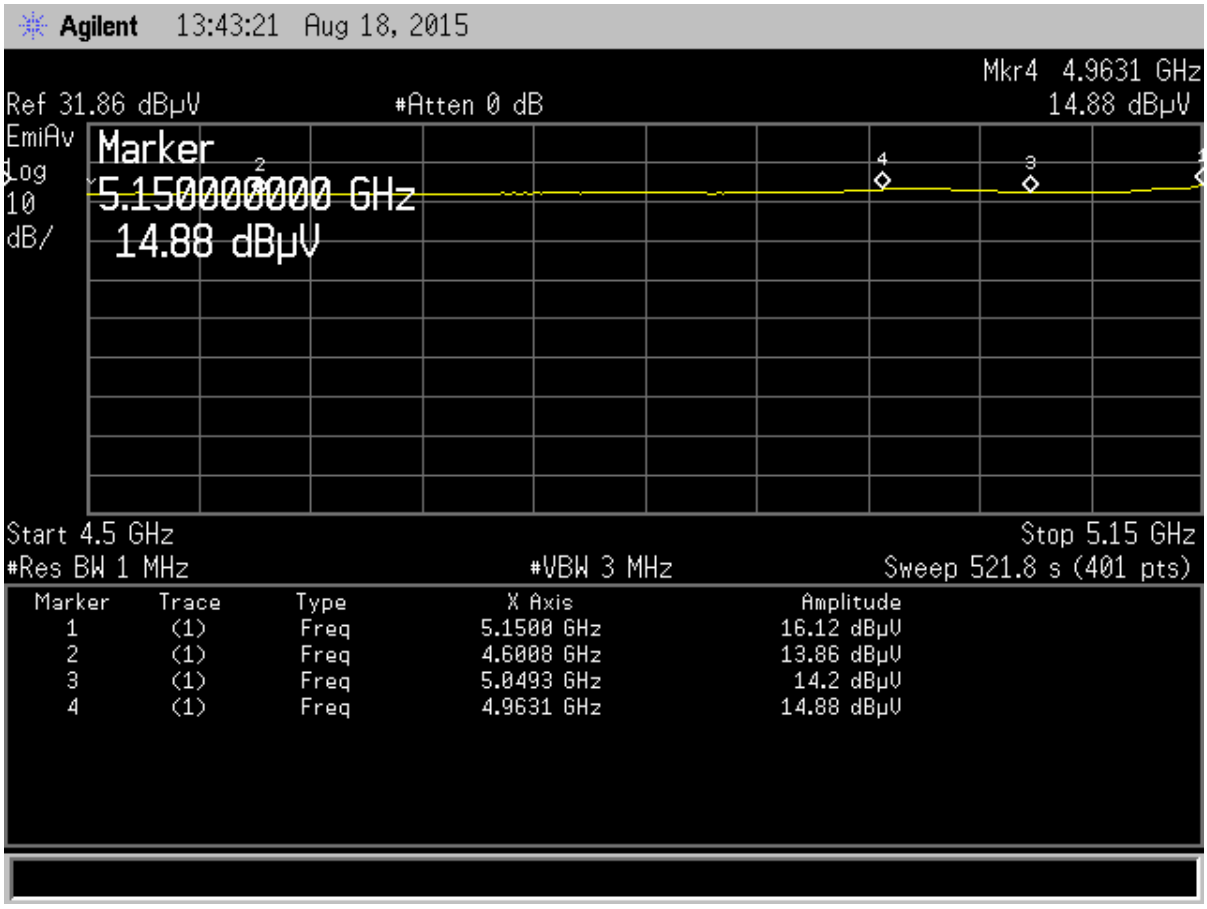


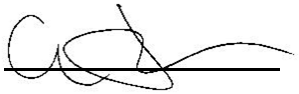
Figure 65. Restricted Band 4.5 - 5.15 GHz operating on Channel 36, 802.11n-Average on U.FL Antenna

Table 19. Radiated Restricted Band 4.5 GHz to 5.15 GHz, 802.11n – Average on U.FL Antenna

4.5 GHz to 5.15 GHz Restricted Band AVG Measurements							
Test: Radiated Emissions				**Client:** Inventek Systems			
Project: 15-0108				**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**AVG Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
5150.00	16.12	39.65	46.27	54.0	1.0m./HORZ	7.7	**AVG**
4600.80	13.86	37.90	42.26	54.0	1.0m./HORZ	11.7	**AVG**
5049.30	14.20	39.26	43.96	54.0	1.0m./HORZ	10.0	**AVG**
4963.10	14.88	38.82	44.20	54.0	1.0m./HORZ	9.8	**AVG**

Note: extrapolation factor of -9.5 dB applied to the results.

Sample calculation: at 5150.00 MHz, 16.12 dBuV + 39.65 (dB) + -9.5 dB (extrapolation factor) = 46.27 dBuV/m

Test Date: August 18, 2015
Tested By
Signature:  Name: Carrie Ingram

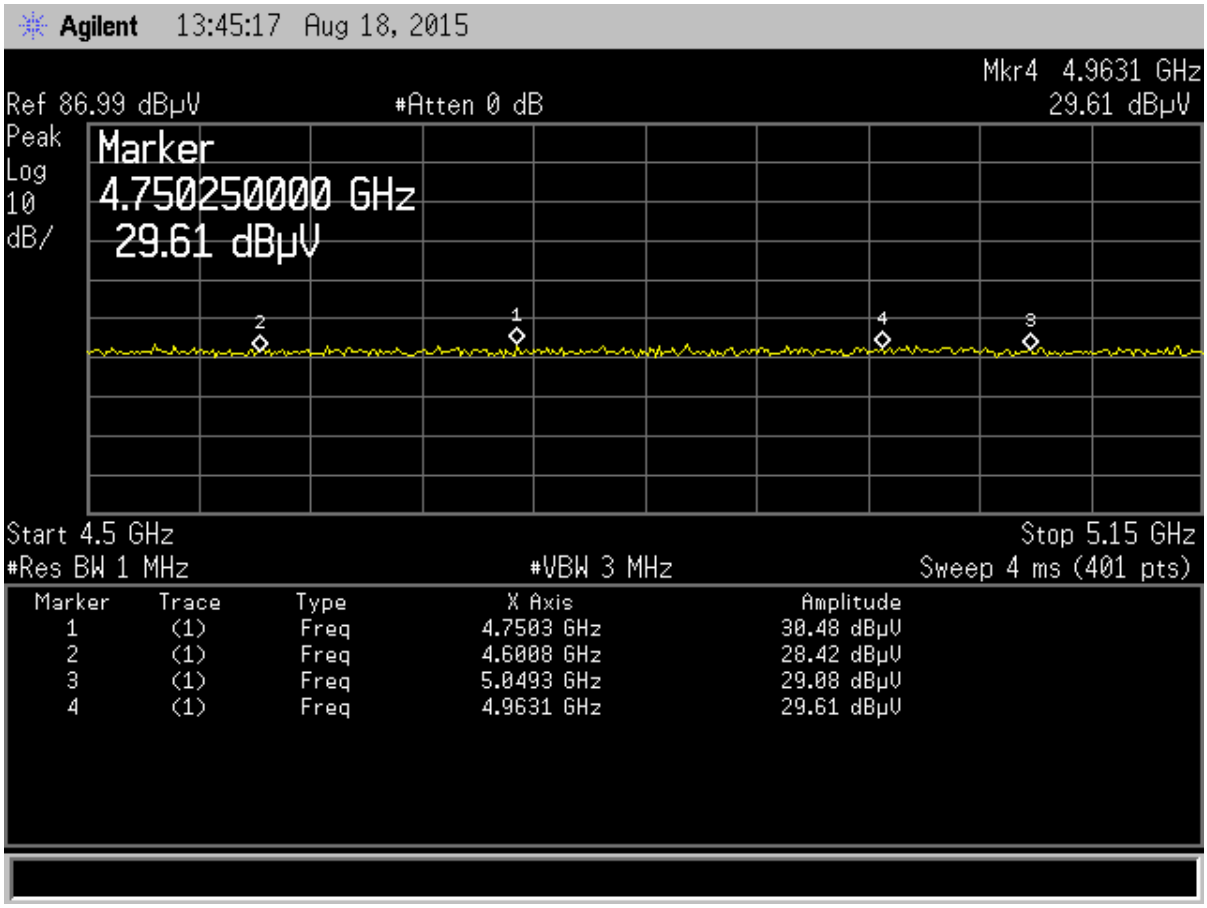


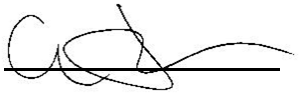
Figure 66. Restricted Band 4.5 - 5.15 GHz operating on Channel 36, 802.11a - Peak on U.FL Antenna

Table 20. Radiated Restricted Band 4.5 GHz to 5.15 GHz, 802.11a – Peak on U.FL Antenna

4.5 GHz to 5.15 GHz Restricted Band Peak Measurements							
Test: Radiated Emissions				**Client:** Inventek Systems			
Project: 15-0108				**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**PK Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
4750.30	30.48	38.17	59.15	74.0	1.0m./HORZ	14.8	**PK**
4600.80	28.42	37.90	56.82	74.0	1.0m./HORZ	17.2	**PK**
5049.30	29.08	39.26	58.84	74.0	1.0m./HORZ	15.2	**PK**
4963.10	29.61	38.82	58.93	74.0	1.0m./HORZ	15.1	**PK**

Note: extrapolation factor of -9.5 dB applied to the results.

Sample calculation: at 4750.30 MHz, 30.48 dBuV + 38.17 (dB) + -9.5 dB (extrapolation factor) = 59.15 dBuV/m

Test Date: August 18, 2015
Tested By
Signature:  Name: Carrie Ingram

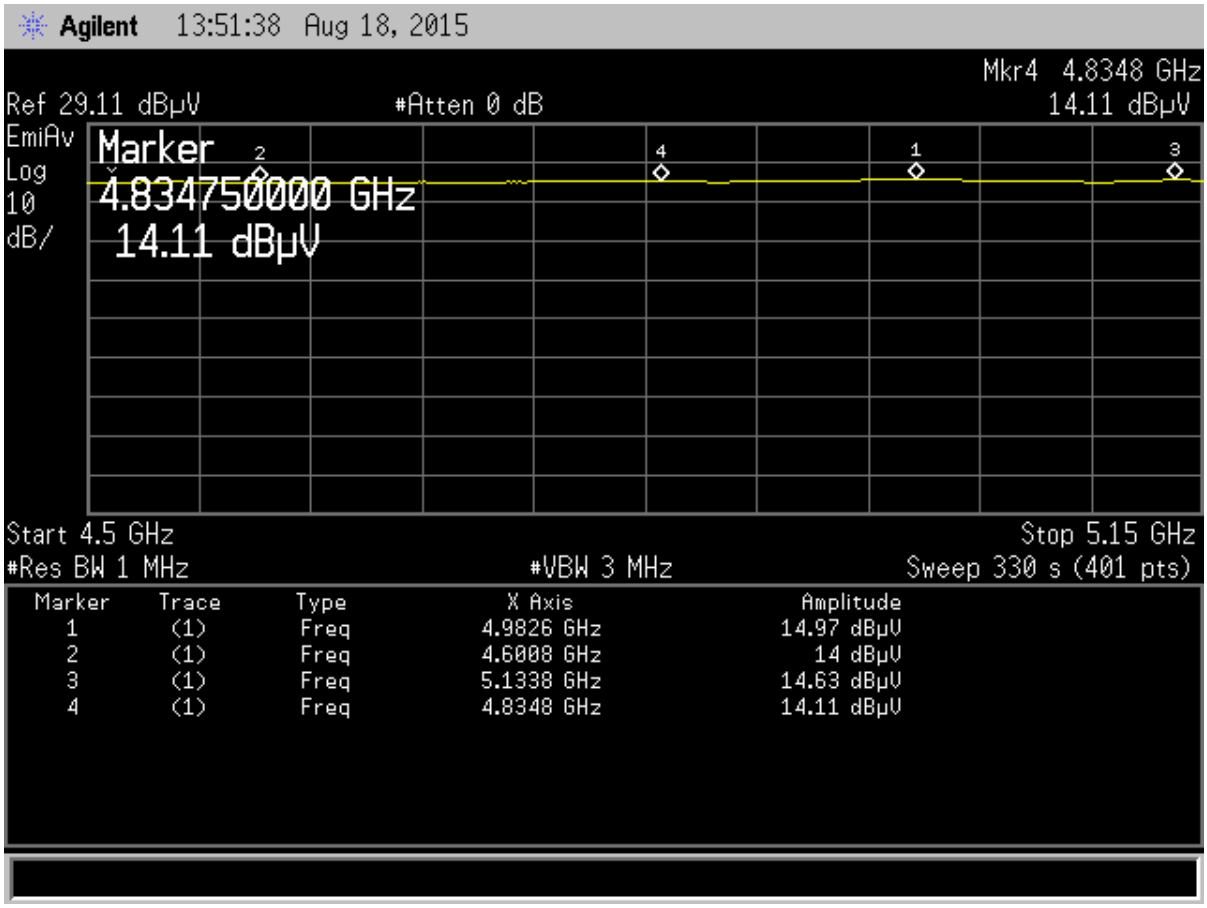


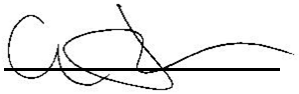
Figure 67. Restricted Band 4.5 - 5.15 GHz operating on Channel 36, 802.11a – Average on U.FL Antenna

Table 21. Radiated Restricted Band 4.5 GHz to 5.15 GHz, 802.11a – Average on U.FL Antenna

4.5 GHz to 5.15 GHz Restricted Band Average Measurements							
Test: Radiated Emissions				**Client:** Inventek Systems			
Project: 15-0108				**Model:** ISM4334X-M4G-L44 Module			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**AVG Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
4982.60	14.97	38.82	44.29	54.0	1.0m./HORZ	9.7	**AVG**
4600.80	14.00	37.90	42.40	54.0	1.0m./HORZ	11.6	**AVG**
5133.80	14.63	39.65	44.78	54.0	1.0m./HORZ	9.2	**AVG**
4834.80	14.11	38.47	43.08	54.0	1.0m./HORZ	10.9	**AVG**

Note: extrapolation factor of -9.5 dB applied to the results.

Sample calculation: at 4982.60 MHz, 14.97 dBuV + 38.82 (dB) + -9.5 dB (extrapolation factor) = 44.29 dBuV/m

Test Date: August 18, 2015
Tested By
Signature:  Name: Carrie Ingram

2.13 Six (6) dB Bandwidth per CFR 15.407(e),

The EUT antenna port was connected to a spectrum analyzer having a 50 Ω input impedance. The RBW was set to 1 MHz and with the VBW ≥ RBW. The results of this test are given in the table below and Figures below. The Highest and Lowest Channel that the EUT can operate on in the 5.74525 to 5.85 GHz were measured to ensure that the 6 dB bandwidth is at least 500 kHz.

Table 22. Six (6) dB Bandwidth

Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum FCC Bandwidth (MHz)
802.11a		
5745	15.14	0.500
5825	14.25	0.500
802.11n		
5745	17.31	0.500
5825	16.95	0.500

Test Date: August 17 and September 30, 2015
Tested By
Signature: _____ Name: Carrie Ingram

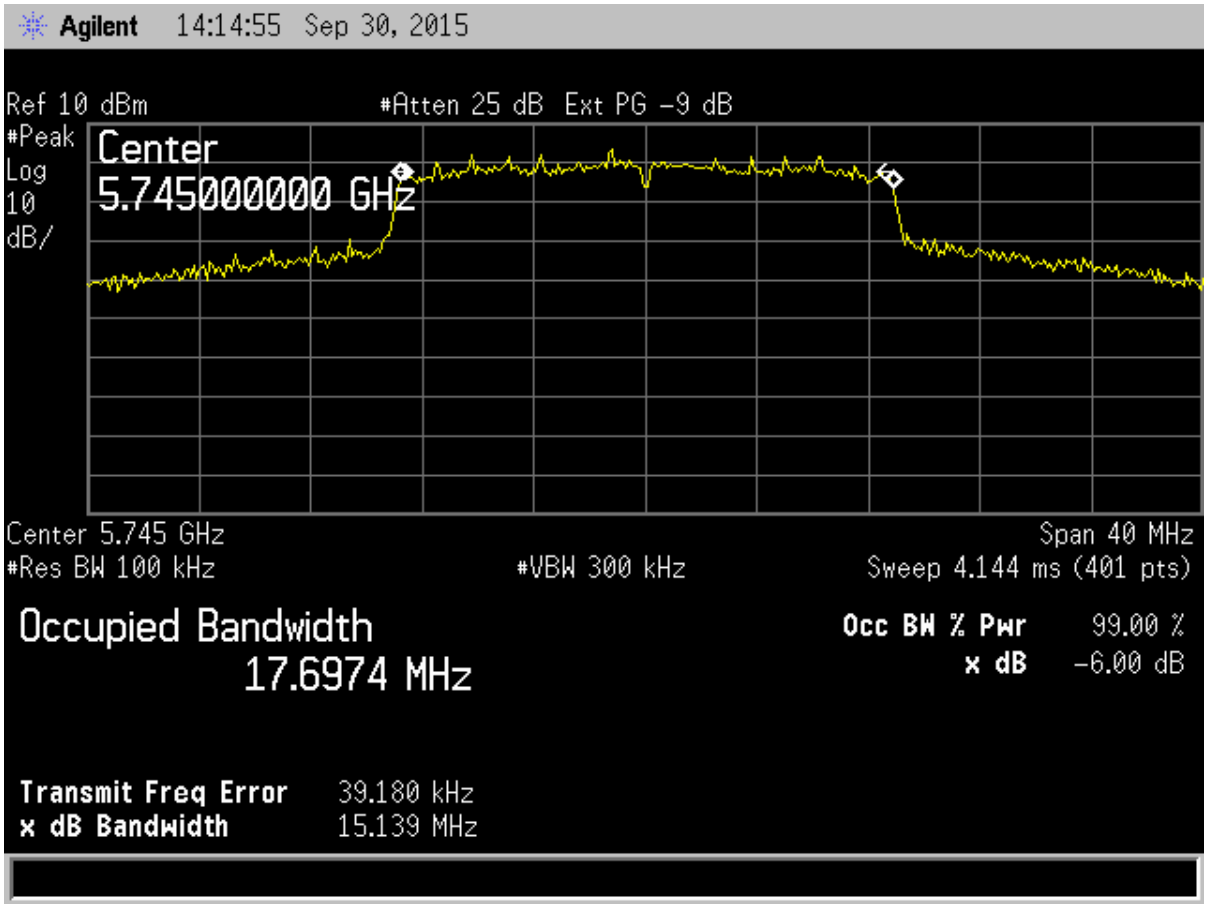


Figure 68. Six dB Bandwidth 802.11a - 15.407 - Low Channel

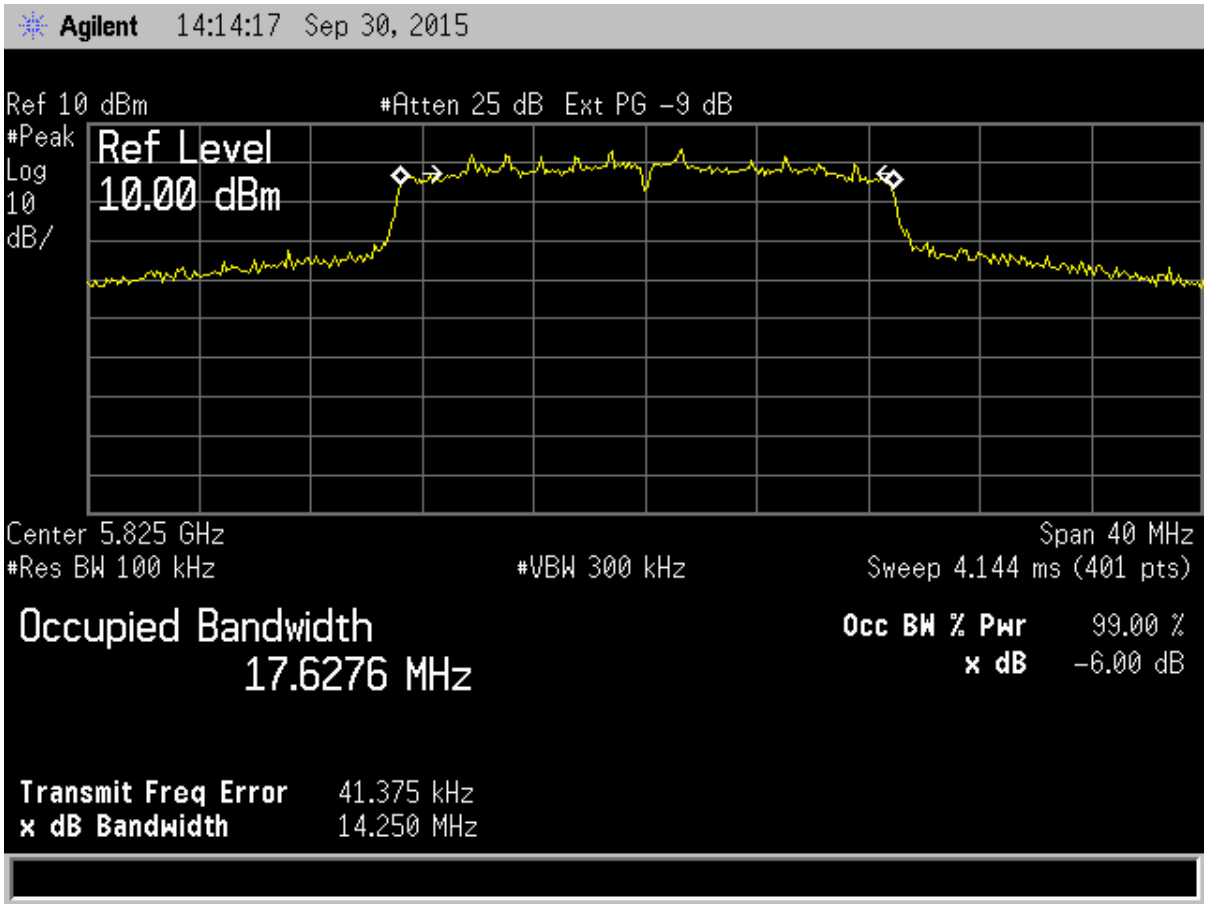


Figure 69. Six dB Bandwidth 802.11a - 15.407 - High Channel

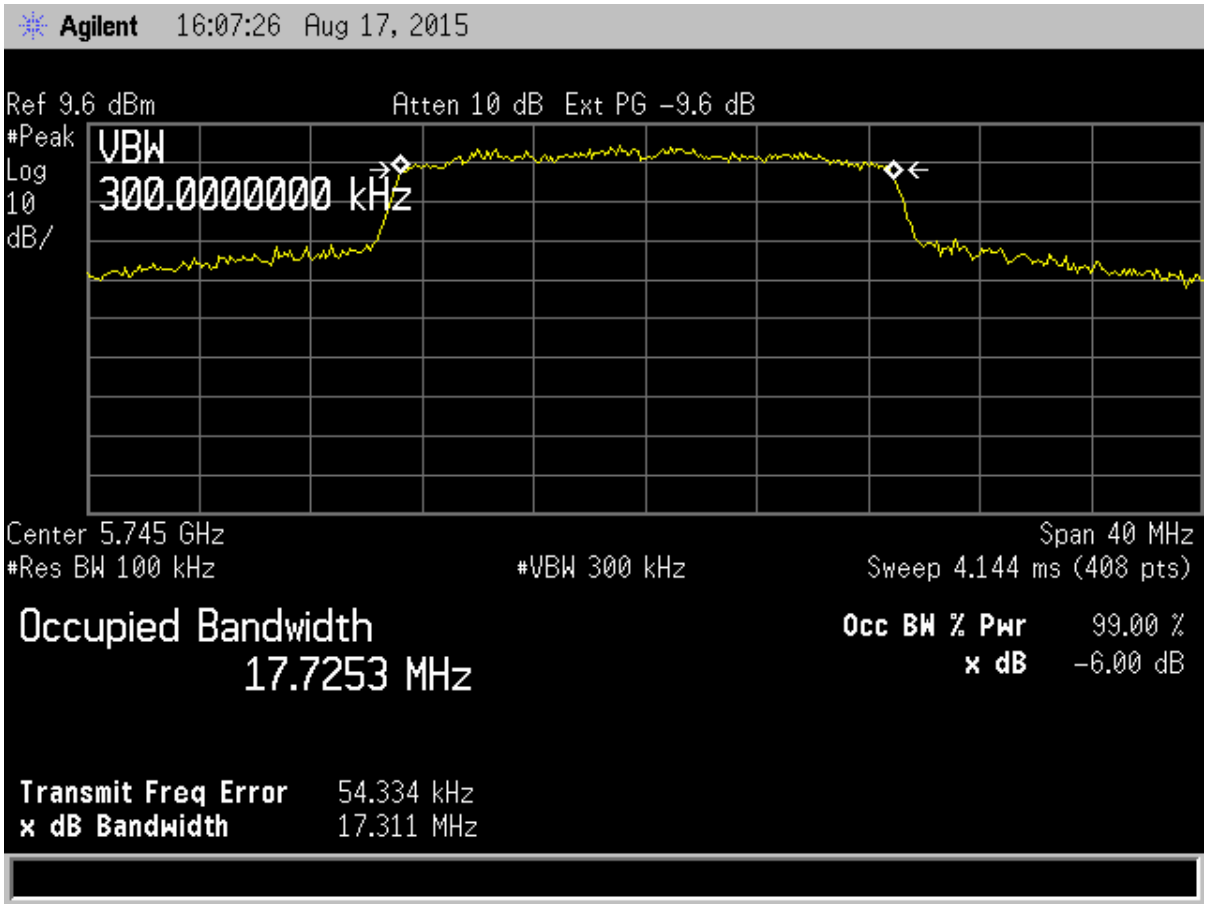


Figure 70. Six dB Bandwidth 802.11n - 15.407 - Low Channel

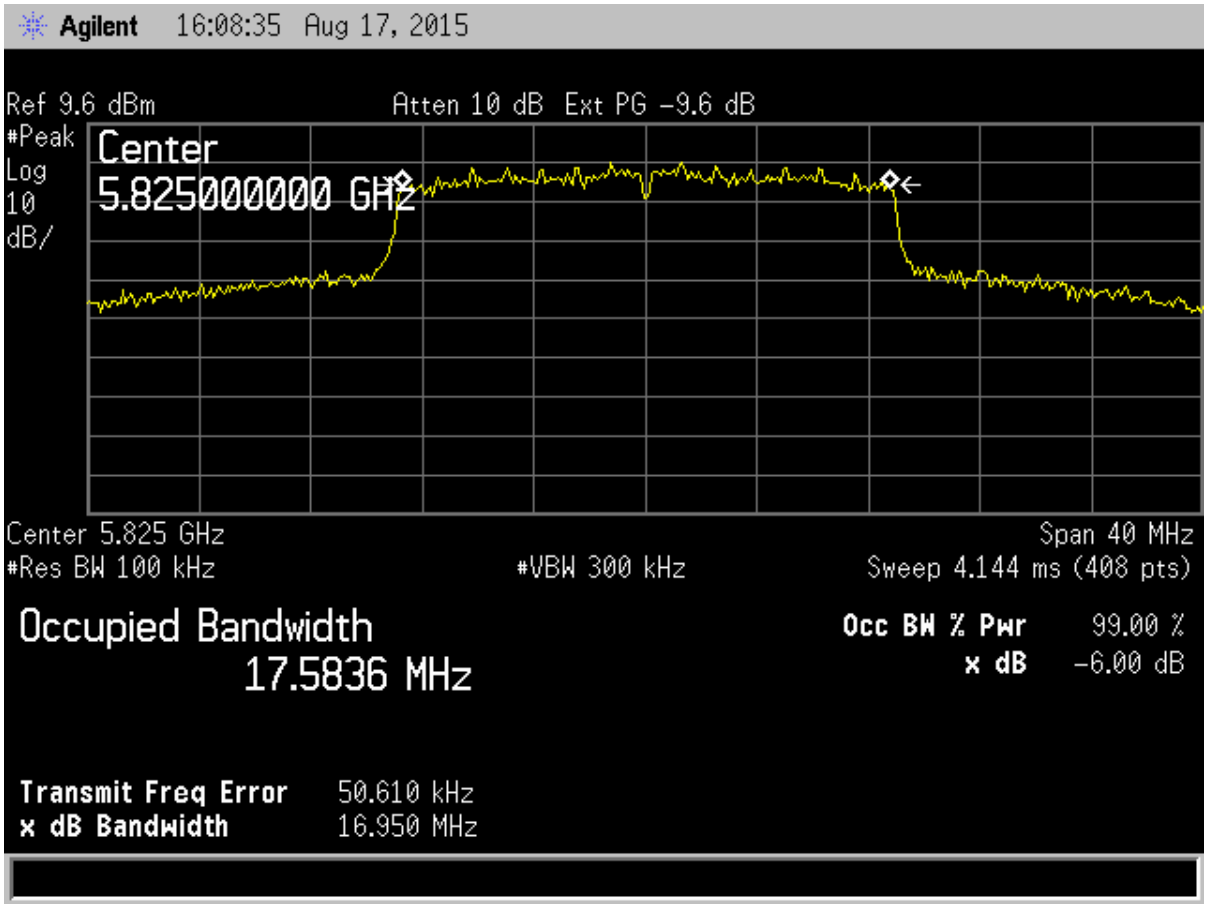


Figure 71. Six dB Bandwidth 802.11n - 15.407 - High Channel

2.14 99% Occupied Bandwidth (15.407(a) (5), IC RSS 247, 6.4)

These measurements were performed while the EUT was in a constant transmit mode. The spectrum analyzers bandwidth measurement was used to determined the 26 dB bandwidth and the 99 % BW. The test procedures in the KDB document 789033 D02 v01 were followed. The RBW was set to approximately1 % to 5 % times the OBW with the VBW ≥ RBW and the span 1.5 to 5.0 times the OBW. The results of this test are given in Table 10 and 11 and Figures 86-99.

Table 23. 26 dB Bandwidth and 99% Occupied Bandwidth for 802.11a

Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
5180	25.20	17.64
5240	21.22	17.63
5745	32.65	18.03
5825	35.43	17.97

Test Date: September 30, 2015
Tested By
Signature: _____ Name: Carrie Ingram

Table 24. 26 dB Bandwidth and 99% Occupied Bandwidth for 802.11n

Frequency (MHz)	26 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
5180	19.40	17.61
5240	19.35	17.63
5745	22.70	17.72
5825	22.72	17.73

Test Date: August 17, 2015
Tested By
Signature: _____ Name: Carrie Ingram

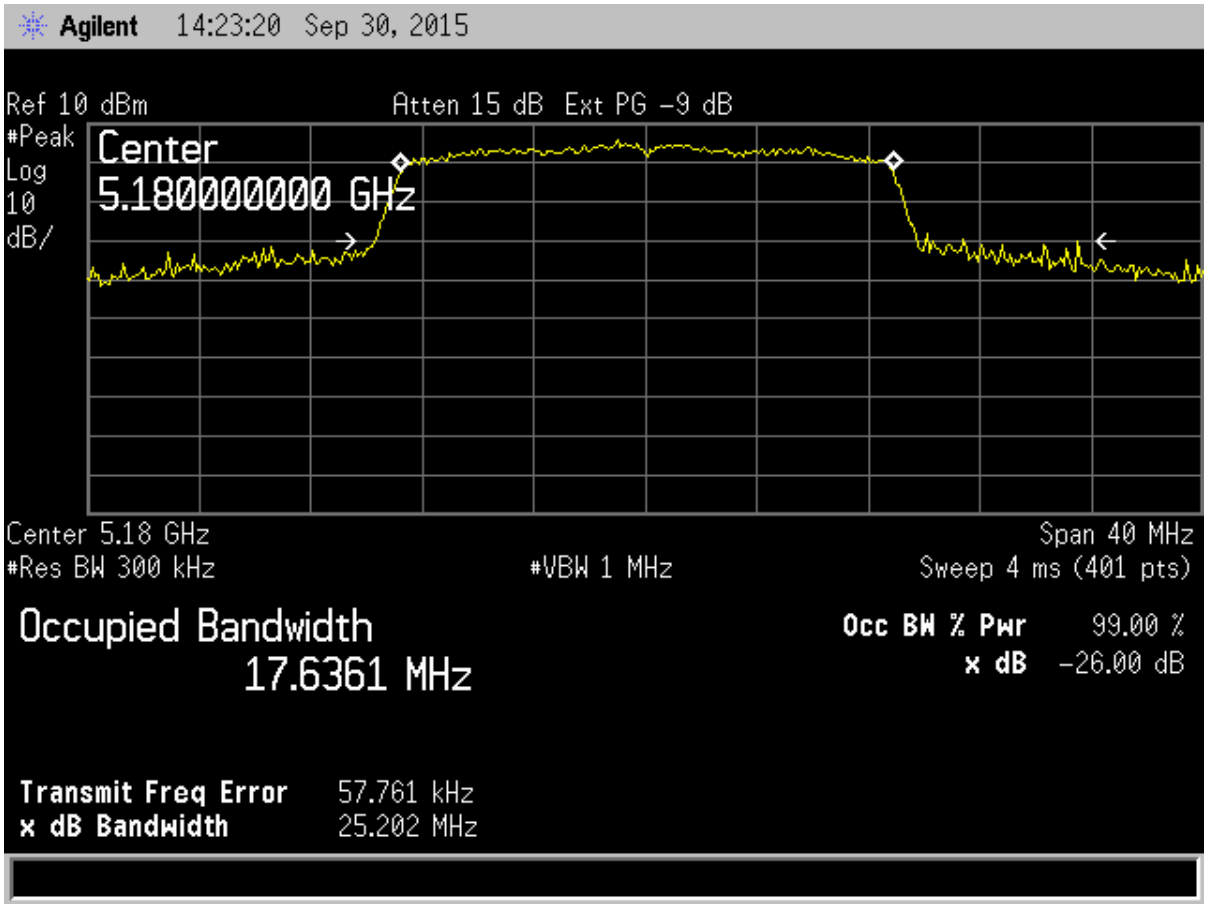


Figure 72. 26 dB BW and OBW -802.11a- Channel 36

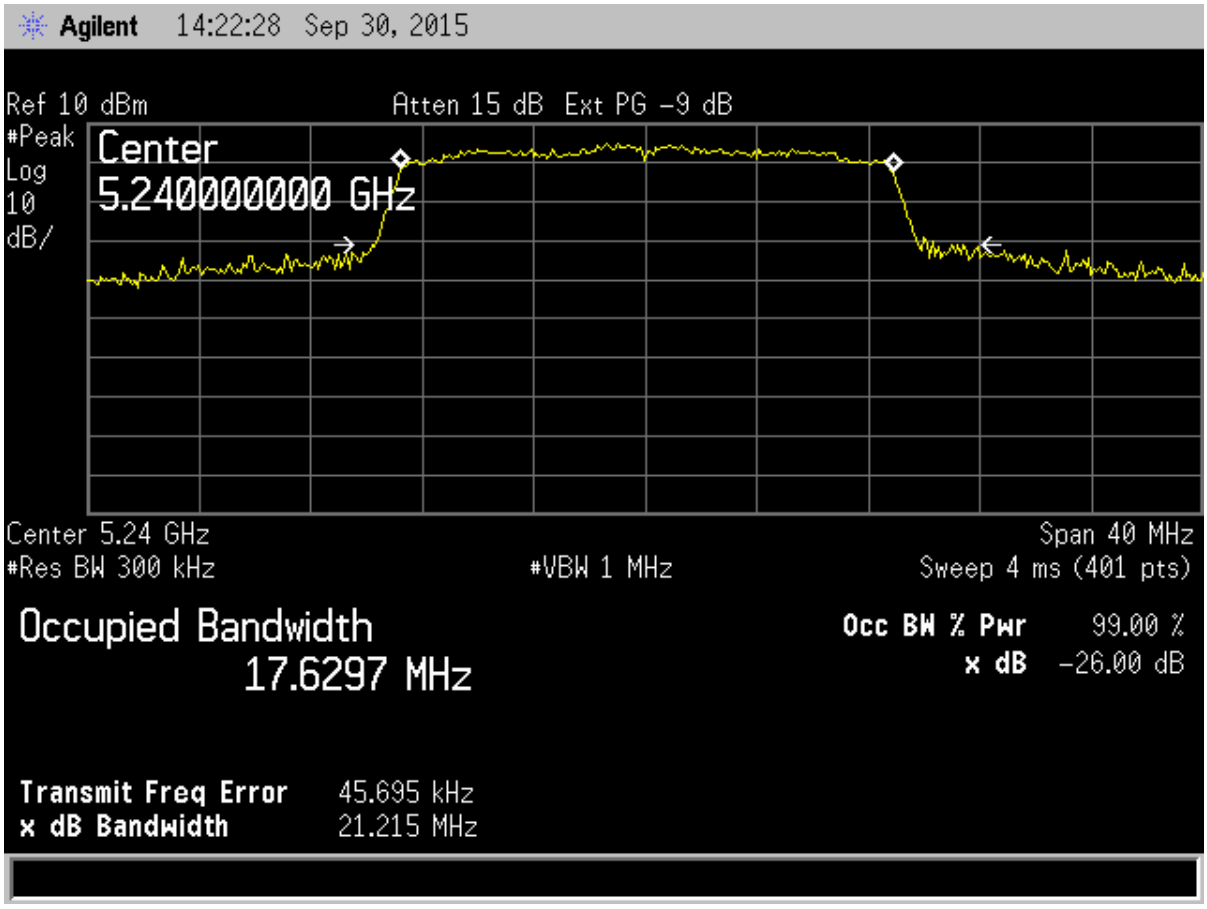


Figure 73. 26 dB BW and OBW -802.11a- Channel 48

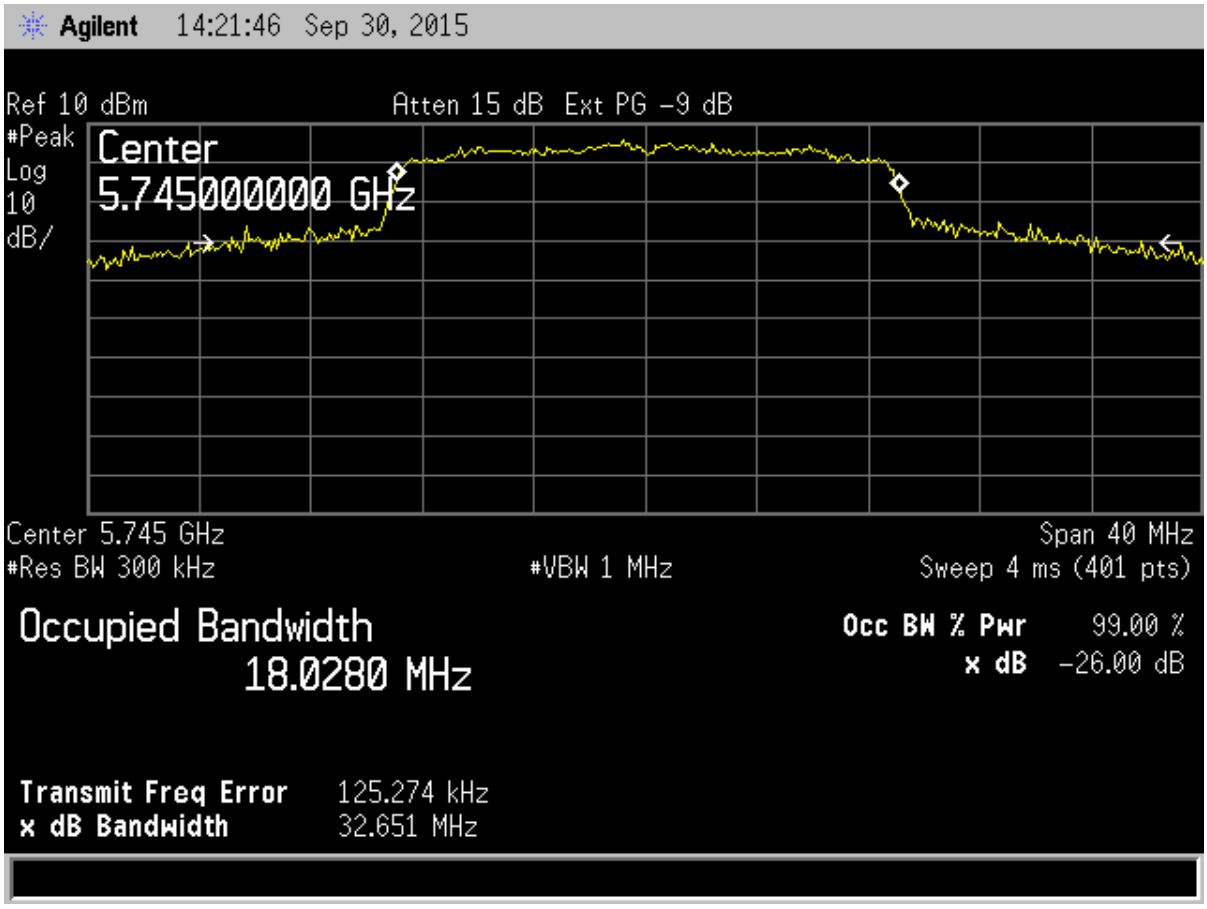


Figure 74. 26 dB BW and OBW -802.11a- Channel 149

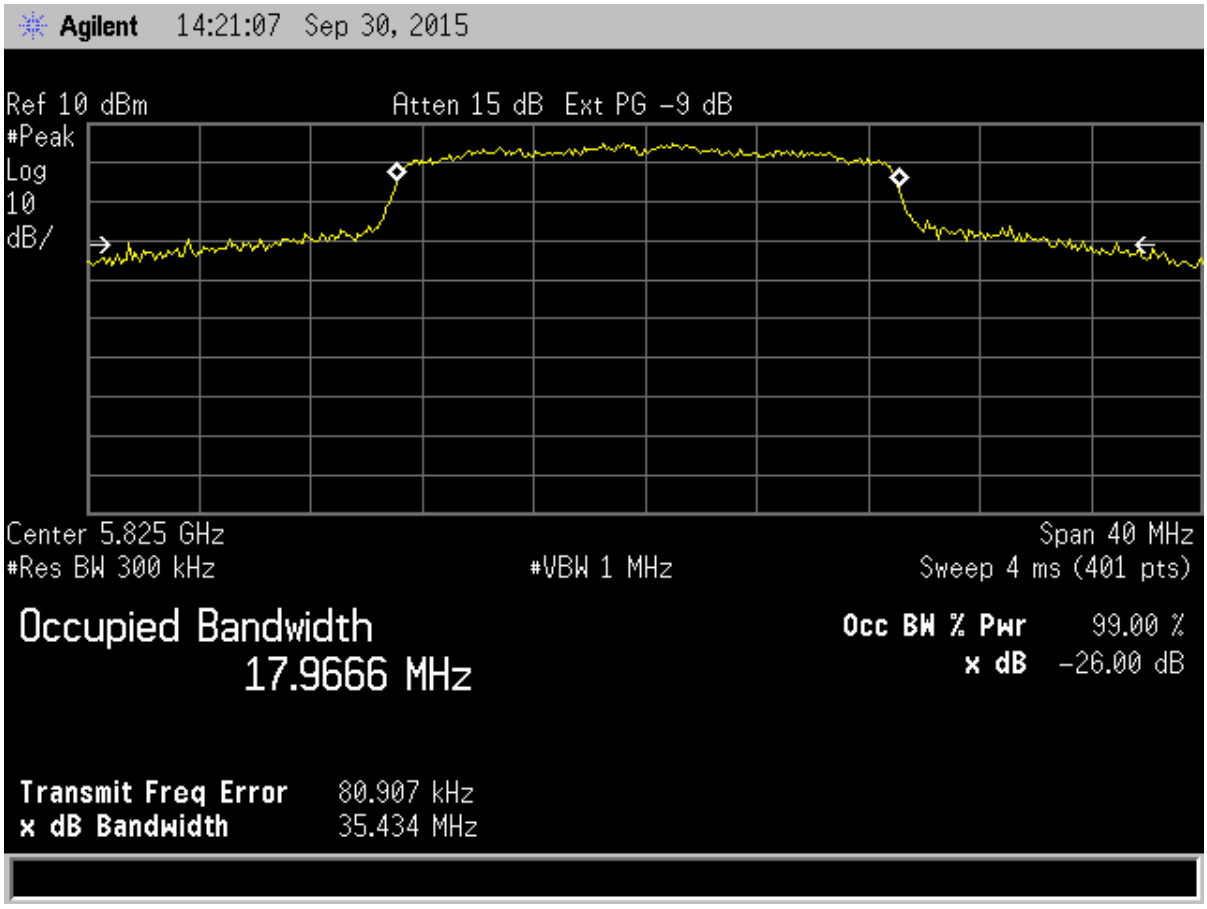


Figure 75. 26 dB BW and OBW -802.11a- Channel 165

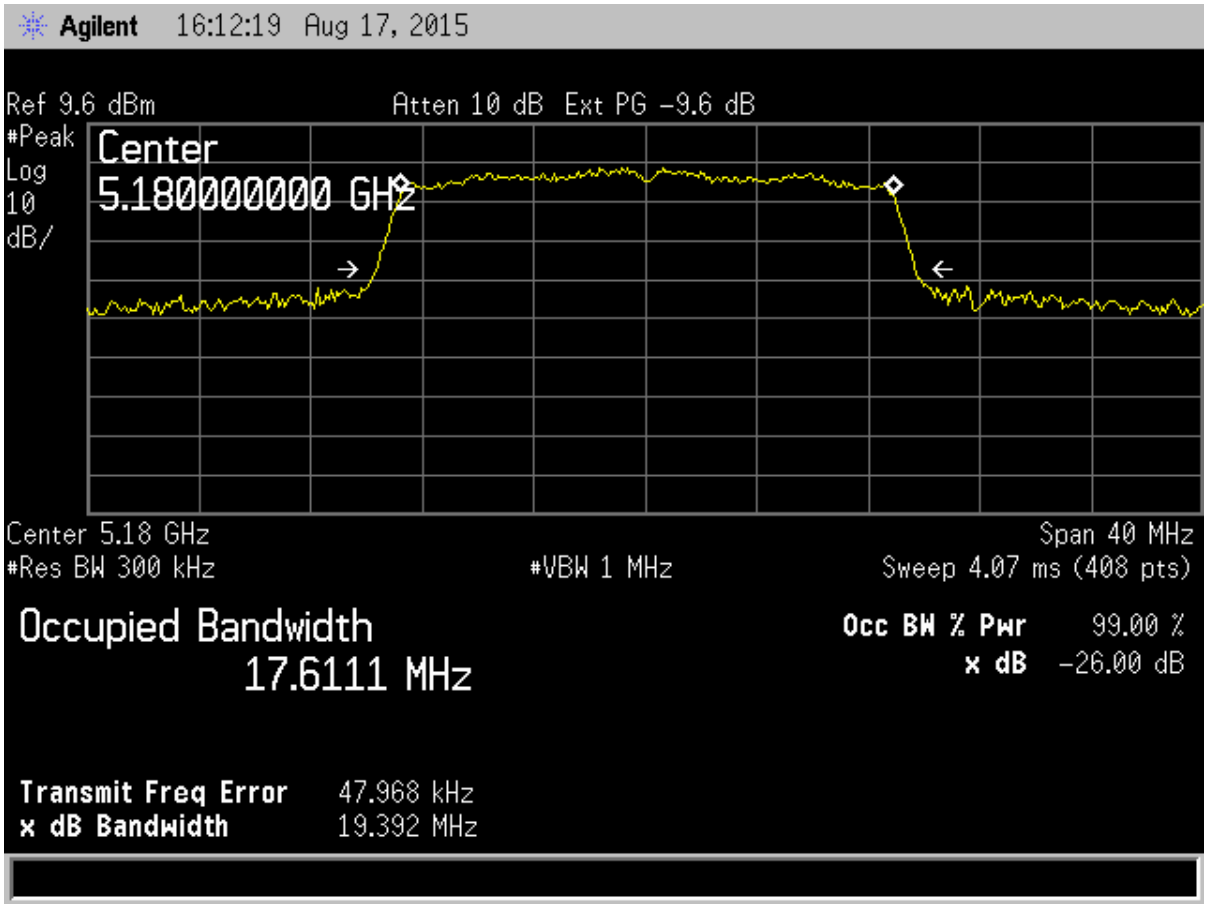


Figure 76. 26 dB BW and OBW -802.11n- Channel 36

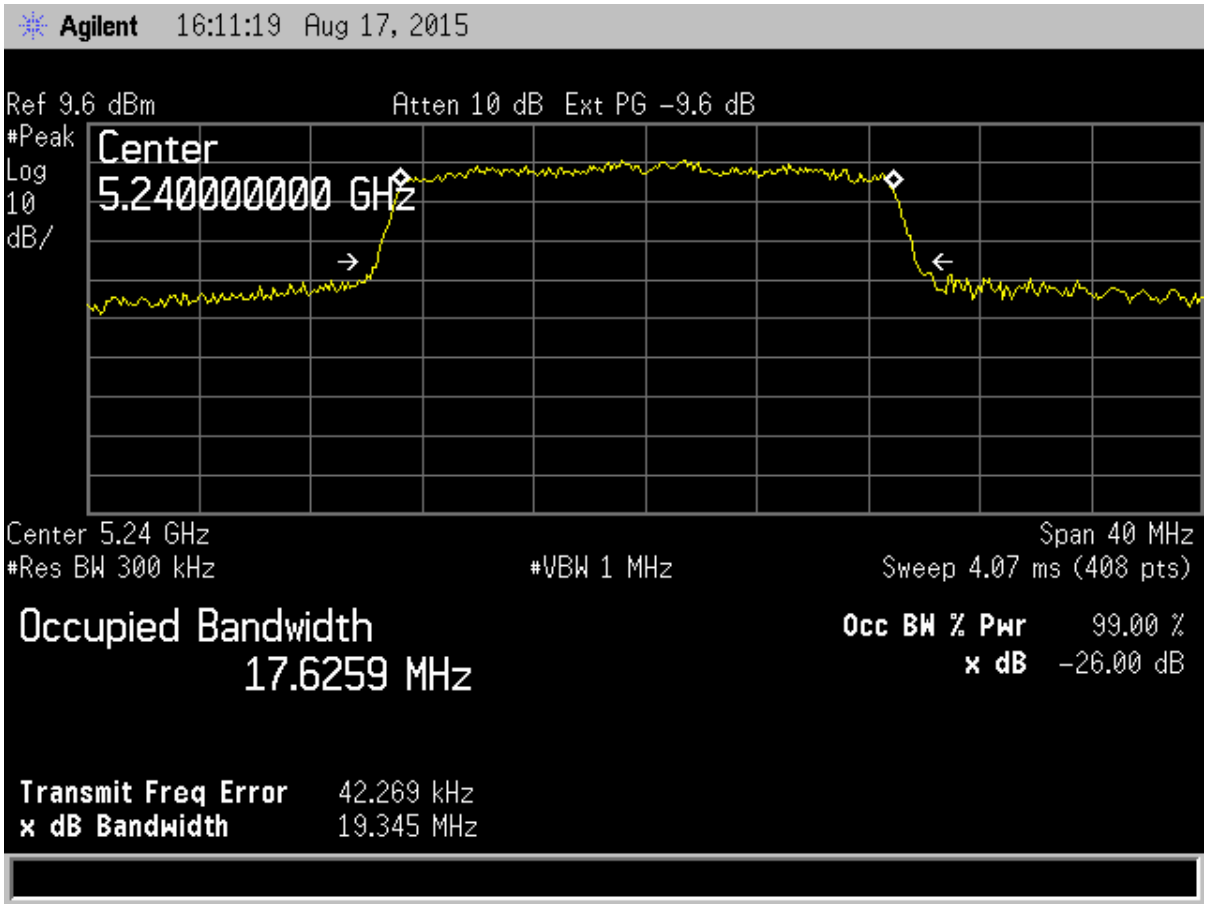


Figure 77. 26 dB BW and OBW -802.11n- Channel 48

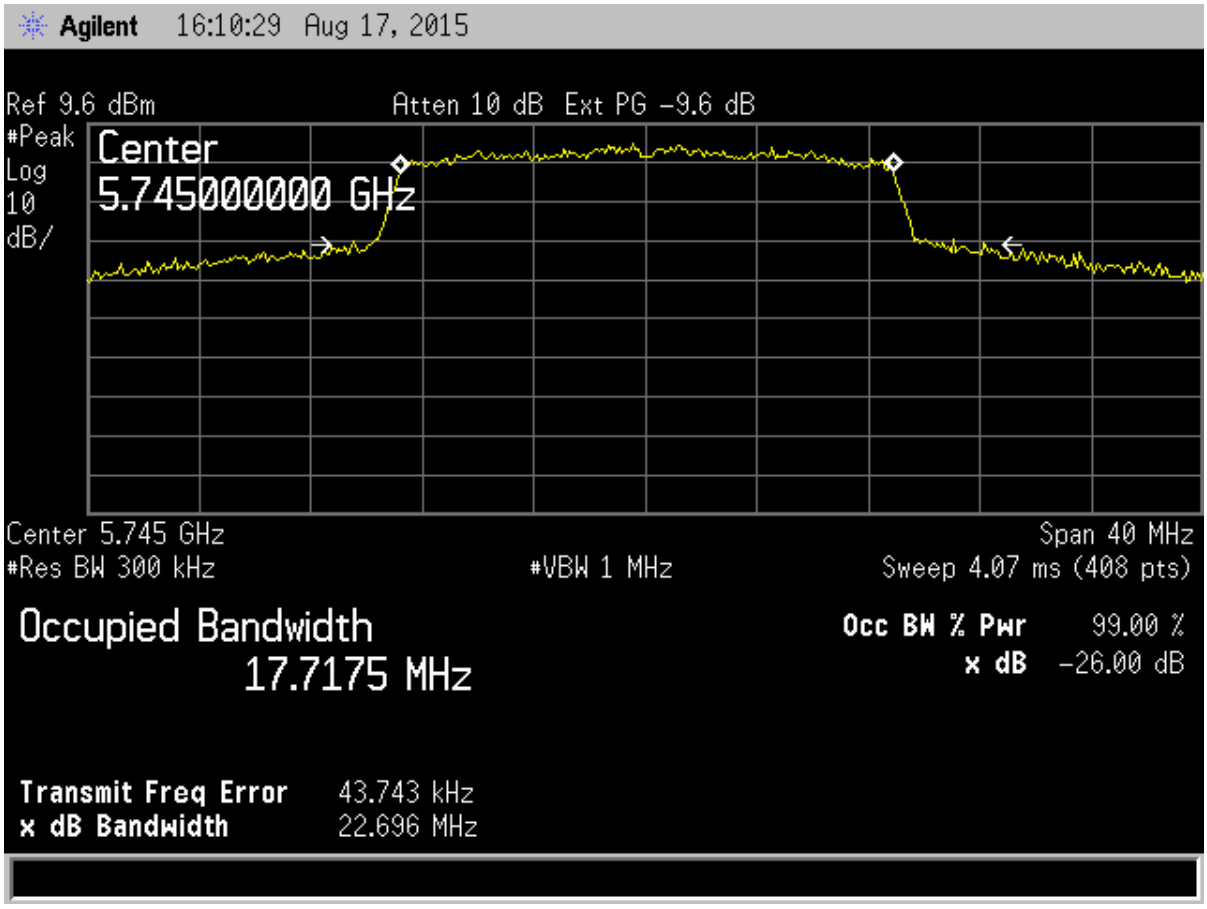


Figure 78. 26 dB BW and OBW -802.11n- Channel 149

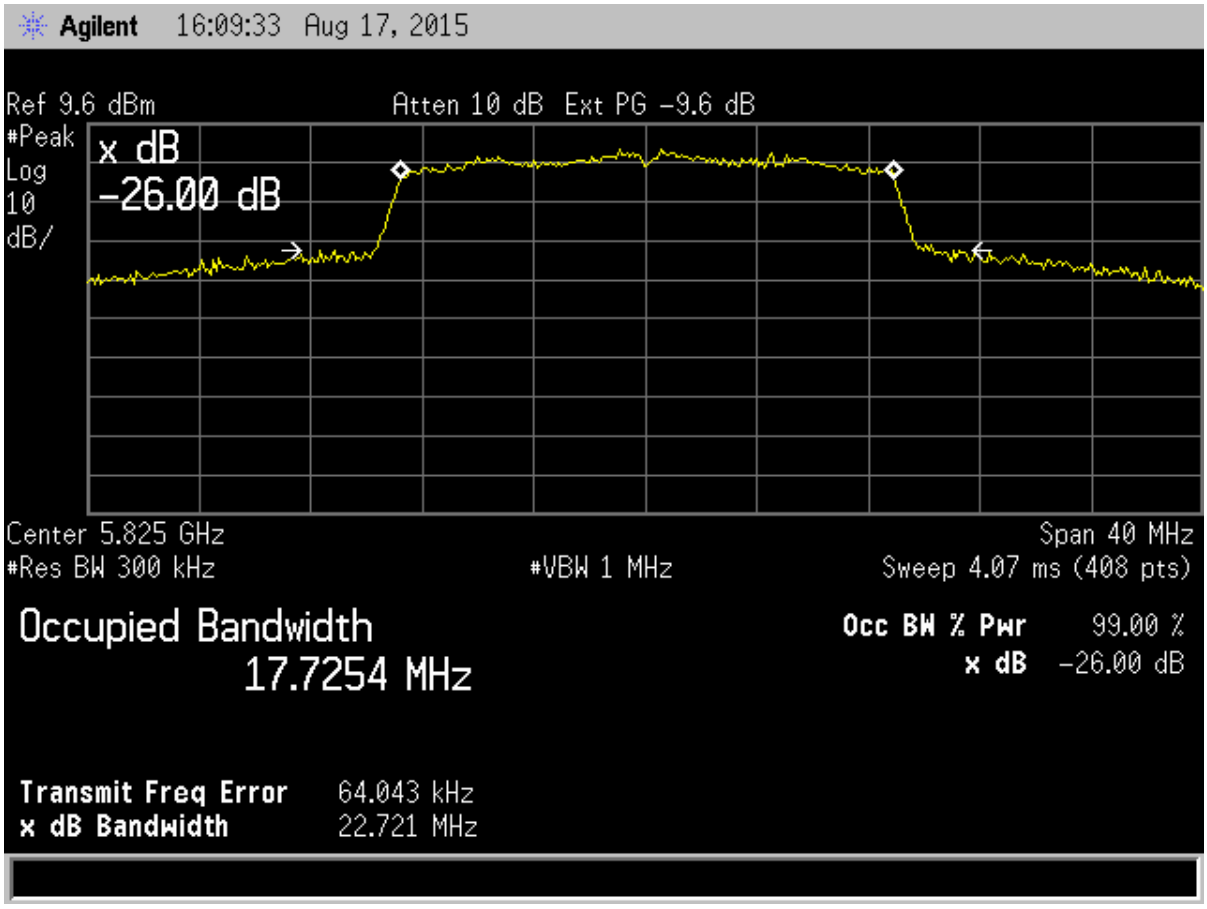


Figure 79. 26 dB BW and OBW -802.11n- Channel 165

2.15 Maximum Peak Conducted Output Power (CFR 15.407 (a) (1,2,3))

The transmitter was programmed to operate at a maximum output power across the bandwidth.

Peak power within the transmitting bands was measured per FCC KDB Publication 789033 D02 v01 as an Antenna Conducted test with a spectrum analyzer by connecting the spectrum analyzer directly, via a short RF cable, and attenuators to the antenna output terminals on the EUT. The spectrum analyzer was set for an impedance of 50 Ω with the RBW set to 1 MHz, the VBW ≥ 3*RBW, and span large enough to encompass the entire 99 % bandwidth and the channel power was integrated over the whole band. Peak antenna conducted output power is tabulated in the table below.

Table 25. Peak Antenna Conducted Output Power per 15.407 (a) (1,2,3) for 802.11a

Frequency of Fundamental (MHz)	Peak Test Data (dBm)	FCC Limit (dBm)	Margin (dB)
5180	18.26	23.98	5.72
5240	17.90	23.98	6.08
5745	18.18	30.00	11.82
5825	17.55	30.00	12.45

Test Date: September 30 ,2015
Tested By
Tested By
Signature:  Name: Carrie Ingram

Table 26. Peak Antenna Conducted Output Power per 15.407 (a) (1,2,3) for 802.11n

Frequency of Fundamental (MHz)	Test Data (dBm)	FCC Limit (dBm)	Margin (dB)
5180	17.39	23.98	6.59
5240	17.87	23.98	6.11
5745	16.72	30.00	13.28
5825	15.14	30.00	14.86

Test Date: August 24, 2015
Tested By
Signature:  Name: Carrie Ingram

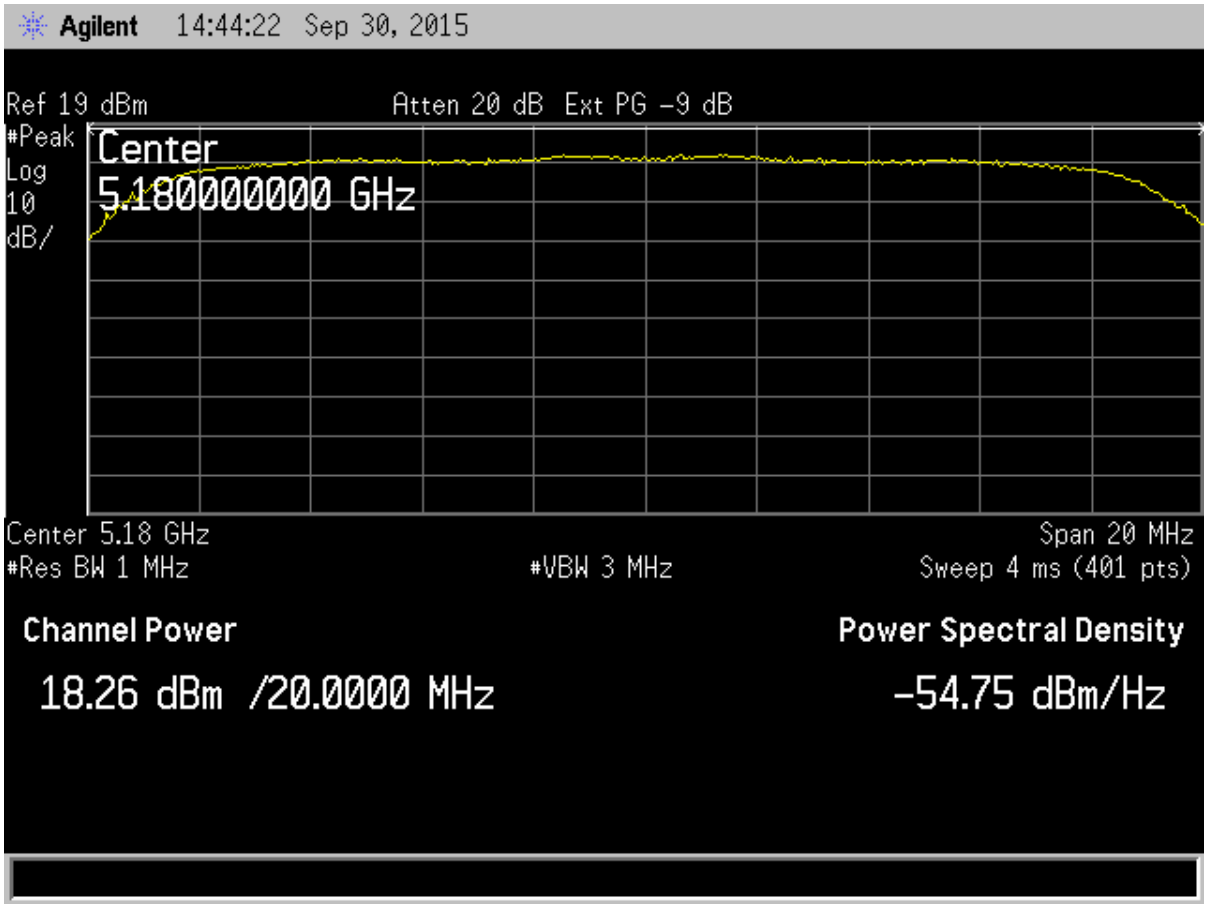


Figure 80. Peak Antenna Conducted Output Power, 802.11a Channel 36

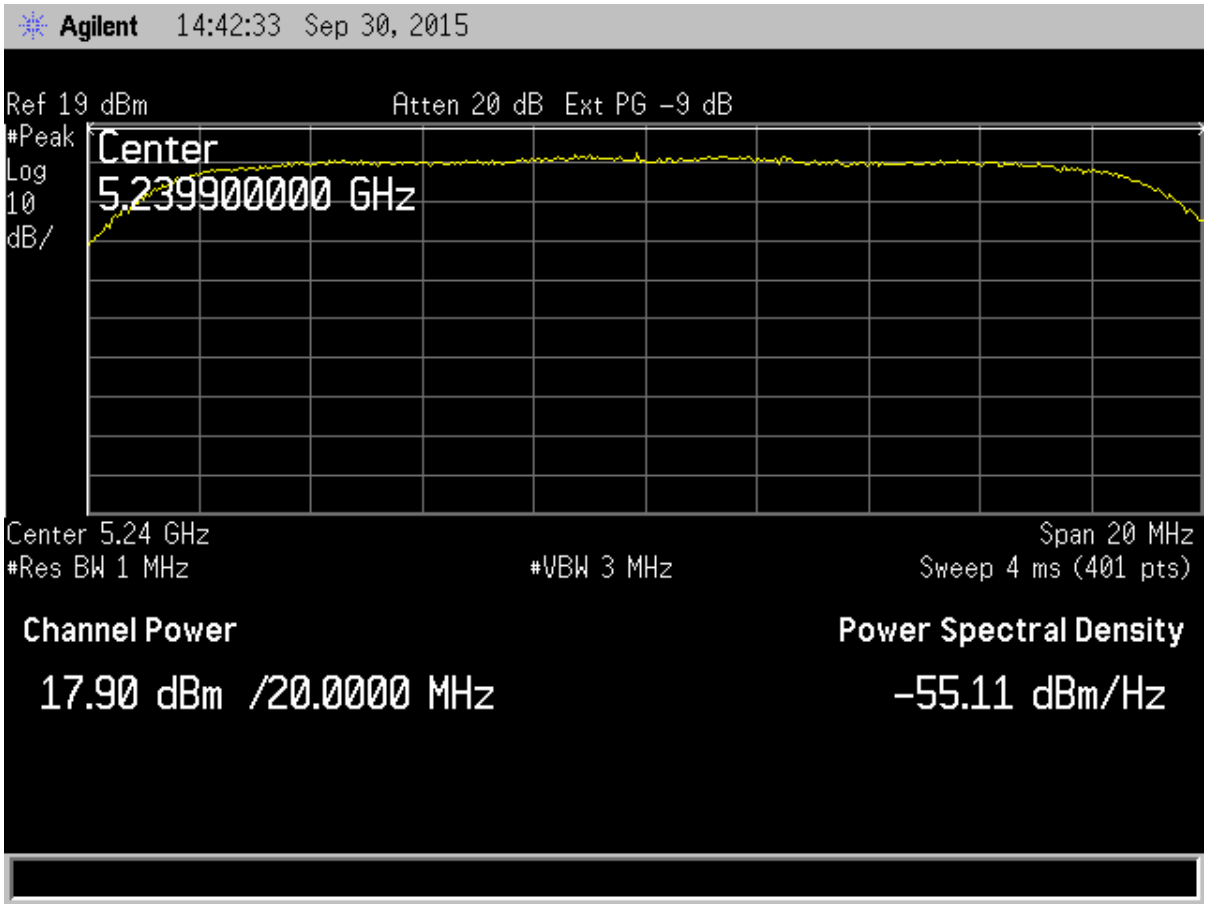


Figure 81. Peak Antenna Conducted Output Power, 802.11a Channel 48

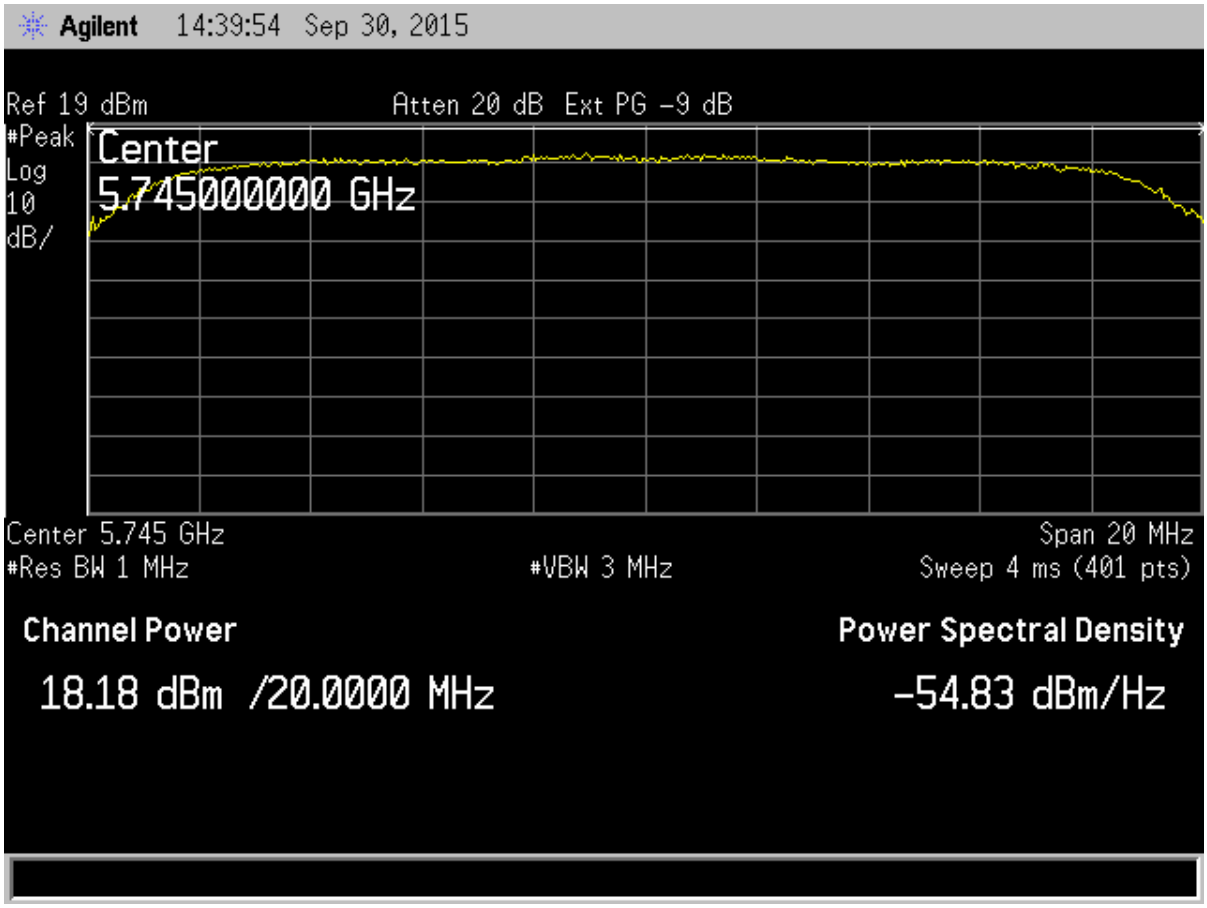


Figure 82. Peak Antenna Conducted Output Power, 802.11a Channel 149

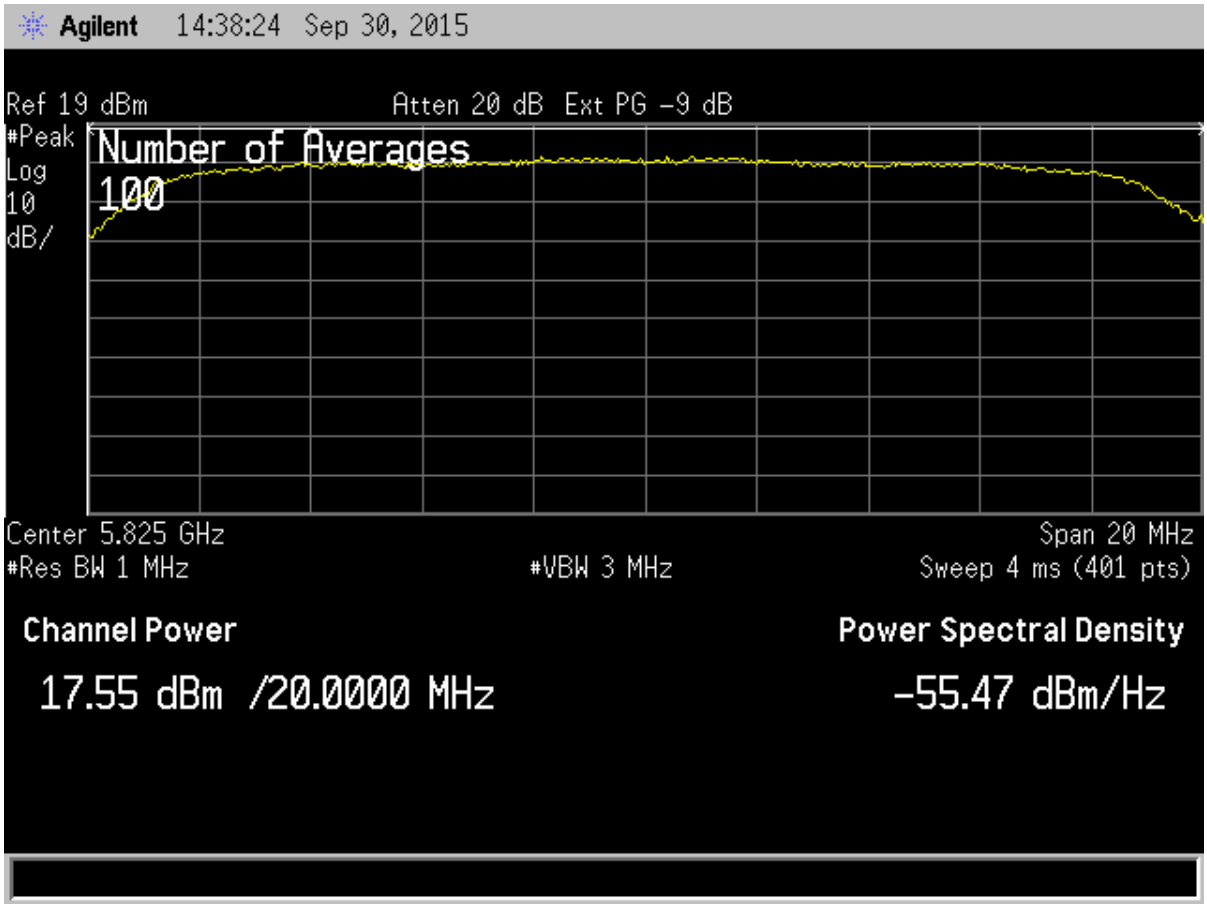


Figure 83. Peak Antenna Conducted Output Power, 802.11a Channel 165

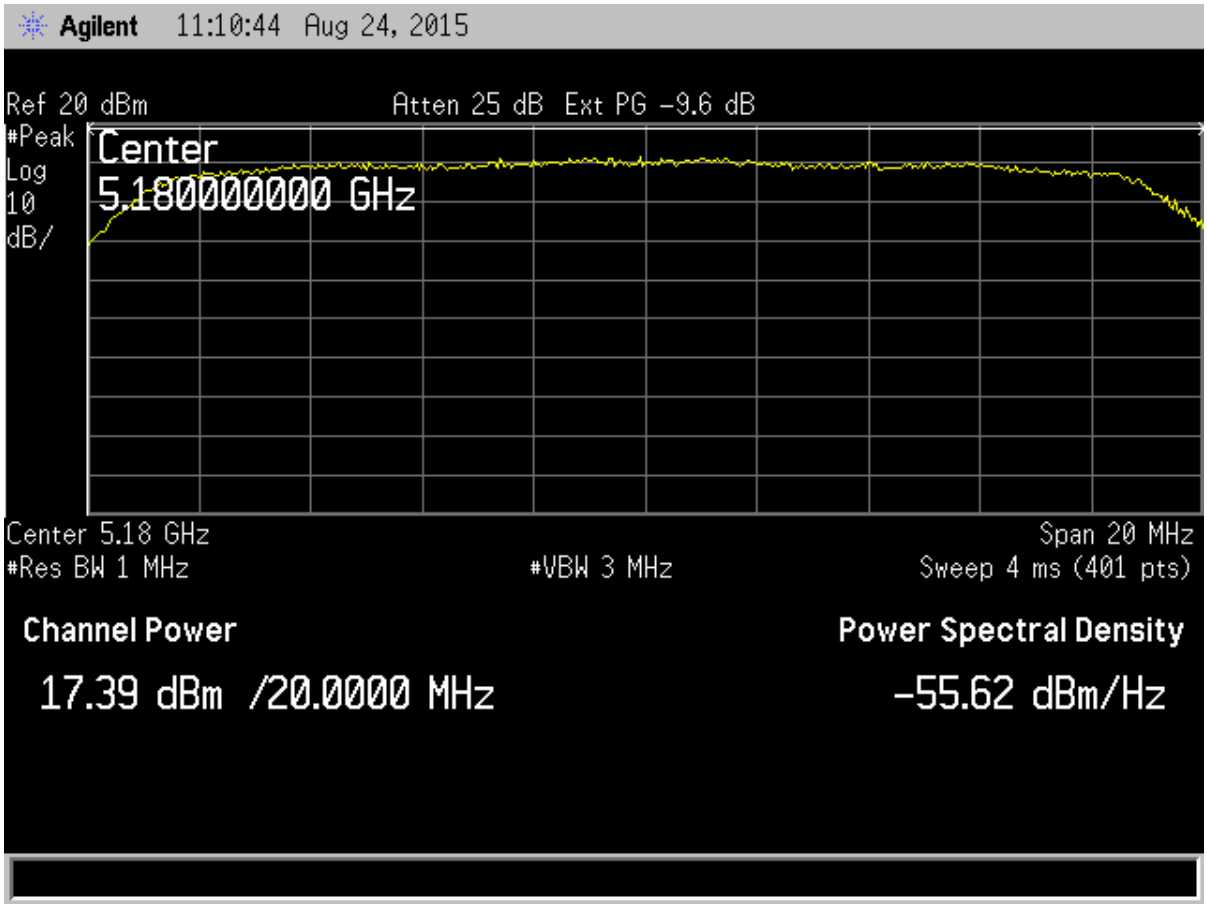


Figure 84. Peak Antenna Conducted Output Power, 802.11n Channel 36

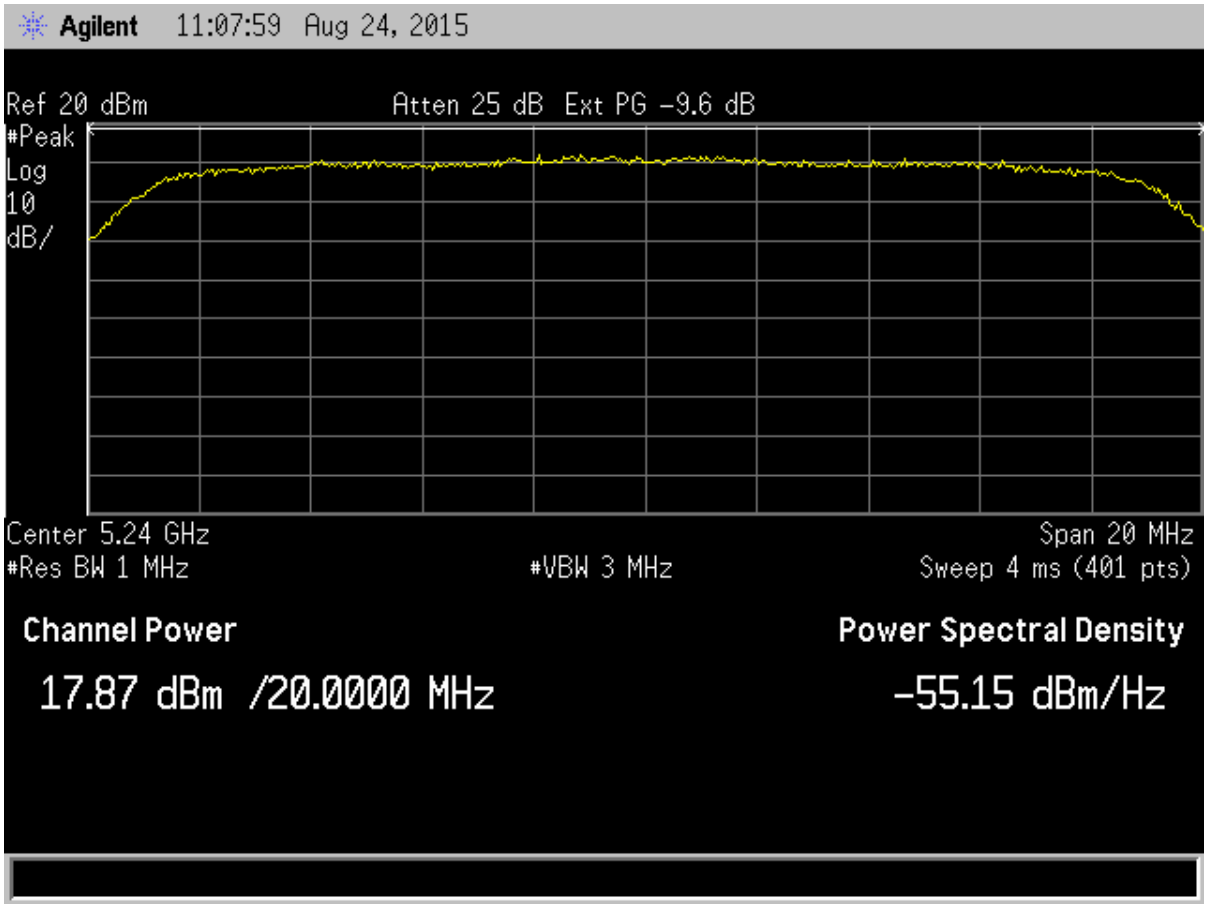


Figure 85. Peak Antenna Conducted Output Power, 802.11n Channel 48

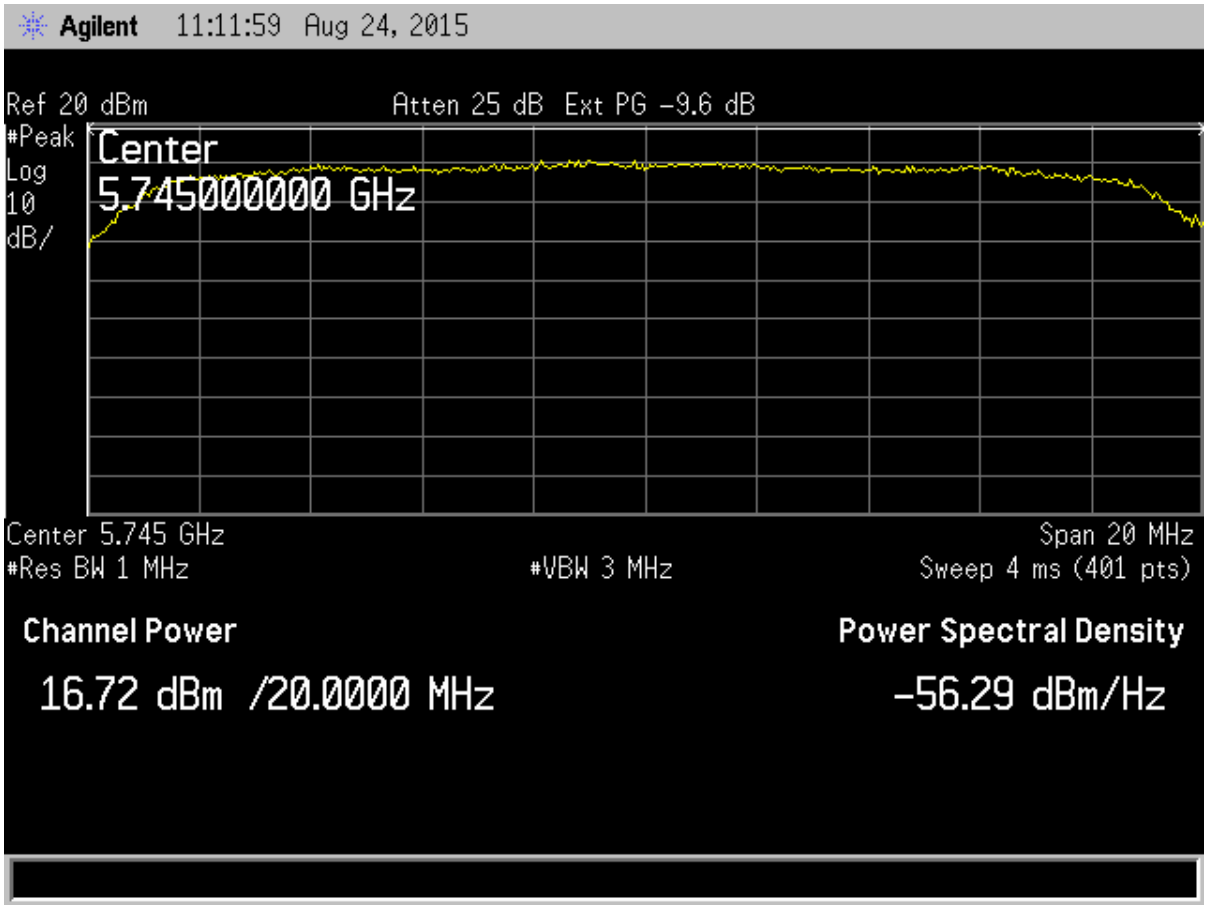


Figure 86. Peak Antenna Conducted Output Power, 802.11n Channel 149

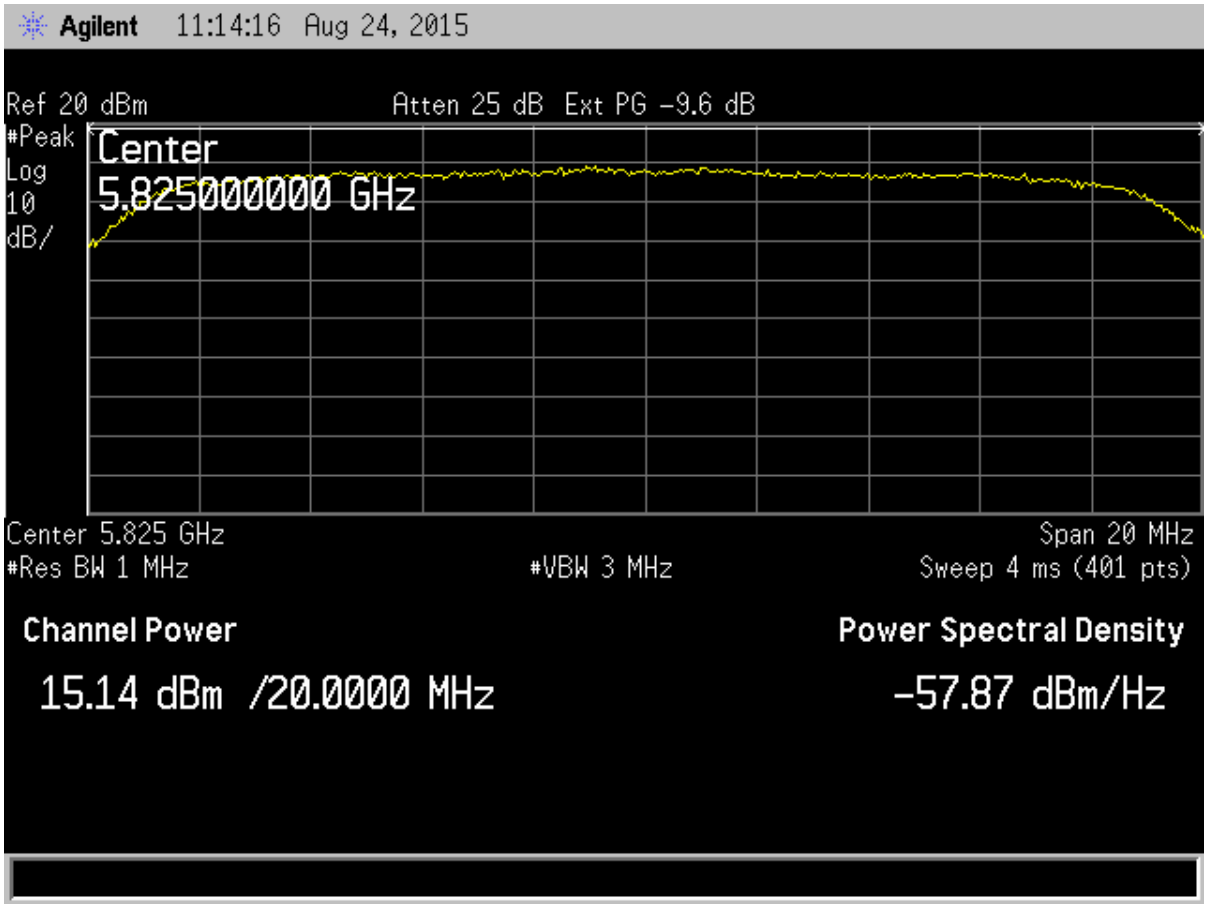


Figure 87. Peak Antenna Conducted Output Power, 802.11n Channel 165

2.16 Power Spectral Density (CFR 15.407(a) (5)) (IC RSS 247 5.1, 5.2)

The transmitter was placed into a continuous mode of operation at all applicable frequencies. The measurements were performed per the procedures of FCC KDB Procedure 789033 D02 v01. The RBW was set to 1 MHz and the Video Bandwidth was set to ≥ 3*RBW. The span was set to encompass the OBW. The averaging detector was used on the spectrum analyzer was used to determine the maximum PSD over the corresponding bandwidth

In the operating bands 15.15 – 5.25 GHz, 5.25 - 5.355 GHz, and 5.47 - 5.725 GHz, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. In the operating band 5.725 - 5.85 GHz the maximum conducted output power spectral density shall not exceed 30 dBm in any 500 kHz band. Since the spectrum analyzer used for testing is not have a 500 kHz RBW, the RBW was set to 1 MHz for a worst case testing configuration.

Table 27. Power Spectral Density for 802.11a in the Lower Frequency Bands

Frequency (MHz)	Test Data (dBm/1 MHz)	FCC Limit (dBm/1 MHz)	Margin (dB)
5180	8.21	11.00	2.79
5240	7.93	11.00	3.07

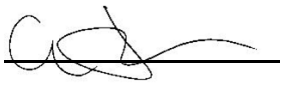
Test Date: September 30,2015
Tested By
Tested By
Signature:  Name: Carrie Ingram

Table 28. Power Spectral Density for 802.11a in the Upper Frequency Bands

Frequency (MHz)	Test Data (dBm/1 MHz)	FCC Limit (dBm/500 kHz)	Margin (dB)
5745	8.32	30	21.68
5825	8.01	30	21.99

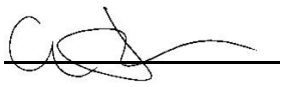
Test Date: September 30, 2015
Tested By
Tested By
Signature:  Name: Carrie Ingram

Table 29. Power Spectral Density for 802.11n in the Lower Frequency Bands

Frequency (MHz)	Test Data (dBm/1 MHz)	FCC Limit (dBm/1 MHz)	Margin (dB)
5180	8.8	11.00	2.2
5240	8.8	11.00	2.2

Test Date: August 24, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 30. Power Spectral Density for 802.11n in the Upper Frequency Bands

Frequency (MHz)	Test Data (dBm/1 MHz)	FCC Limit (dBm/500 kHz)	Margin (dB)
5745	8.1	30.00	21.9
5825	6.4	30.00	23.6

Test Date: August 24, 2015
Tested By
Signature:  Name: Carrie Ingram

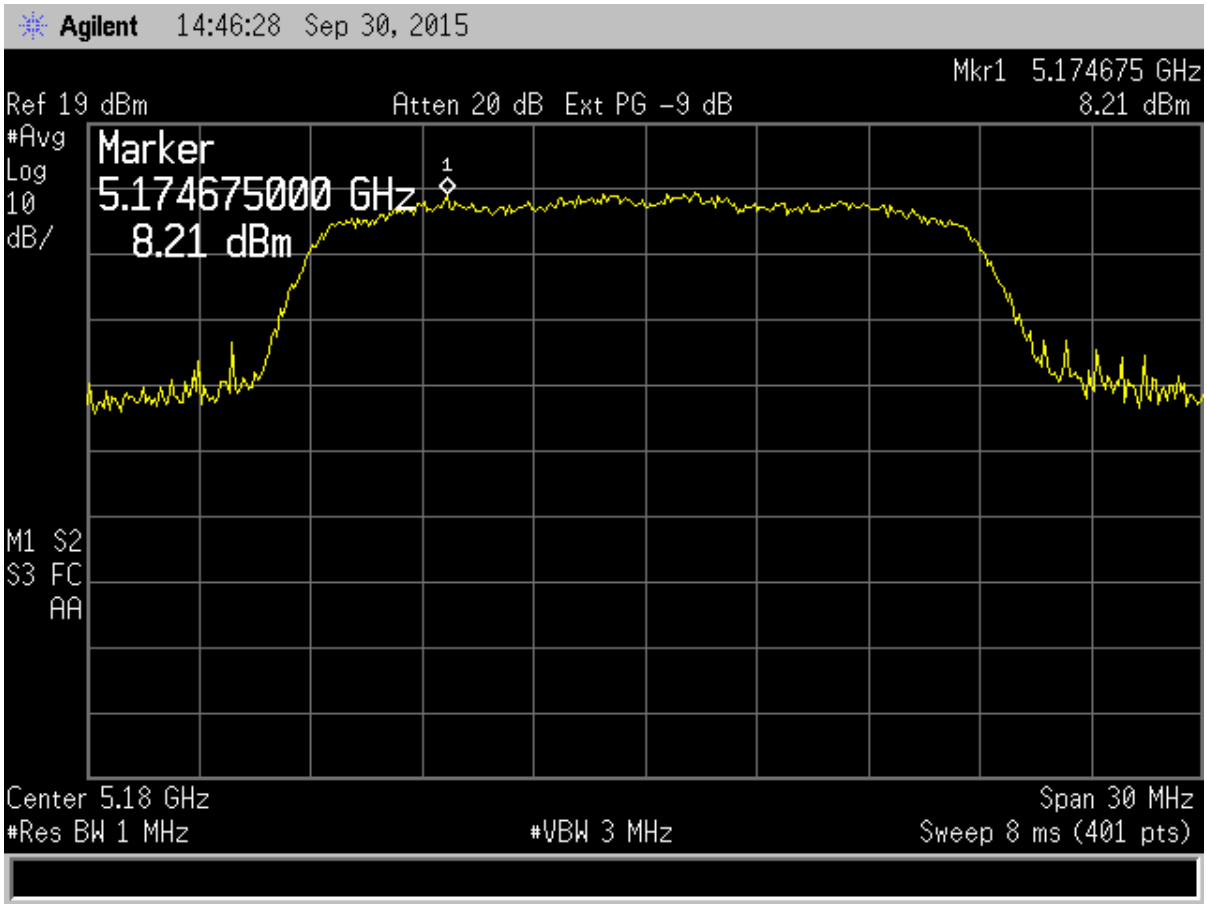


Figure 88. Power Spectral Density, Channel 36, 802.11a

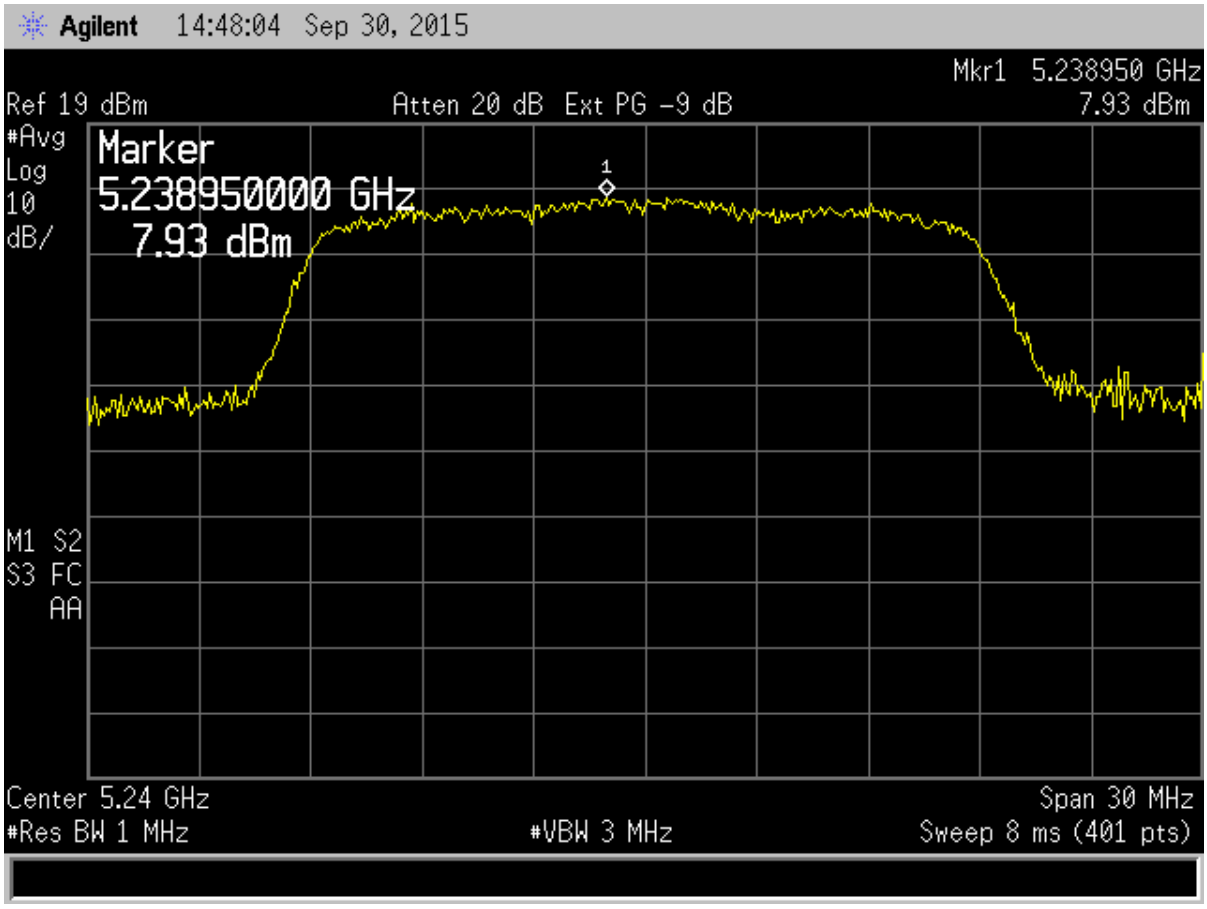


Figure 89. Power Spectral Density, Channel 48, 802.11a

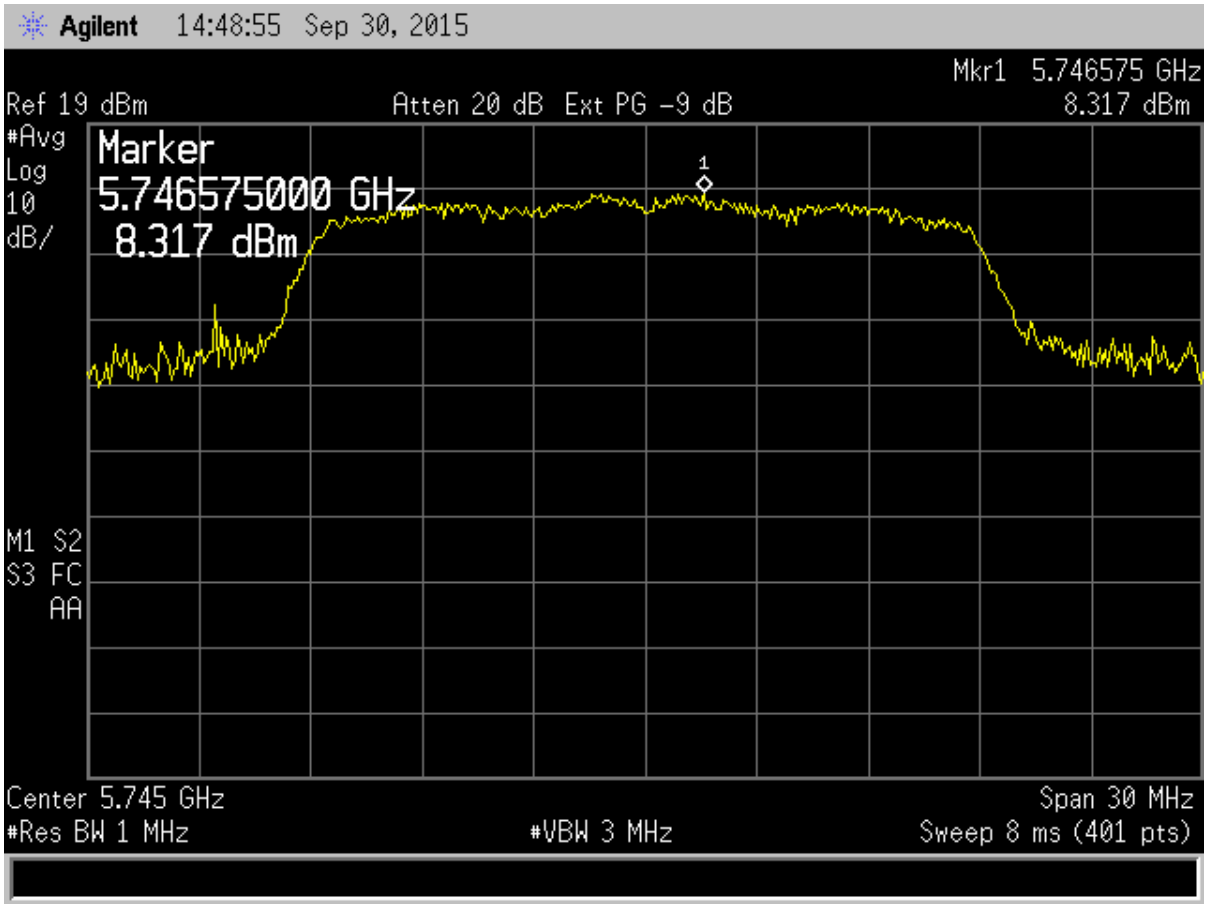


Figure 90. Power Spectral Density, Channel 149, 802.11a

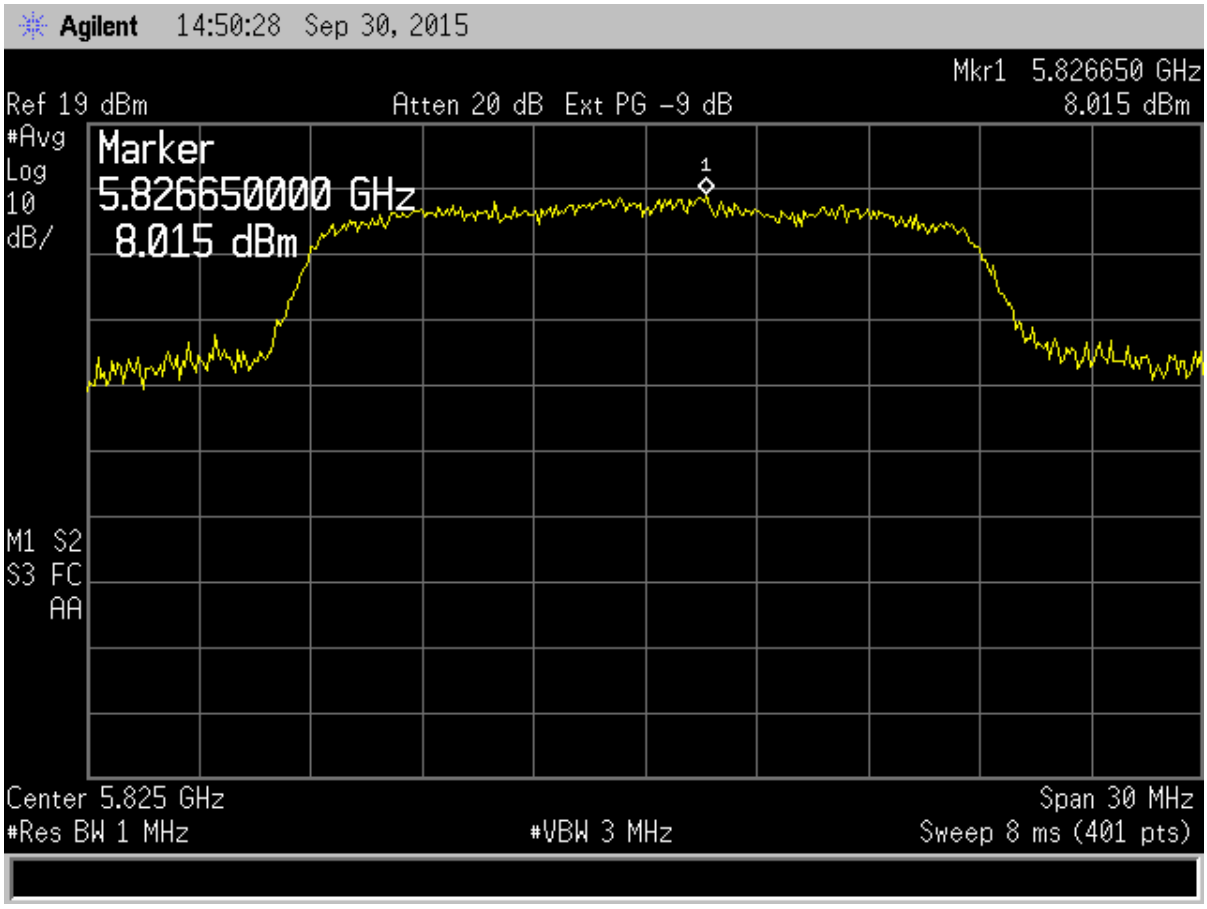


Figure 91. Power Spectral Density, Channel 165, 802.11a

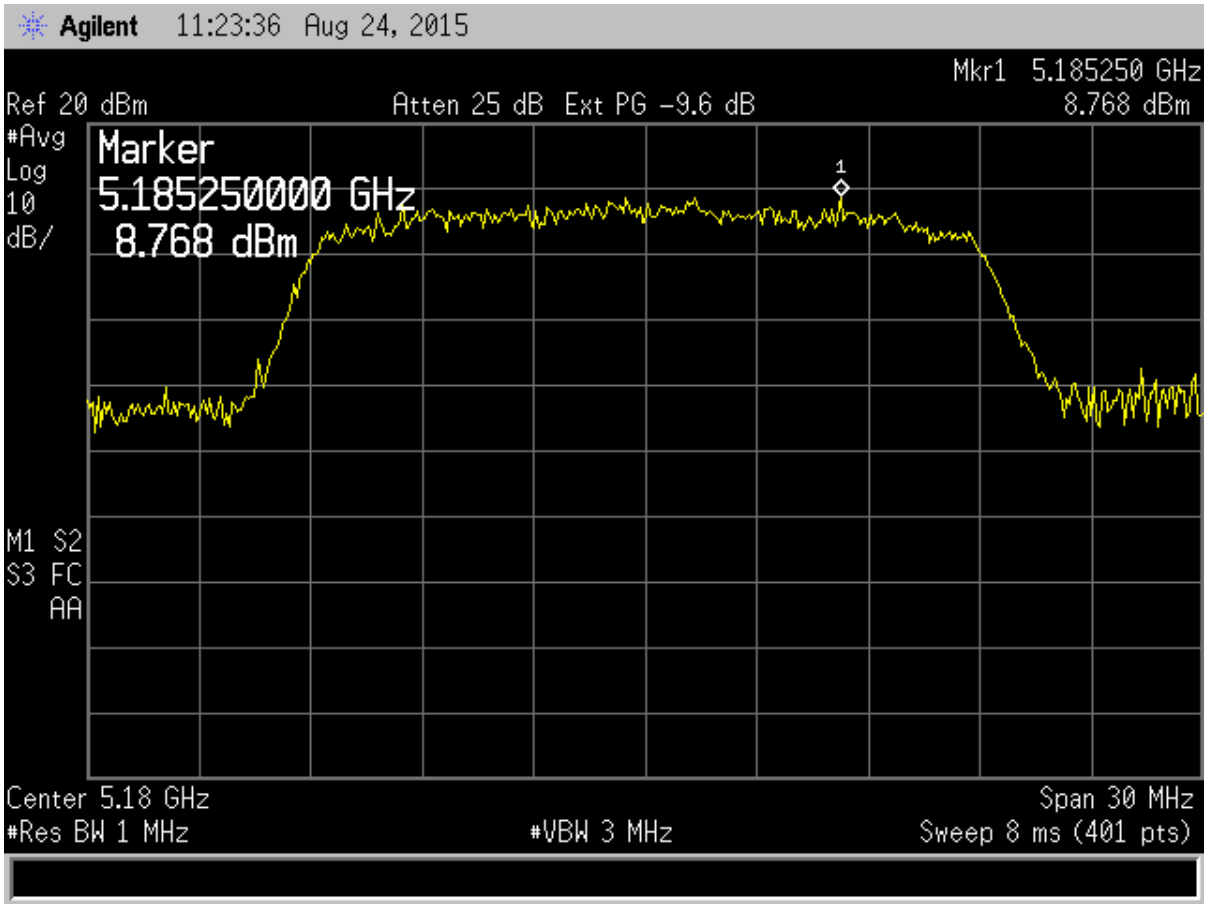


Figure 92. Power Spectral Density, Channel 36, 802.11n

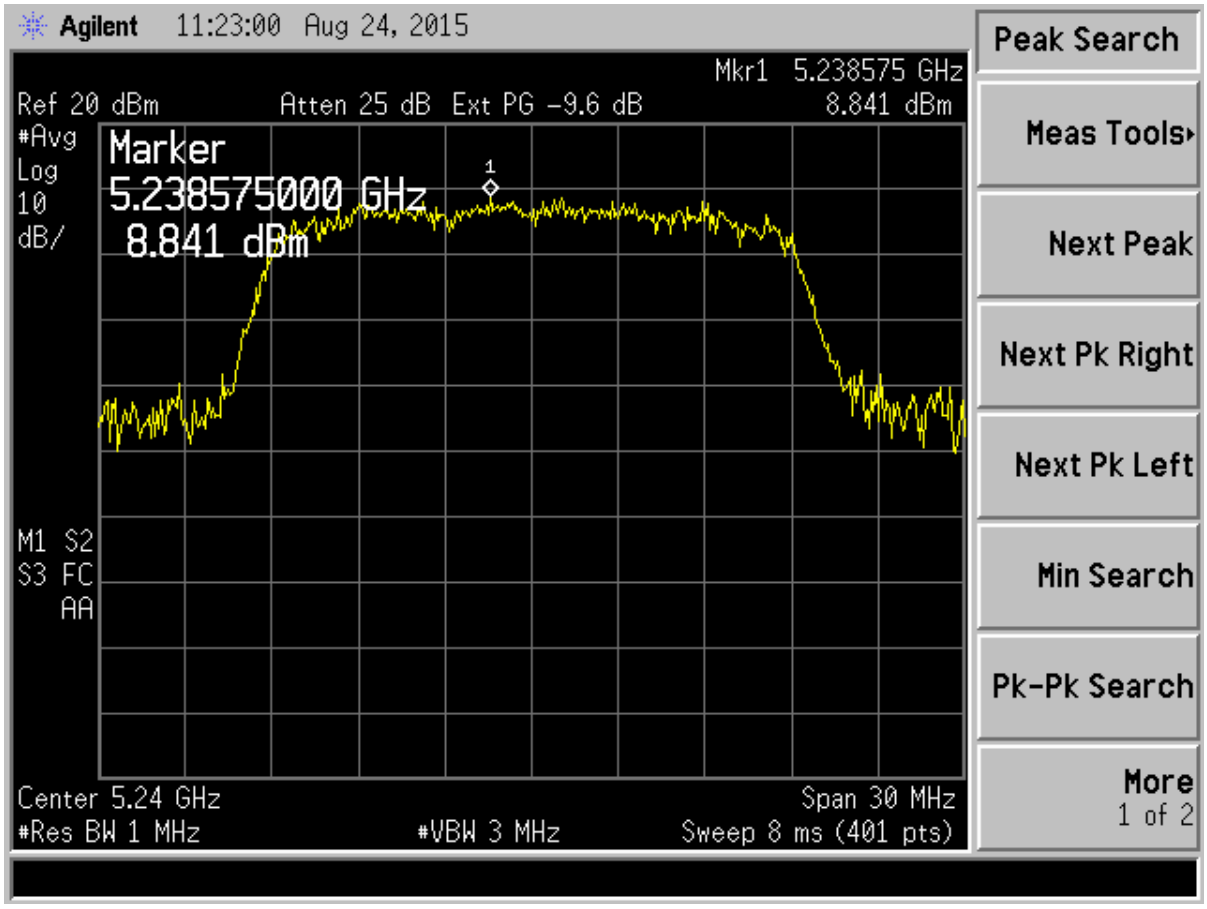


Figure 93. Power Spectral Density, Channel 48, 802.11n

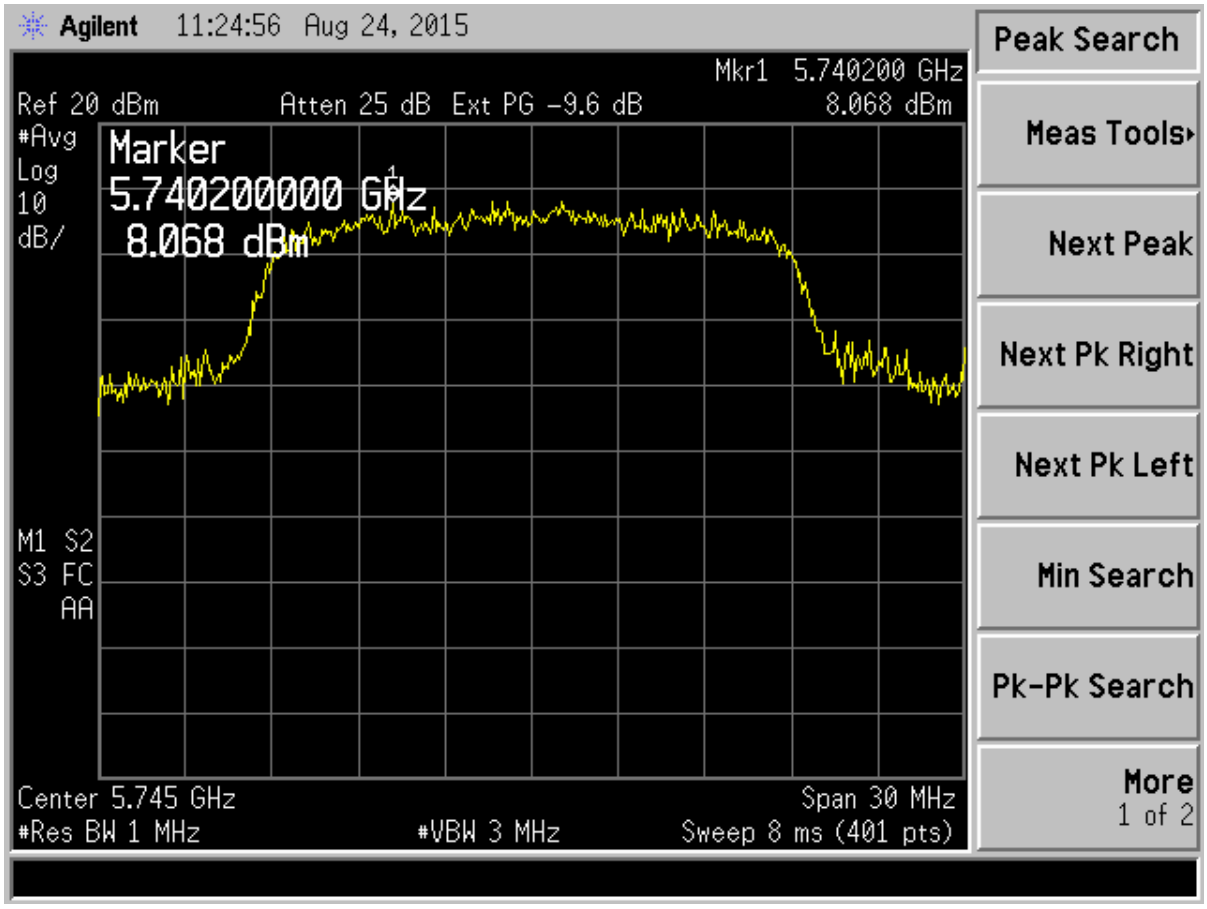


Figure 94. Power Spectral Density, Channel 149, 802.11n

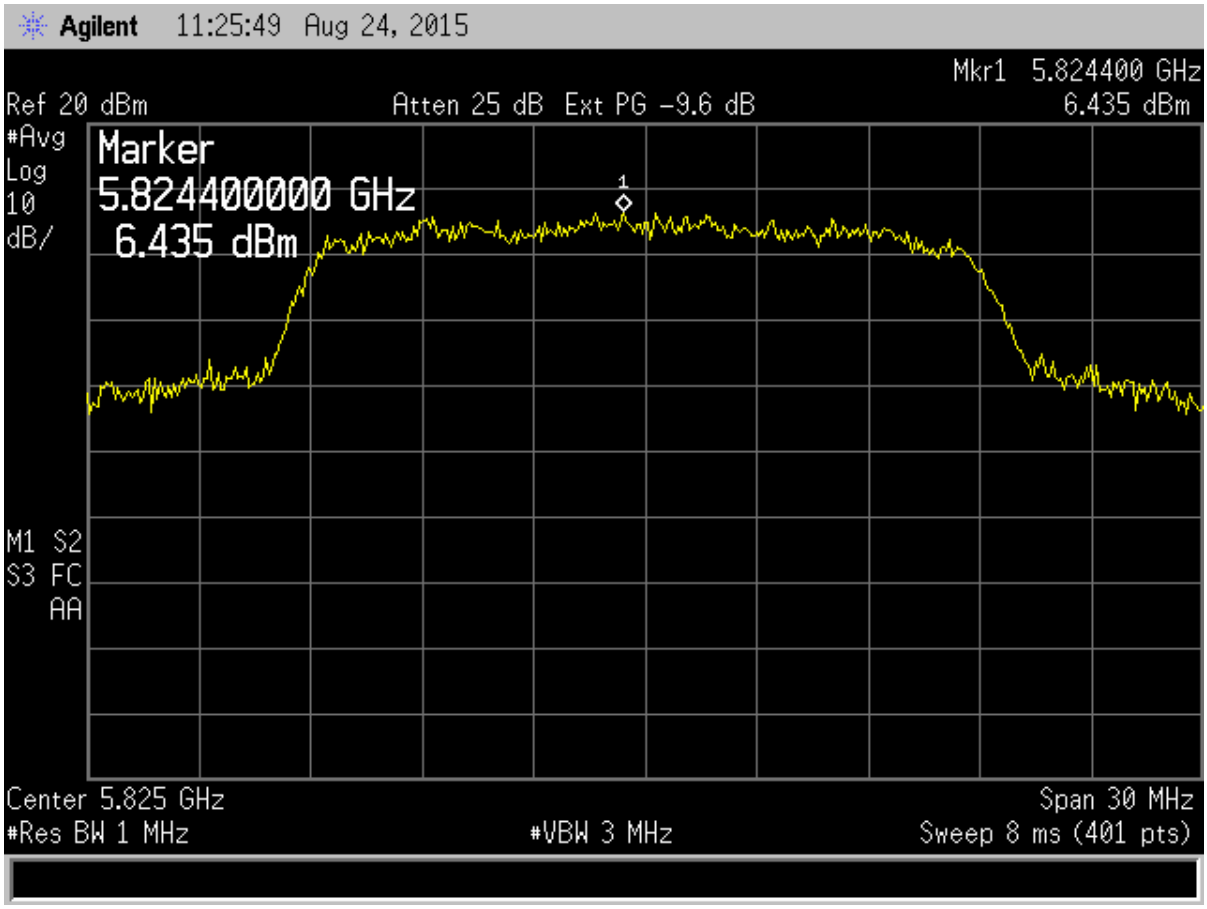


Figure 95. Power Spectral Density, Channel 165, 802.11n

2.17 Frequency Stability (CFR 15.407 (g))

The transmitter was placed into a continuous mode of operation at all applicable frequencies. The RBW was set to 1 MHz and the Video Bandwidth was set to ≥ 3*RBW. The span was adjusted during testing to ensure measurement accuracy. The carrier frequency was measured from 50˚C to -30˚C at 10 ˚C increments and at 85 % nominal voltage to 115 % Nominal voltage to ensure that it stayed within the band of operation.

Table 31. Frequency Stability 50˚C to -30˚C for 802.11a Channel 36

Temperature (˚C)	Measured Frequency (MHz)	Deviation (ppm)
50	5180.032617	6.30
40	5180.035000	6.76
30	5180.030000	5.79
20	5180.045000	8.69
10	5180.050000	9.66
0	5180.085000	16.41
-10	5180.080000	15.44
-20	5180.080000	15.44
-30	5180.055000	10.62

Test Date: September 29-30, 2015
Tested By
Signature: _____ Name: Carrie Ingram

Table 32. Frequency Stability 50˚C to -30˚C for 802.11a Channel 48

Temperature (˚C)	Measured Frequency (MHz)	Deviation (ppm)
50	5240.032500	6.20
40	5240.030000	5.73
30	5240.030000	5.73
20	5240.057525	10.98
10	5240.072000	13.74
0	5240.075000	14.31
-10	5240.070000	13.36
-20	5240.085000	16.22
-20	5240.080000	15.27

Test Date: September 29-30, 2015
Tested By
Signature: _____ Name: Carrie Ingram

Table 33. Frequency Stability 50˚C to -30˚C for 802.11a Channel 149

Temperature (˚C)	Measured Frequency (MHz)	Deviation (ppm)
50	5745.040000	6.96
40	5745.035000	6.09
30	5745.017500	3.05
20	5745.035000	6.09
10	5745.030000	5.22
0	5745.080300	13.98
-10	5745.100000	17.41
-20	5745.105000	18.28
-20	5745.090000	15.67

Test Date: September 29-30, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 34. Frequency Stability 50˚C to -30˚C for 802.11a Channel 165

Temperature (˚C)	Measured Frequency (MHz)	Deviation (ppm)
50	5825.040000	6.87
40	5825.030000	5.15
30	5825.040000	6.87
20	5825.045000	7.73
10	5825.005000	0.86
0	5825.070000	12.02
-10	5825.096250	16.52
-20	5825.105000	18.026
-20	5825.100000	17.17

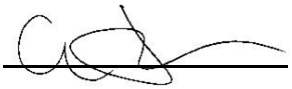
Test Date: September 29-30, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 35. Frequency Stability 50˚C to -30˚C for 802.11n Channel 36

Temperature (˚C)	Measured Frequency (MHz)	Deviation (ppm)
50	5180.005250	1.01
40	5180.063250	12.21
30	5180.027000	5.21
20	5180.033000	6.37
10	5180.086000	16.60
0	5180.057500	11.10
-10	5180.057500	11.10
-20	5180.056303	10.87
-30	5180.093000	17.95

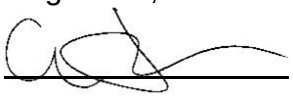
Test Date: August 25, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 36. Frequency Stability 50˚C to -30˚C for 802.11n Channel 48

Temperature (˚C)	Measured Frequency (MHz)	Deviation (ppm)
50	5240.022500	4.29
40	5240.075000	14.31
30	5240.025250	4.82
20	5240.036750	7.01
10	5240.084759	16.17
0	5240.067250	12.83
-10	5240.092500	17.65
-20	5240.084200	16.07
-30	5240.082750	15.79

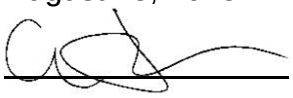
Test Date: August 25, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 37. Frequency Stability 50˚C to -30˚C for 802.11n Channel 149

Temperature (˚C)	Measured Frequency (MHz)	Deviation (ppm)
50	5745.032000	5.57
40	5745.025000	4.35
30	5745.035250	6.14
20	5745.039250	6.83
10	5745.072000	12.53
0	5745.071750	12.49
-10	5745.059750	10.40
-20	5745.099250	17.28
-20	5745.108500	18.86

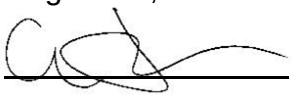
Test Date: August 25, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 38. Frequency Stability 50˚C to -30˚C for 802.11n Channel 165

Temperature (˚C)	Measured Frequency (MHz)	Deviation (ppm)
50	5825.002750	0.47
40	5825.032500	5.58
30	5825.070500	12.10
20	5825.086000	14.76
10	5825.065000	11.16
0	5825.102750	17.64
-10	5825.081750	14.03
-20	5825.096250	16.52
-20	5825.080750	13.86

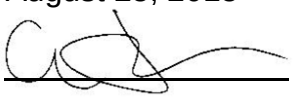
Test Date: August 25, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 39. Frequency Stability 85% voltage to 115% voltage for 802.11a Channel 36

Voltage (%)	Measured Frequency (MHz)	Deviation (ppm)
85	5180.0475	9.7
115	5180.036750	7.09

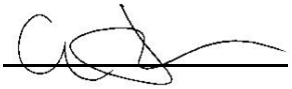
Test Date: September 29-30, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 40. Frequency Stability 85% voltage to 115% voltage for 802.11a Channel 48

Voltage (%)	Measured Frequency (MHz)	Deviation (ppm)
85	5240.040500	7.73
115	5240.065750	12.55

Test Date: September 29-30, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 41. Frequency Stability 85% voltage to 115% voltage for 802.11a Channel 149

Voltage (%)	Measured Frequency (MHz)	Deviation (ppm)
85	5745.006750	1.17
115	5745.018250	3.18

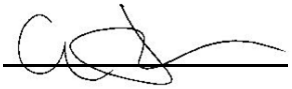
Test Date: September 29-30, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 42. Frequency Stability 85% voltage to 115% voltage for 802.11a Channel 165

Voltage (%)	Measured Frequency (MHz)	Deviation (ppm)
85	5825.048750	8.37
115	5825.034250	5.88

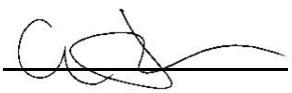
Test Date: September 29-30, 2015
Tested By
Signature:  Name: Carrie Ingram
:

Table 43. Frequency Stability 85% voltage to 115% voltage for 802.11n Channel 36

Voltage (%)	Measured Frequency (MHz)	Deviation (ppm)
85	5180.047500	9.17
115	5180.036750	7.09

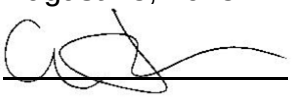
Test Date: August 25, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 44. Frequency Stability 85% voltage to 115% voltage for 802.11n Channel 48

Voltage (%)	Measured Frequency (MHz)	Deviation (ppm)
85	5240.040500	7.73
115	5240.065750	12.55

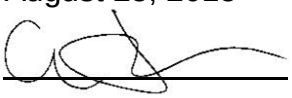
Test Date: August 25, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 45. Frequency Stability 85% voltage to 115% voltage for 802.11n Channel 149

Voltage (%)	Measured Frequency (MHz)	Deviation (ppm)
85	5745.006750	1.17
115	5745.018250	3.18

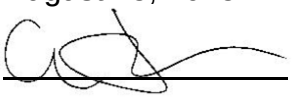
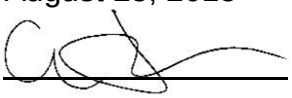
Test Date: August 25, 2015
Tested By
Signature:  Name: Carrie Ingram

Table 46. Frequency Stability 85% voltage to 115% voltage for 802.11n Channel 165

Voltage (%)	Measured Frequency (MHz)	Deviation (ppm)
85	5825.048750	8.37
115	5825.034250	5.88

Test Date: August 25, 2015
Tested By
Signature:  Name: Carrie Ingram

2.18 Radiated Digital Emissions (Co-Location)

See US Tech report # 15-0108A for test details of radiated emissions for co-location testing of the radio.

2.19 Measurement Uncertainty

The measurement uncertainties given were calculated using the method detailed in CISPR 16-4-2. A coverage factor of k=2 was used to give a level of confidence of approximately 95%.

2.19.1 Conducted Emissions Measurement Uncertainty

Measurement Uncertainty (within a 95% confidence level) for this test is ± 2.78 dB.

2.19.2 Radiated Emissions Measurement Uncertainty

For a measurement distance of 3 m the measurement uncertainty (with a 95% confidence level) for this test using a Biconical Antenna (30 MHz to 200 MHz) is ± 5.39 dB. This value includes all elements of measurement.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna (200 MHz to 1000 MHz) is ± 5.18 dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Horn Antenna is ± 5.21dB.