

Testing Tomorrow's Technology

Permissive Change Application

For

Part 2, Subpart J, Paragraph 2.907 Equipment Authorization of Certification for an Intentional Radiator per Part 15, Subpart C, paragraphs 15.207, 15.209 and 15.247

Part 2, Subpart J, Section 2.902, Verification Per Part 15, Subpart B, for Unintentional Radiators, section 15.101, 15.107 and 15.109

And

Industry Canada RSS-Gen, Issue 4 and RSS-247, Issue 1

For the

Inventek Systems

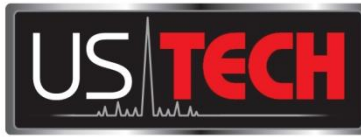
**Models: ISM43362-M3G-L44-U
ISM43362-M3G-L44-E**

**FCC ID: O7P-362
IC: 10147A-362**

**UST Project: 16-0291
Issue Date: December 16, 2016**

Total Pages in This Report: 46

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Testing Tomorrow's Technology

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 December 16, 2016



NVLAP LAB CODE 200162-0

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MEASUREMENT TECHNICAL REPORT

COMPANY NAME: Inventek Systems
MODEL: ISM43362-M3G-L44-U, ISM43362-M3G-L44-E
FCC ID: O7P-362
IC: 10147A-362
DATE: December 16, 2016

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

Equipment type: DSSS WiFi module for use in other devices

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

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Agency Agreement
Application Forms
Letter of Confidentiality
Equipment Label(s)
Block Diagram(s)
Schematic(s)
Test Configuration Photographs
Internal Photographs
External Photographs
Antenna Photographs
Theory of Operation
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User's Manual

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1 General Information

1.1 Purpose of this Report

The manufacturer is adding the following external antenna to be used with the radio module:

MFG: Zodiac Part Number: B0023200, 5 dBi gain, Omni Directional

This change does not affect the transmitter circuitry. The RF portion of the product remains identical to the originally tested product.

To show continued compliance with the relative subpart, the product was re-evaluated for radiated intentional emissions. No other testing was deemed necessary. The additional test data is presented in this report for consideration.

1.2 Characterization of Test Sample

The sample used for testing was received by US Tech on December 6, 2016 in good operating condition.

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1.3 Product Description

The Equipment Under Test (EUT) is the Inventek Systems eS-WiFi module. The module employs DSSS modulation techniques. The module comes with two antenna options, on board trace antenna or external u.fl connected antenna. Both models use the same radio module: BCM43362 from Broadcom. The module (BCM43362) is part of Inventek Systems eS-WiFi module family targeting embedded WiFi 802.11 b/g/n applications. eS-WiFi modules offer plug and play WiFi solution that enables the embedded designers to integrate WiFi into their devices. The eS-WiFi module hardware system consists of a host processor, integrated antenna and Broadcom WiFi device(BCM43362). The module provides SPI, USB and UART interfaces. The module requires no operation system and has a completely integrated TCP/IP stack that only requires a simple AT command set to establish connectivity.

The eS-WiFi module is offered in two configurations:

1. 15mm x 30mm module with integrated trace antenna (Designated as Model ISM43362-M3G-L44-E)
2. 15mm x 30mm module with external antenna, external antennas attached with a u.fl connector (Designated as Model ISM43362-M3G-L44-U) see user's manual for approved antennas.

1.4 Configuration of Tested System

The Test Sample was tested per *ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices* and per FCC KDB Publication number 558074 v03r05 for Digital Transmission Systems Operating Under section 15.247.

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.

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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.

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1.6 Related Submittals

1.6.1 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.

1.6.2 Verification of the Digital Apparatus

The Verification requirement shares many common report elements with the Certification report. Therefore, though this report is mostly intended to provide data for the Certification process, the Verification authorization report (part 15.107 and 15.109) for the EUT is included herein.

Table 1. EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC/IC ID:	CABLES P/D
EUT Inventek Systems	ISM43362-M3G-L44-E ISM43362-M3G-L44-U	Engineering Sample	O7P-362/ 10147A-362	None
Antenna See antenna details	--	--	--	--

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

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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	CALIBRATION DUE DATE
SPECTRUM ANALYZER	E4407B	Agilent	US41442935	2/11/2017
PREAMP	8449B	HEWLETT-PACKARD	3008A00480	12/01/2016 Extended 90 days
HORN ANTENNA	3115	EMCO	9107-3723	09/22/2018 2 yr

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

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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 2412 MHz to 2462 MHz, 3 test frequencies were used.

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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.

2.6 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 dBi	TYPE OF CONNECTOR
Antenna 3	Zodiac	External Omni directional	B0023200	5.0	u.fl

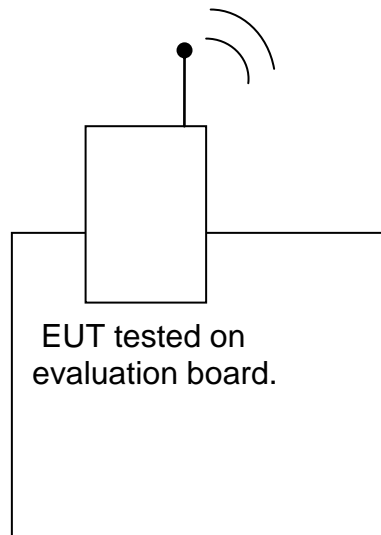


Figure 1. Block Diagram of Test Configuration

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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 2.10 of the test report.

2.8 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d))

Radiated Spurious measurements: The EUT was placed into a continuous transmit mode of operation (>98% duty cycle) and tested per 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. A preliminary scan was performed on the EUT to find the 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 up to the tenth harmonic of the device (not 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 100/120 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.

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Table 5. 802.11b Peak Radiated Fundamental & Harmonic Emissions

Test: FCC Part 15, Para 15.209, 15.247(d)				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP (dB/m)	Results (dBuV/m)	Limits (dBuV/m)	Antenna Distance/Polarization	Margin (dB)	Detector Mode
Low Channel – PEAK							
2411.90	71.08	30.16	101.24	-	3.0m./HORZ	-	PK
4824.10	63.58	2.40	65.98	74.0	3.0m./HORZ	8.0	PK
7236.70	46.56	8.05	54.61	74.0	3.0m./HORZ	19.4	PK
Mid Channel – PEAK							
2441.75	70.98	30.13	101.11	-	3.0m./HORZ	-	PK
4884.10	62.05	2.59	64.64	74.0	3.0m./HORZ	9.4	PK
7288.30	47.06	7.77	52.24	74.0	3.0m./HORZ	21.8	PK
High Channel – PEAK							
2462.15	67.67	30.13	97.80	-	3.0m./HORZ	-	PK
4923.90	40.05	2.27	42.32	74.0	3.0m./HORZ	31.7	PK
7382.25	35.62	7.53	43.15	74.0	3.0m./HORZ	30.8	PK

1. (*) Falls outside the restricted bands of CFR 15.205. Limits based on CFR15.209 15.247.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. 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 2411.90 MHz:

Magnitude of Measured Frequency	71.08	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	30.16	dB/m
Corrected Result	101.24	dBuV/m

Test Date: December 7, 2016

Tested By
 Signature: 

Name: Robert K. Mills

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Table 6. 802.11b Average Radiated Fundamental & Harmonic Emissions

Test: FCC Part 15, Para 15.209, 15.247(d)				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP (dB/m)	Results (dBuV/m)	Limits (dBuV/m)	Antenna Distance/Polarization	Margin (dB)	Detector Mode
Low Channel – AVERAGE							
2411.90	59.58	30.16	89.74	-	3.0m./HORZ	-	
4824.10	49.20	2.40	51.60	54.0	3.0m./HORZ	2.4	AVG
7236.70	30.22	8.05	38.27	54.0	3.0m./HORZ	15.7	AVG
Mid Channel – AVERAGE							
2441.75	60.73	30.13	90.86	-	3.0m./HORZ	-	
4884.10	47.06	2.59	49.65	54.0	3.0m./HORZ	4.3	AVG
7288.30	30.13	7.77	37.90	54.0	3.0m./HORZ	16.1	AVG
High Channel – AVERAGE							
2462.15	56.53	30.13	86.66	-	3.0m./HORZ	-	
4923.90	25.61	2.27	27.88	54.0	3.0m./HORZ	26.1	AVG
7382.25	21.76	7.53	29.29	54.0	3.0m./HORZ	24.7	AVG

- (*) Falls outside the restricted bands of CFR 15.205. Limits based on CFR15.209 15.247.
- No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
- 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 2411.90 MHz:

Magnitude of Measured Frequency	59.58	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	30.16	dB/m
Corrected Result	89.74	dBuV/m

Test Date: December 7, 2016

Tested By

Signature:  Name: Robert K. Mills

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Table 7. 802.11g Peak Radiated Fundamental & Harmonic Emissions

Test: FCC Part 15, Para 15.209, 15.247(d)				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP (dB/m)	Results (dBuV/m)	Limits (dBuV/m)	Antenna Distance/Polarization	Margin (dB)	Detector Mode
Low Channel – PEAK							
2412.65	70.92	30.16	101.08	-	3.0m./HORZ	-	PK
4820.80	63.21	2.40	65.61	74.0	3.0m./HORZ	8.4	PK
7232.15	44.41	8.05	52.46	74.0	3.0m./HORZ	21.5	PK
Mid Channel – PEAK							
2441.75	69.27	30.13	99.40	-	3.0m./HORZ	-	PK
4880.30	60.32	2.59	62.91	74.0	3.0m./HORZ	11.1	PK
7326.15	44.46	8.31	52.77	74.0	3.0m./HORZ	21.2	PK
High Channel - PEAK							
2462.15	67.75	30.13	97.88	-	3.0m./HORZ	-	PK
4927.20	60.81	2.34	63.15	74.0	3.0m./HORZ	10.8	PK
7378.10	45.03	7.53	52.56	74.0	3.0m./HORZ	21.4	PK


- (*) Falls outside the restricted bands of CFR 15.205. Limits based on CFR15.209 15.247.
- No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
- 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 2412.65 MHz:

Magnitude of Measured Frequency	70.92	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	30.16	dB/m
Corrected Result	101.08	dBuV/m

Test Date: December 7, 2016

Tested By

Signature: 

Name: Robert K. Mills

US Tech Test Report:
 FCC ID:
 IC:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

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Table 8. 802.11g Average Radiated Fundamental & Harmonic Emissions

Test: FCC Part 15, Para 15.209, 15.247(d)				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP (dB/m)	Results (dBuV/m)	Limits (dBuV/m)	Antenna Distance/Polarization	Margin (dB)	Detector Mode
Low Channel – AVERAGE							
2412.65	52.19	30.16	82.35	-	3.0m./HORZ	-	QP
4820.80	43.47	2.40	45.87	54.0	3.0m./HORZ	8.1	AVG
7232.15	30.58	8.05	38.63	54.0	3.0m./HORZ	15.4	AVG
Mid Channel – AVERAGE							
2441.75	50.27	30.13	80.40	-	3.0m./HORZ	-	QP
4880.30	42.82	2.59	45.41	54.0	3.0m./HORZ	8.6	AVG
7326.15	30.66	8.31	38.97	54.0	3.0m./HORZ	15.0	AVG
High Channel – AVERAGE							
2462.15	49.95	30.13	80.08	-	3.0m./HORZ	-	QP
4927.20	43.04	2.34	45.38	54.0	3.0m./HORZ	8.6	AVG
7378.10	30.69	7.53	38.22	54.0	3.0m./HORZ	15.8	AVG

- (*) Falls outside the restricted bands of CFR 15.205. Limits based on CFR15.209 15.247.
- No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
- 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 2412.65 MHz:

Magnitude of Measured Frequency	52.19	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	30.16	dB/m
Corrected Result	82.35	dBuV/m

Test Date: December 7, 2016

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 Signature: 

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Table 9. 802.11n Peak Radiated Fundamental & Harmonic Emissions

Test: FCC Part 15, Para 15.209, 15.247(d)				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP (dB/m)	Results (dBuV/m)	Limits (dBuV/m)	Antenna Distance/Polarization	Margin (dB)	Detector Mode
Low Channel – PEAK							
2410.15	70.11	30.16	100.27	-	3.0m./HORZ	-	PK
4826.30	59.55	2.40	61.95	74.0	3.0m./HORZ	12.1	PK
7233.55	43.97	8.05	52.02	74.0	3.0m./HORZ	22.0	PK
Mid Channel – PEAK							
2441.05	68.08	30.13	98.21	-	3.0m./HORZ	-	PK
4883.00	57.06	2.59	59.65	74.0	3.0m./HORZ	14.3	PK
7318.70	45.27	8.31	53.58	74.0	3.0m./HORZ	20.4	PK
High Channel – PEAK							
2460.70	66.76	30.13	96.89	-	3.0m./HORZ	-	PK
4924.55	47.34	2.27	58.85	74.0	3.0m./HORZ	15.2	PK
7386.15	44.40	7.53	51.93	74.0	3.0m./HORZ	22.1	PK

- (*) Falls outside the restricted bands of CFR 15.205. Limits based on CFR15.209 15.247.
- No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
- 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 2410.15 MHz:

Magnitude of Measured Frequency	70.11	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	30.16	dB/m
Corrected Result	100.27	dBuV/m

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Table 10. 802.11n Average Radiated Fundamental & Harmonic Emissions

Test: FCC Part 15, Para 15.209, 15.247(d)				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP (dB/m)	Results (dBuV/m)	Limits (dBuV/m)	Antenna Distance/Polarization	Margin (dB)	Detector Mode
Low Channel – AVERAGE							
2410.15	51.32	30.16	81.48	-	3.0m./HORZ	-	
4826.30	41.69	2.40	44.09	54.0	3.0m./HORZ	9.9	AVG
7233.55	30.21	8.05	38.26	54.0	3.0m./HORZ	15.7	AVG
Mid Channel – AVERAGE							
2441.05	47.56	30.13	77.69	-	3.0m./HORZ	-	
4883.00	39.29	2.59	41.88	54.0	3.0m./HORZ	12.1	AVG
7318.70	30.39	8.31	38.70	54.0	3.0m./HORZ	15.3	AVG
High Channel – AVERAGE							
2460.70	47.34	30.13	77.47	-	3.0m./HORZ	-	
4924.55	39.73	2.27	42.00	54.0	3.0m./HORZ	12.0	AVG
7386.15	30.45	7.53	37.98	54.0	3.0m./HORZ	16.0	AVG

- (*) Falls outside the restricted bands of CFR 15.205. Limits based on CFR15.209 15.247.
- No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
- 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 2410.15 MHz:

Magnitude of Measured Frequency	51.32	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	30.16	dB/m
Corrected Result	81.48	dBuV/m

Test Date: December 7, 2016

Tested By
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Name: Robert K. Mills

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2.9 Band Edge Measurements – (CFR 15.247)

Band Edge measurements are made following the guidelines in FCC KDB Publication No. 558074 V03R05 with the EUT initially operating on the Lowest Channel and then operating on the Highest Channel within its band of operation. Radiated measurements are performed to demonstrate compliance with the requirement of 15.249(d) that all emissions outside of the band edges be attenuated by at least 50 dB or 15.209 limits, when compared to its highest in-band value (contained in a 100 kHz band).

To capture the band edge, set the Spectrum Analyzer frequency span set to 2 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. See figure and calculations following for more detail.

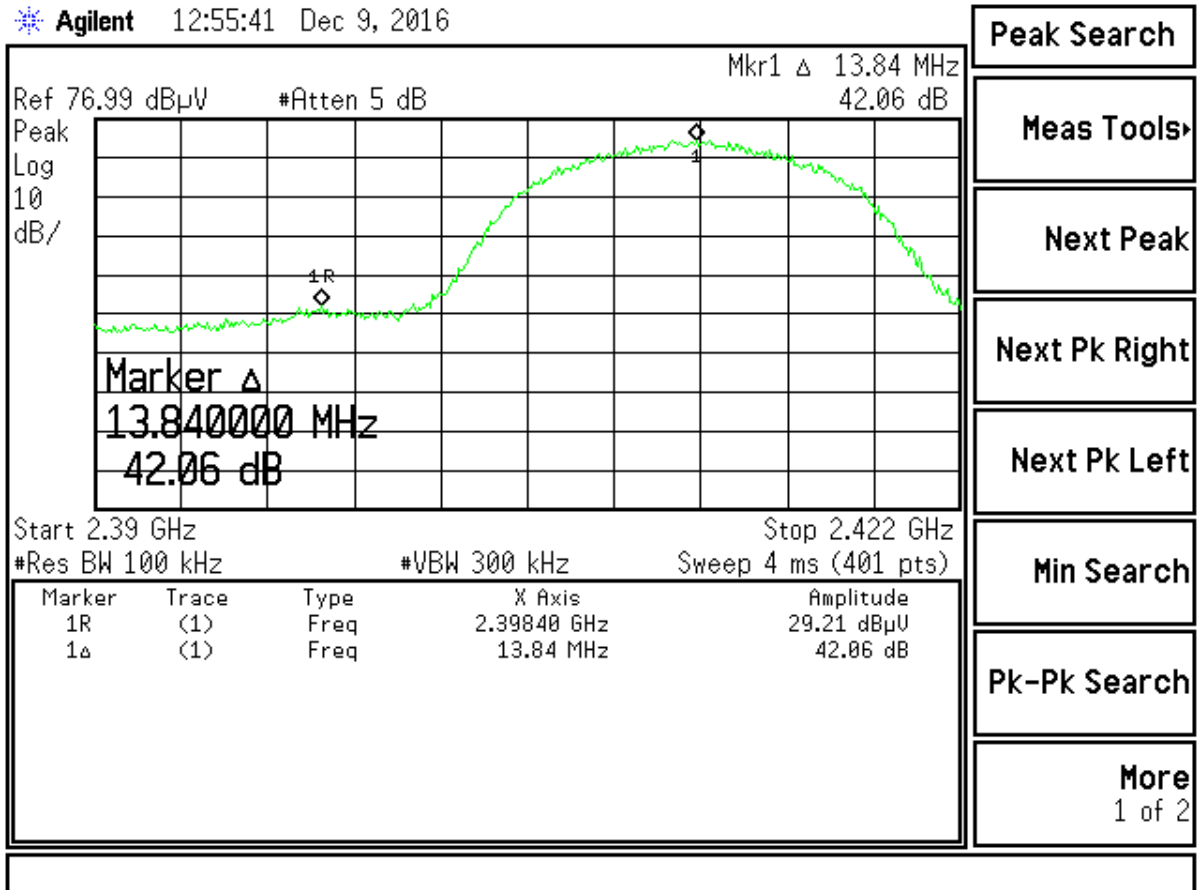


Figure 2. 802.11b Band Edge Compliance, Low Channel Delta - Peak

Low Channel Corrected Measured Value from Table 5	101.24	dBuV
Low Channel Band Edge Delta from Figure 2	42.06	dB
Calculated Result	59.18	dBuV/m
Band Edge Limit	74.00	dBuV/m
Calculated Result	59.18	dBuV/m
Band Edge Margin	14.82	dBuV/m

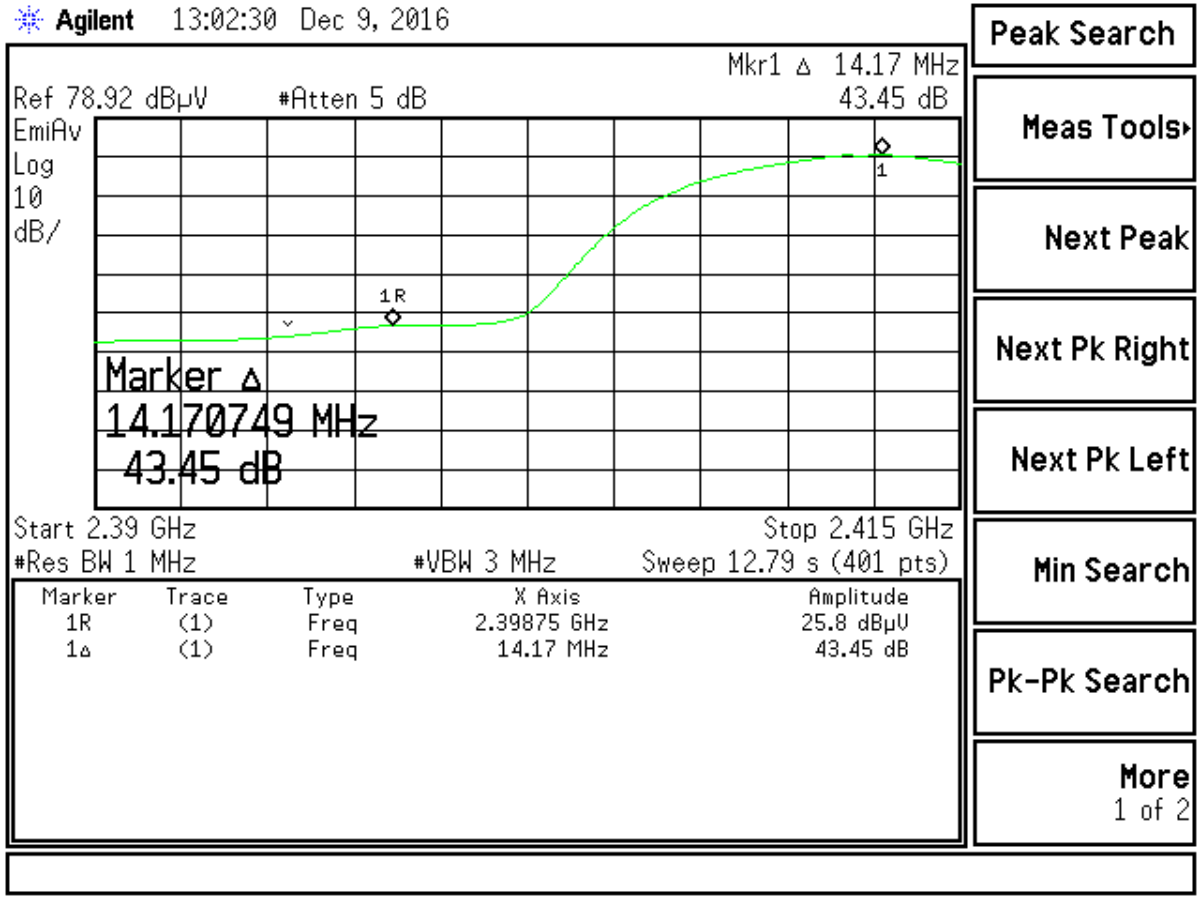


Figure 3. 802.11b Band Edge Compliance, Low Channel Delta - Peak

Low Channel Corrected Measured Value from Table 6	89.74	dBuV
Low Channel Band Edge Delta from Figure 3	43.45	dB
Calculated Result	46.29	dBuV/m
Band Edge Limit	54.00	dBuV/m
Calculated Result	46.29	dBuV/m
Band Edge Margin	7.71	dBuV/m

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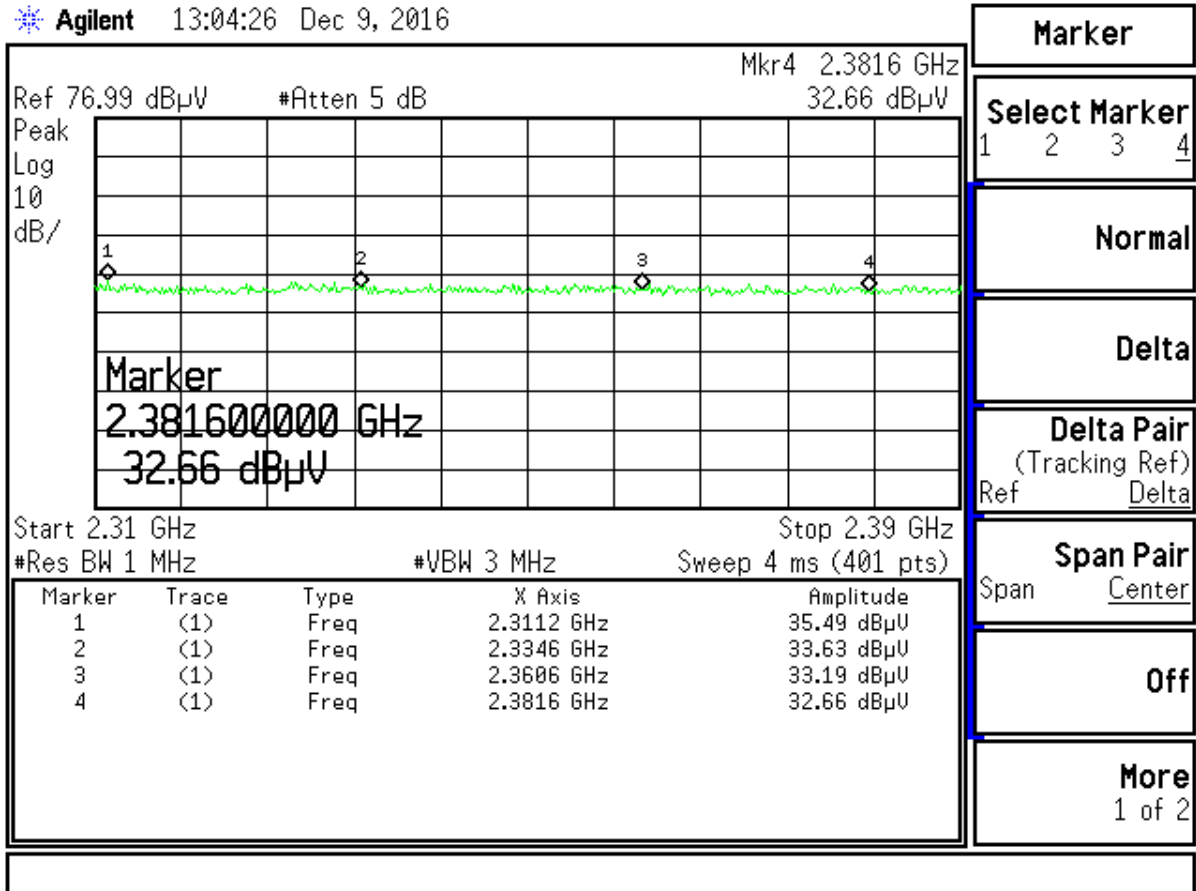


Figure 4. 802.11b Radiated Restricted Band 2310 MHz to 2390 MHz, Peak

Table 11. 802.11b Radiated Restricted Band 2310 MHz to 2390 MHz, Peak

2310 MHz to 2390 MHz Restricted Band Peak Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBµV)	AF+CA-AMP (dB/m)	Results (dBµV/m)	PK Limits (dBµV/m)	Antenna Distance/Polarization	Margin (dB)	Detector PK, or AVG
2311.2	35.49	29.49	64.98	74.0	3.0m./HORZ	9.0	PK
2334.6	33.63	29.49	63.12	74.0	3.0m./HORZ	10.9	PK
2360.6	33.19	29.49	62.68	74.0	3.0m./HORZ	11.3	PK
2381.6	32.66	30.00	62.66	74.0	3.0m./HORZ	11.3	PK

Test Date: December 9, 2016

Tested By
 Signature:

Name: Robert K. Mills

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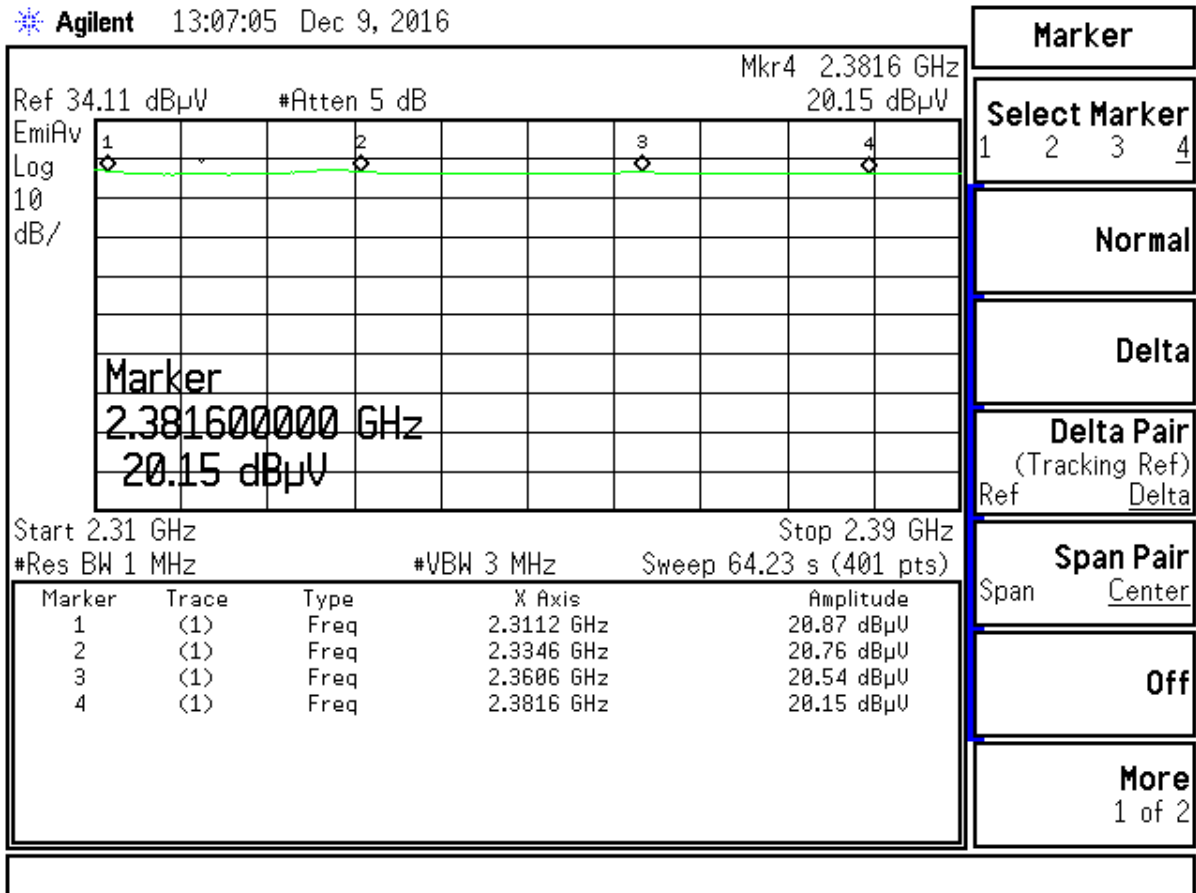


Figure 5. 802.11b Radiated Restricted Band 2310 MHz to 2390 MHz, Average

Table 12. 802.11b Radiated Restricted Band 2310 MHz to 2390 MHz, Average

2310 MHz to 2390 MHz Restricted Band Peak Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
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
2311.2	20.87	29.49	50.36	54.0	3.0m./HORZ	3.6	AVG
2334.6	20.76	29.49	50.25	54.0	3.0m./HORZ	3.8	AVG
2360.6	20.54	29.49	50.03	54.0	3.0m./HORZ	4.0	AVG
2381.6	20.15	30.00	50.15	54.0	3.0m./HORZ	3.9	AVG

Test Date: December 9, 2016

Tested By

Signature: 

Name: Robert K. Mills

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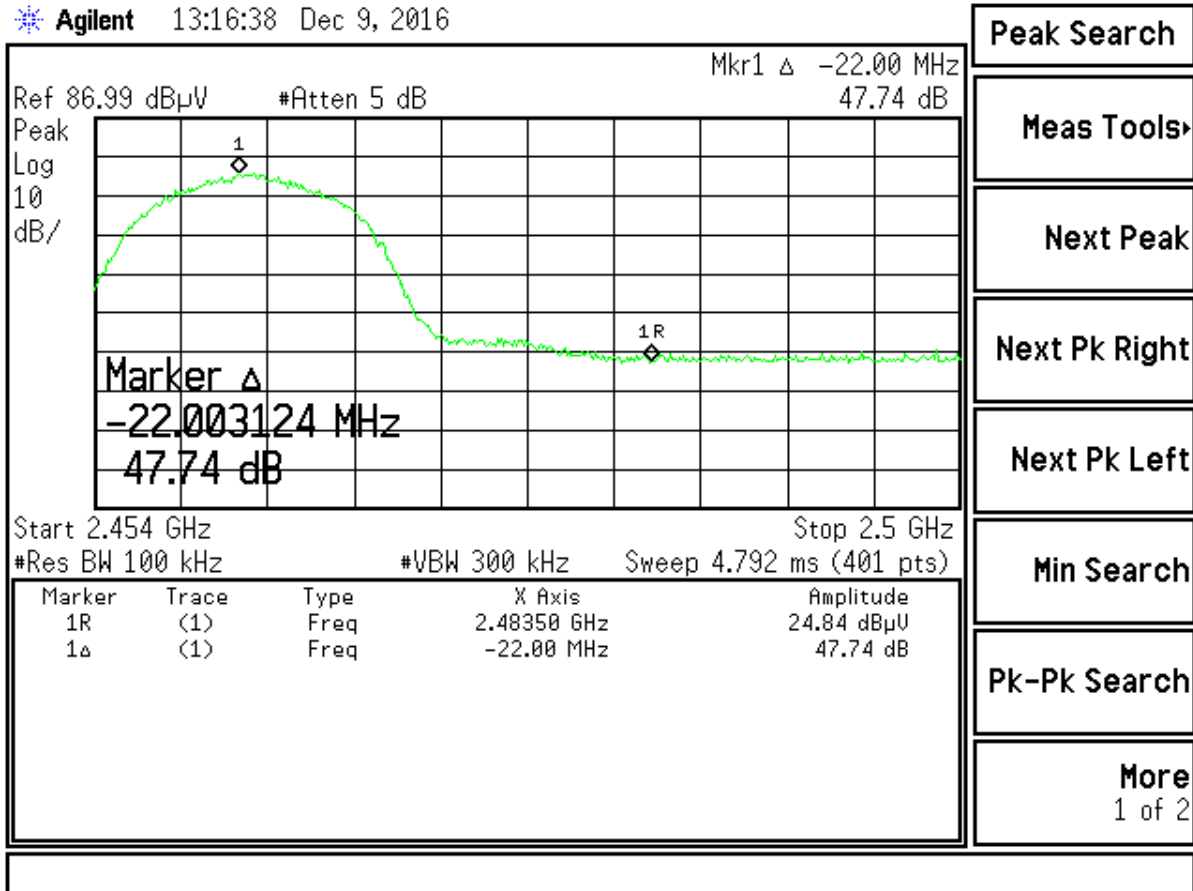


Figure 6. 802.11b Band Edge Compliance, High Channel Delta – Peak

High Channel Corrected Measured Value from Table 5	97.80	dBuV
High Channel Band Edge Delta from Figure 5	47.74	dB
Calculated Result	50.06	dBuV/m
Band Edge Limit	54.00	dBuV/m
Calculated Result	50.06	dBuV/m
Band Edge Margin	3.94	dBuV/m

*Peak meets AVG limit.

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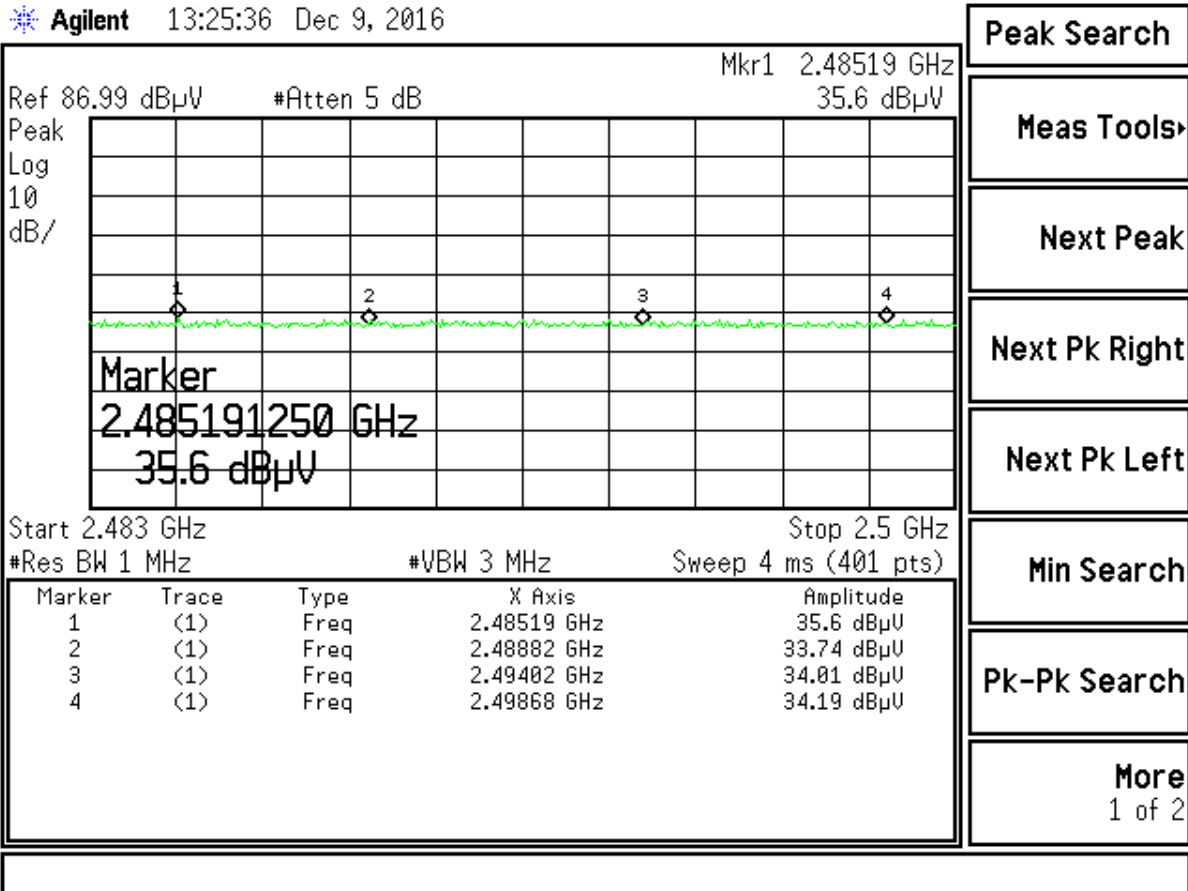


Figure 7. 802.11b Radiated Restricted Band 2483.5 MHz to 2500 MHz, Peak

Table 13. 802.11b Radiated Restricted Band 2483.5 MHz to 2500 MHz, Peak

2483.5 MHz to 2500 MHz Restricted Band Peak Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBµV)	AF+CA-AMP (dB/m)	Results (dBµV/m)	PK Limits (dBµV/m)	Antenna Distance/Polarization	Margin (dB)	Detector PK, or AVG
2485.19	35.60	30.13	65.73	74.0	3.0m./HORZ	8.3	PK
2488.82	33.74	30.13	63.87	74.0	3.0m./HORZ	10.1	PK
2494.02	34.01	30.13	64.14	74.0	3.0m./HORZ	9.9	PK
2498.68	34.19	30.13	64.32	74.0	3.0m./HORZ	9.7	PK

Test Date: December 9, 2016

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Signature:

Name: Robert K. Mills

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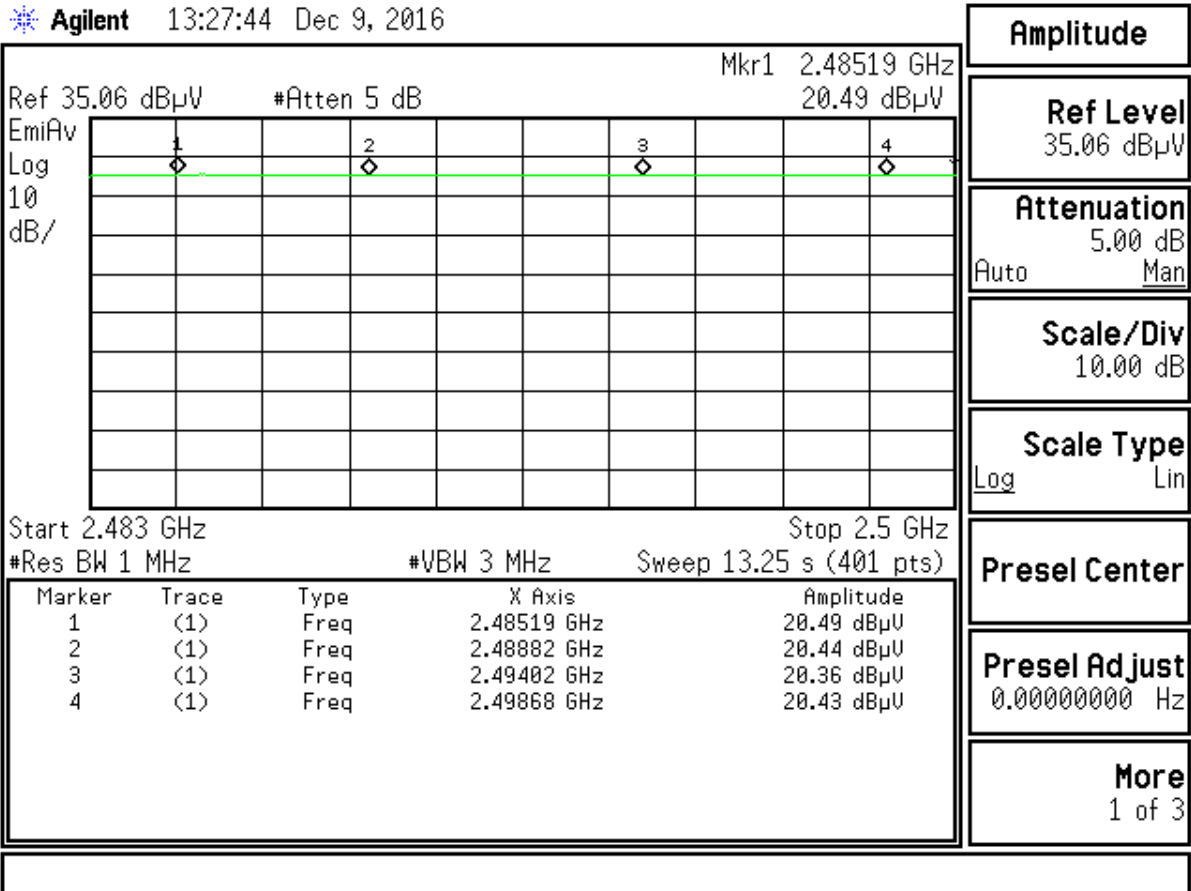


Figure 8. 802.11b Radiated Restricted Band 2483.5 MHz to 2500 MHz, Average

Table 14. 802.11b Radiated Restricted Band 2483.5 MHz to 2500 MHz, Average

2483.5 MHz to 2500 MHz Restricted Band Average Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP+Duty Cycle (dB/m)	Results (dBuV/m)	AVG Limits (dBuV/m)	Antenna Distance/Polarization	Margin (dB)	Detector PK, or AVG
2485.19	20.49	30.13	50.62	54.0	3.0m./HORZ	3.4	AVG
2488.82	20.44	30.13	50.57	54.0	3.0m./HORZ	3.4	AVG
2494.02	20.36	30.13	50.49	54.0	3.0m./HORZ	3.5	AVG
2498.68	20.43	30.13	50.56	54.0	3.0m./HORZ	3.4	AVG

Test Date: December 9, 2016

Tested By

Signature: 

Name: Robert K. Mills

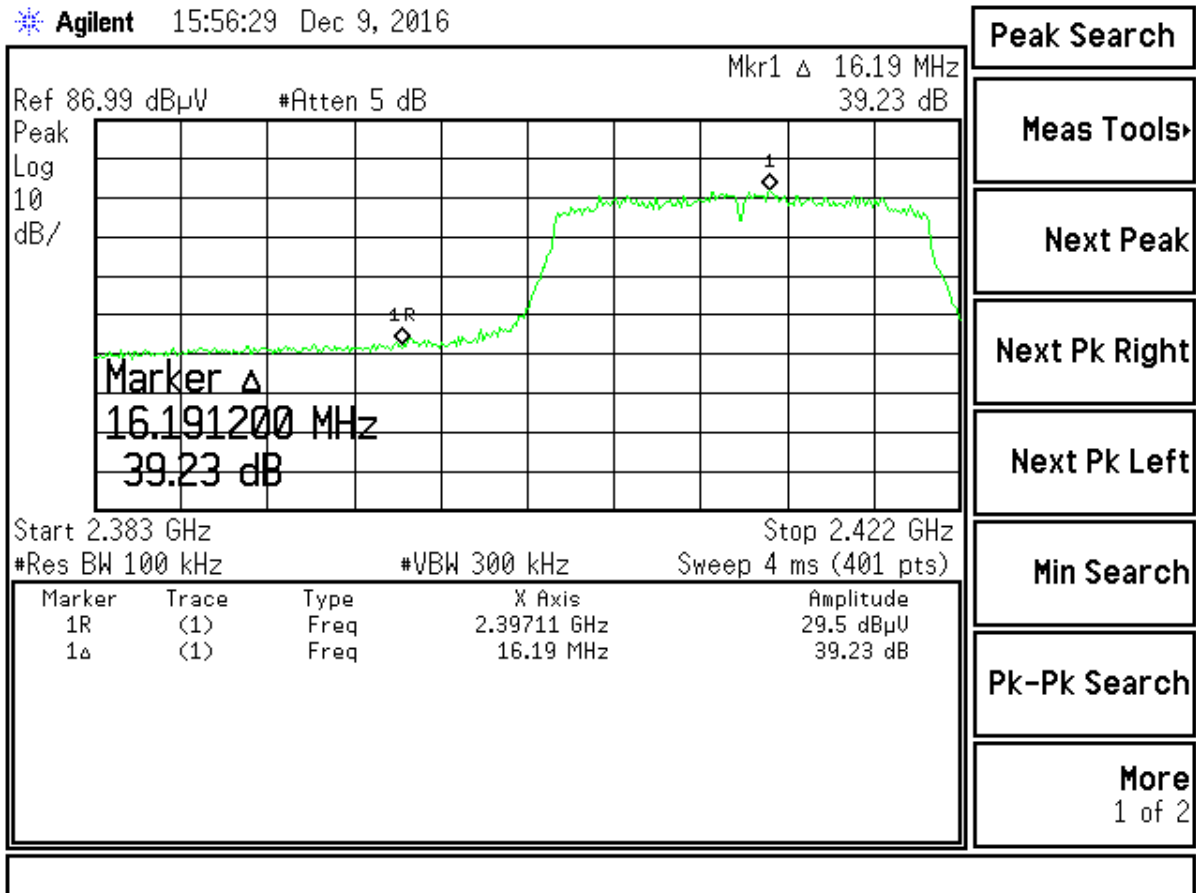


Figure 9. 802.11g Band Edge Compliance, Low Channel Delta - Peak

Low Channel Corrected Measured Value from Table 7	101.08	dBuV
Low Channel Band Edge Delta from Figure 8	39.23	dB
Calculated Result	61.85	dBuV/m
Band Edge Limit	74.00	dBuV/m
Calculated Result	61.85	dBuV/m
Band Edge Margin	12.15	dBuV/m

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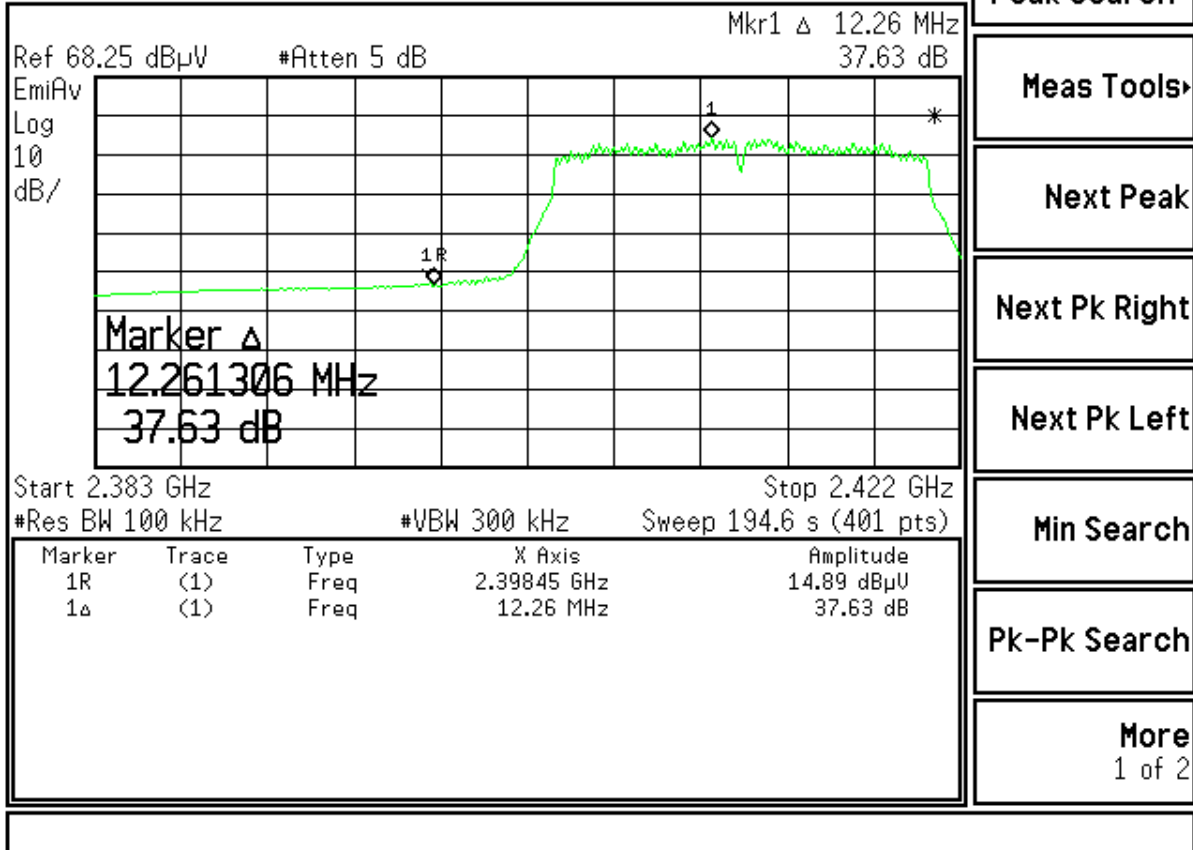


Figure 10. 802.11g Band Edge Compliance, Low Channel Delta - Average

Low Channel Corrected Measured Value from Table 8	82.35	dBuV
Low Channel Band Edge Delta from Figure 10	37.63	dB
Calculated Result	44.72	dBuV/m
Band Edge Limit	54.00	dBuV/m
Calculated Result	44.72	dBuV/m
Band Edge Margin	9.28	dBuV/m

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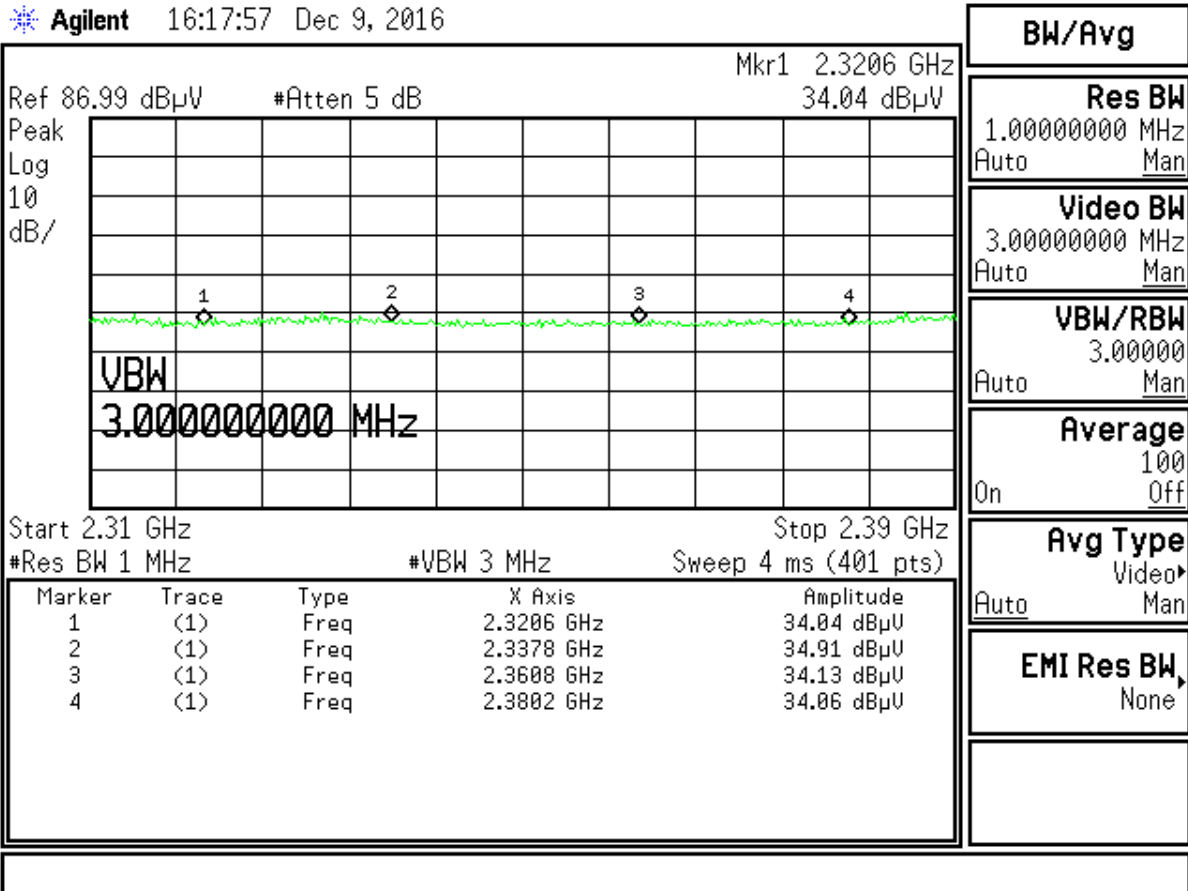


Figure 11. 802.11g Radiated Restricted Band 2310 MHz to 2390 MHz, Peak

Table 15. 802.11g Radiated Restricted Band 2310 MHz to 2390 MHz, Peak

2310 MHz to 2390 MHz Restricted Band Peak Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dB μ V)	AF+CA-AMP (dB/m)	Results (dB μ V/m)	PK Limits (dB μ V/m)	Antenna Distance/Polarization	Margin (dB)	Detector PK, or AVG
2320.6	34.04	29.49	63.53	74.0	3.0m./HORZ	10.5	PK
2337.8	34.91	29.49	64.40	74.0	3.0m./HORZ	9.6	PK
2360.8	34.13	29.49	63.62	74.0	3.0m./HORZ	10.4	PK
2380.2	34.06	30.00	64.06	74.0	3.0m./HORZ	9.9	PK

Test Date: December 9, 2016

Tested By

Signature:  Name: Robert K. Mills

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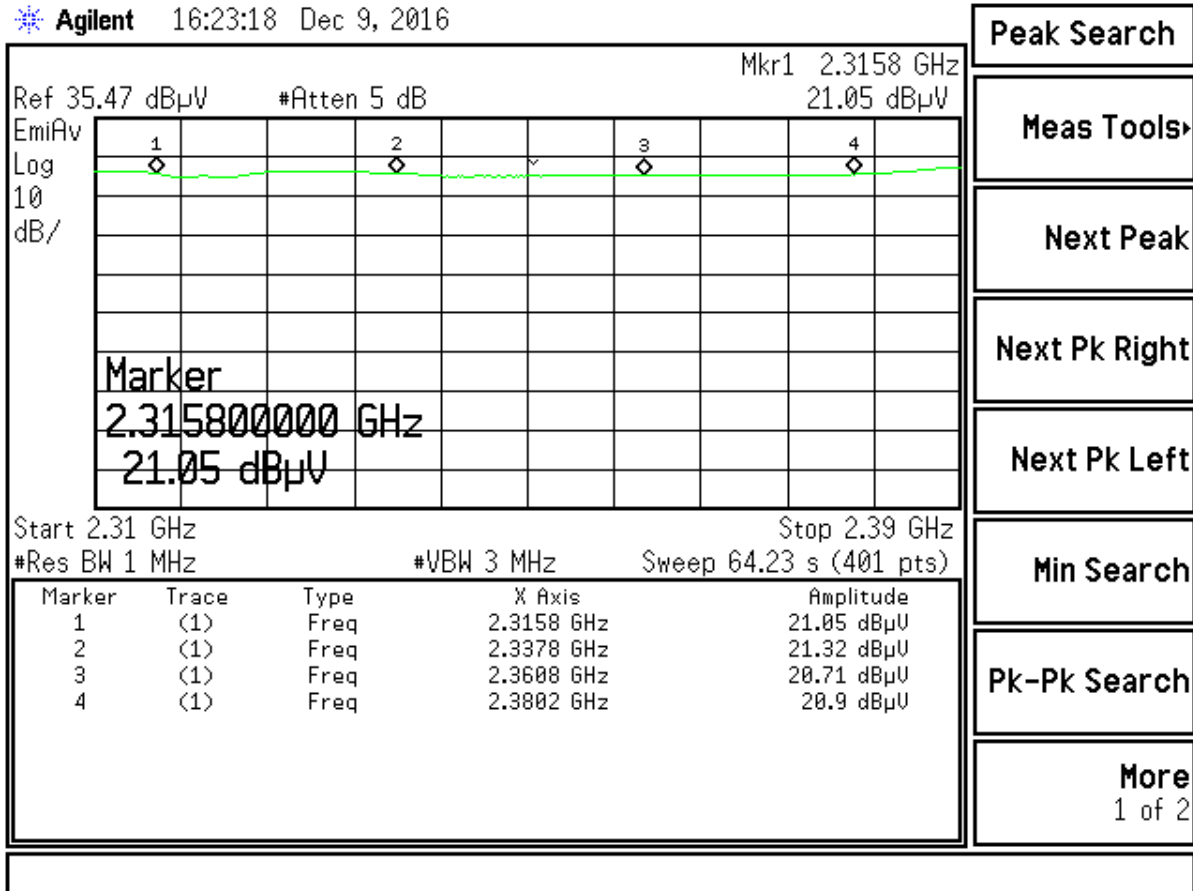


Figure 12. 802.11g Radiated Restricted Band 2310 MHz to 2390 MHz, Average

Table 16. 802.11g Radiated Restricted Band 2310 MHz to 2390 MHz, Average

2310 MHz to 2390 MHz Restricted Band Peak Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
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
2315.8	21.05	29.49	50.54	54.0	3.0m./HORZ	3.5	AVG
2337.8	21.32	29.49	50.81	54.0	3.0m./HORZ	3.2	AVG
2360.8	20.71	29.49	50.20	54.0	3.0m./HORZ	3.8	AVG
2380.2	20.90	30.00	50.90	54.0	3.0m./HORZ	3.1	AVG

Test Date: December 9, 2016

Tested By

Signature:  Name: Robert K. Mills

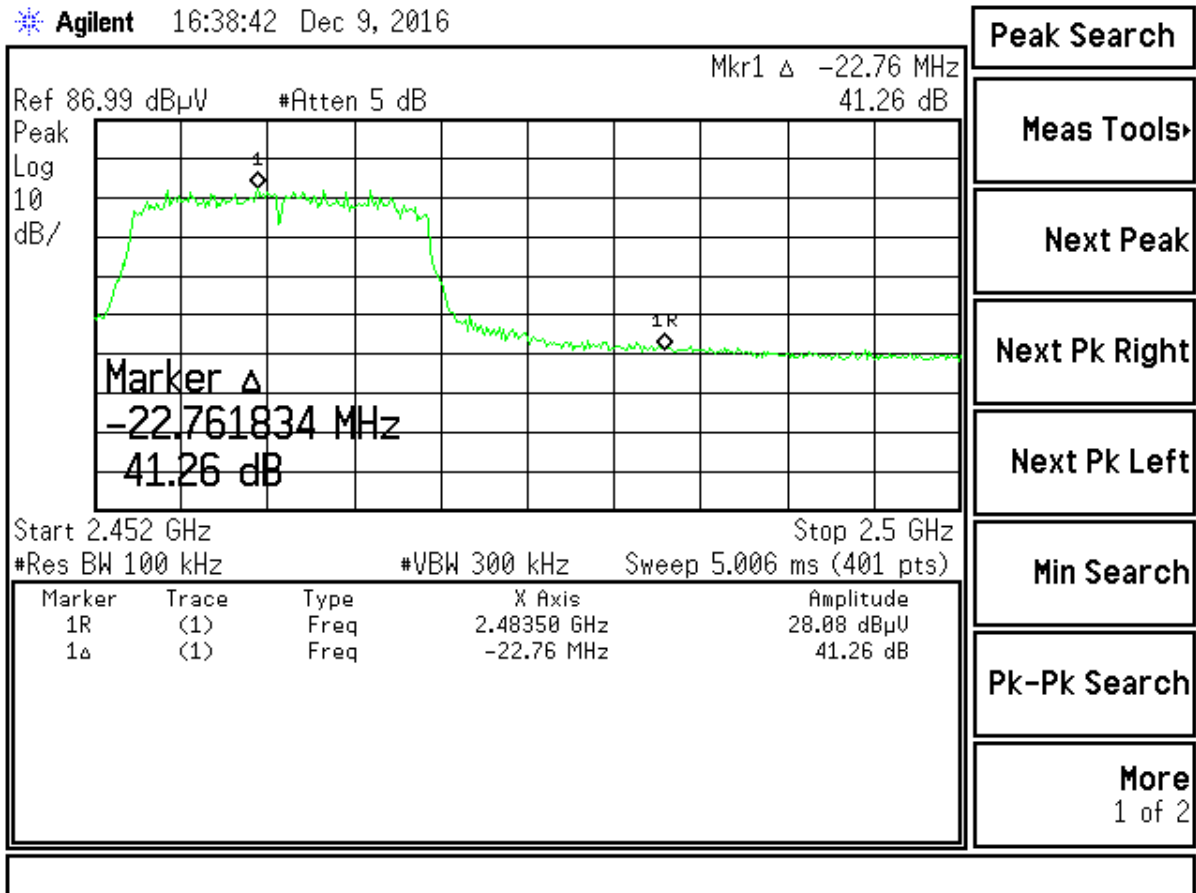


Figure 13. 802.11g Band Edge Compliance, High Channel Delta – Peak

High Channel Corrected Measured Value from Table 7	97.88	dBuV
High Channel Band Edge Delta from Figure 11	41.26	dB
Calculated Result	56.62	dBuV/m
Band Edge Limit	74.00	dBuV/m
Calculated Result	56.62	dBuV/m
Band Edge Margin	17.38	dBuV/m

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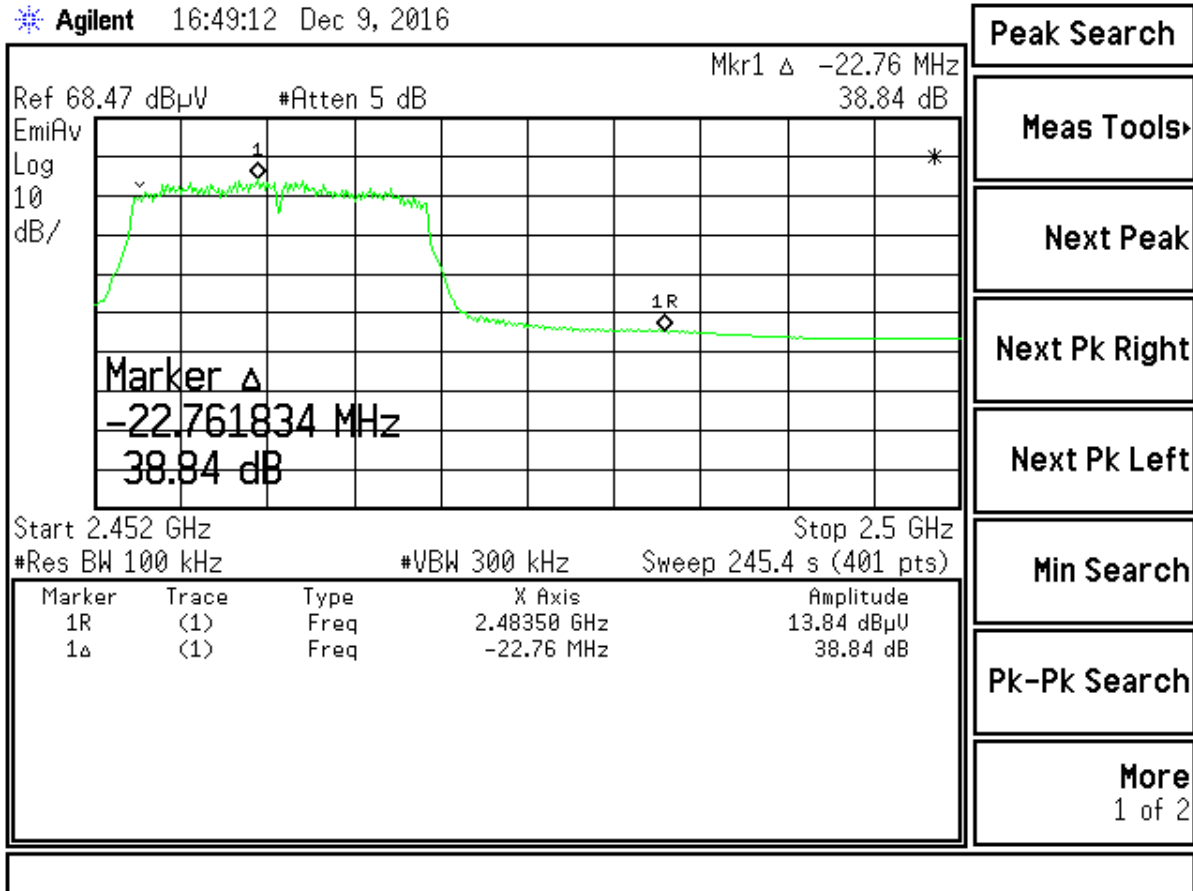


Figure 14. 802.11g Band Edge Compliance, High Channel Delta – Average

High Channel Corrected Measured Value from Table 8	80.08	dBuV
High Channel Band Edge Delta from Figure 14	38.84	dB
Calculated Result	41.24	dBuV/m
Band Edge Limit	54.00	dBuV/m
Calculated Result	41.24	dBuV/m
Band Edge Margin	12.76	dBuV/m

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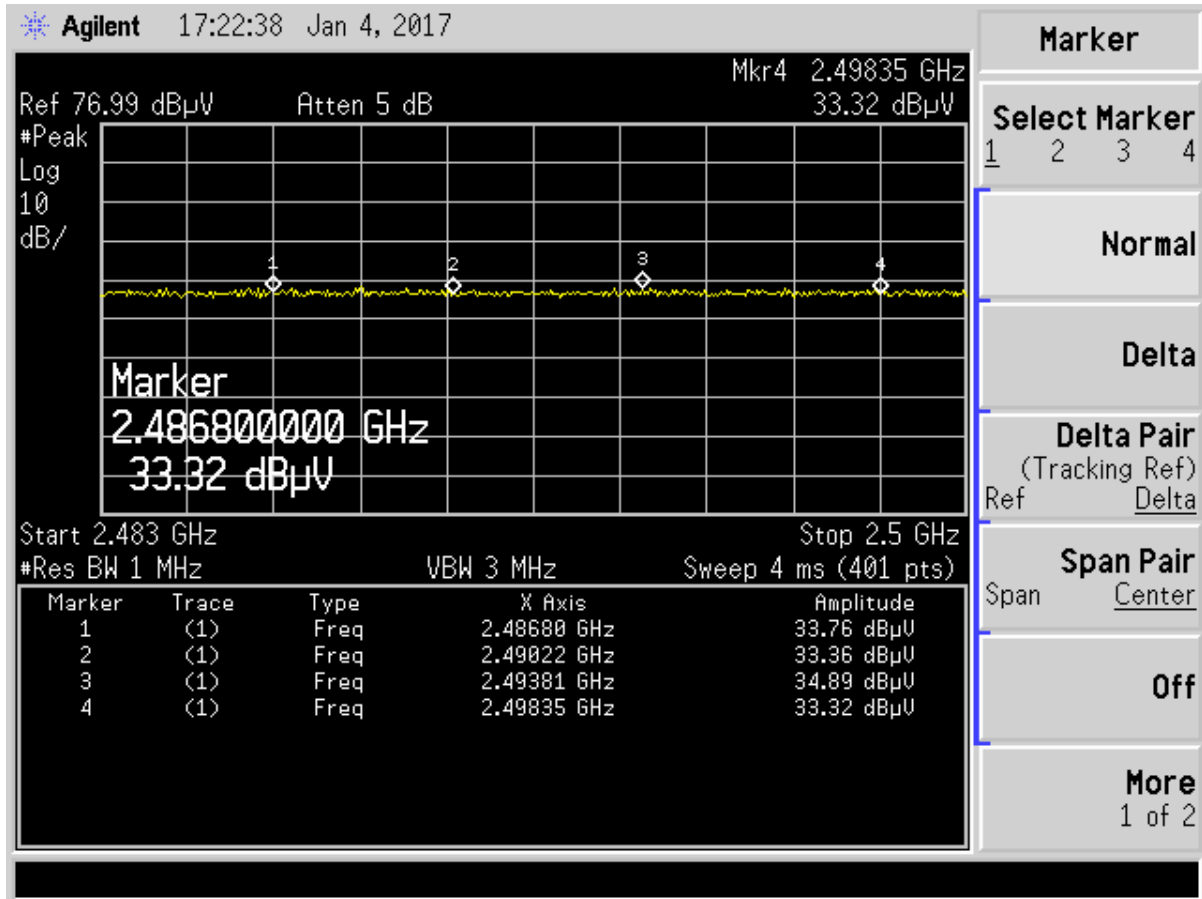


Figure 15. 802.11g Radiated Restricted Band 2483.5 MHz to 2500 MHz, Peak

Table 17. 802.11g Radiated Restricted Band 2483.5 MHz to 2500 MHz, Peak

2483.5 MHz to 2500 MHz Restricted Band Peak Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
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
2484.78	33.76	30.13	63.89	74.0	3.0m./HORZ	10.1	PK
2489.69	33.36	30.13	63.49	74.0	3.0m./HORZ	10.5	PK
2493.94	34.89	30.13	65.02	74.0	3.0m./HORZ	9.0	PK
2498.60	33.32	30.13	63.45	74.0	3.0m./HORZ	10.5	PK

Test Date: January 4, 2017

Tested By

Signature: 

Name: Robert K. Mills

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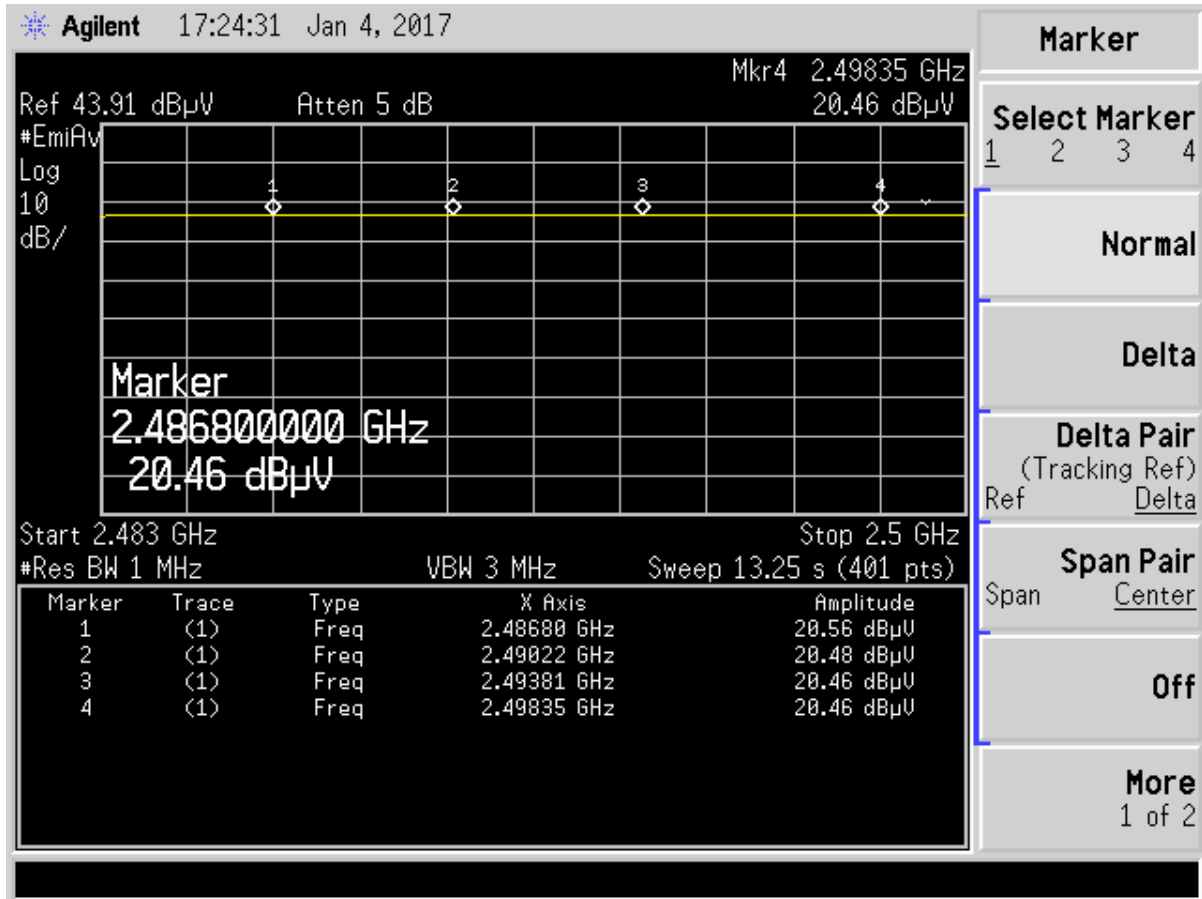


Figure 16. 802.11g Radiated Restricted Band 2483.5 MHz to 2500 MHz, Average

Table 18. 802.11g Radiated Restricted Band 2483.5 MHz to 2500 MHz, Average

2483.5 MHz to 2500 MHz Restricted Band Average Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP+Duty Cycle (dB/m)	Results (dBuV/m)	AVG Limits (dBuV/m)	Antenna Distance/Polarization	Margin (dB)	Detector PK, or AVG
2486.80	20.56	30.13	50.69	54.0	3.0m./HORZ	3.3	AVG
2490.22	20.48	30.13	50.61	54.0	3.0m./HORZ	3.4	AVG
2493.81	20.46	30.13	50.59	54.0	3.0m./HORZ	3.4	AVG
2498.35	20.46	30.13	50.59	54.0	3.0m./HORZ	3.4	AVG

Test Date: January 4, 2017

Tested By

Signature: 

Name: Robert K. Mills

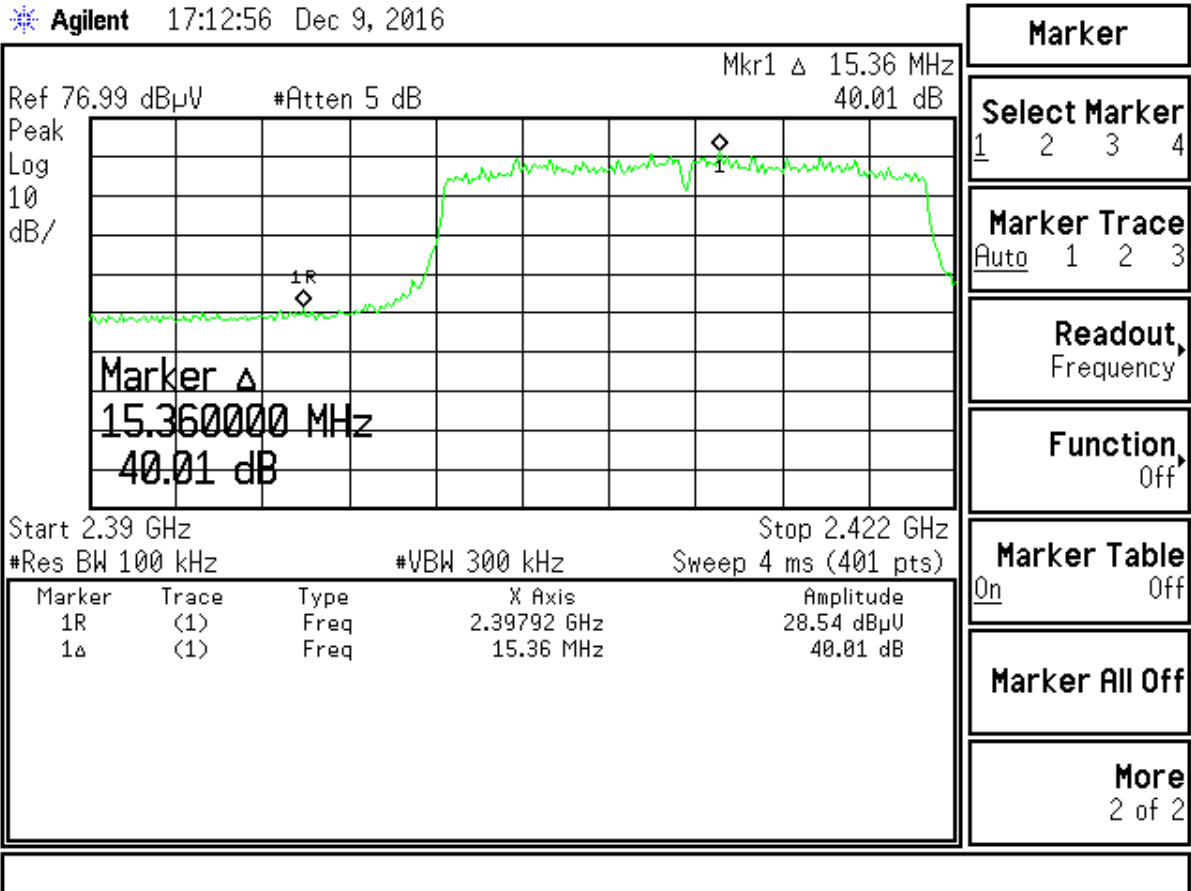


Figure 17. 802.11n Band Edge Compliance, Low Channel Delta - Peak

Low Channel Corrected Measured Value from Table 9	100.27	dBuV
Low Channel Band Edge Delta from Figure 17	40.01	dB
Calculated Result	60.26	dBuV/m
Band Edge Limit	74.00	dBuV/m
Calculated Result	60.26	dBuV/m
Band Edge Margin	13.74	dBuV/m

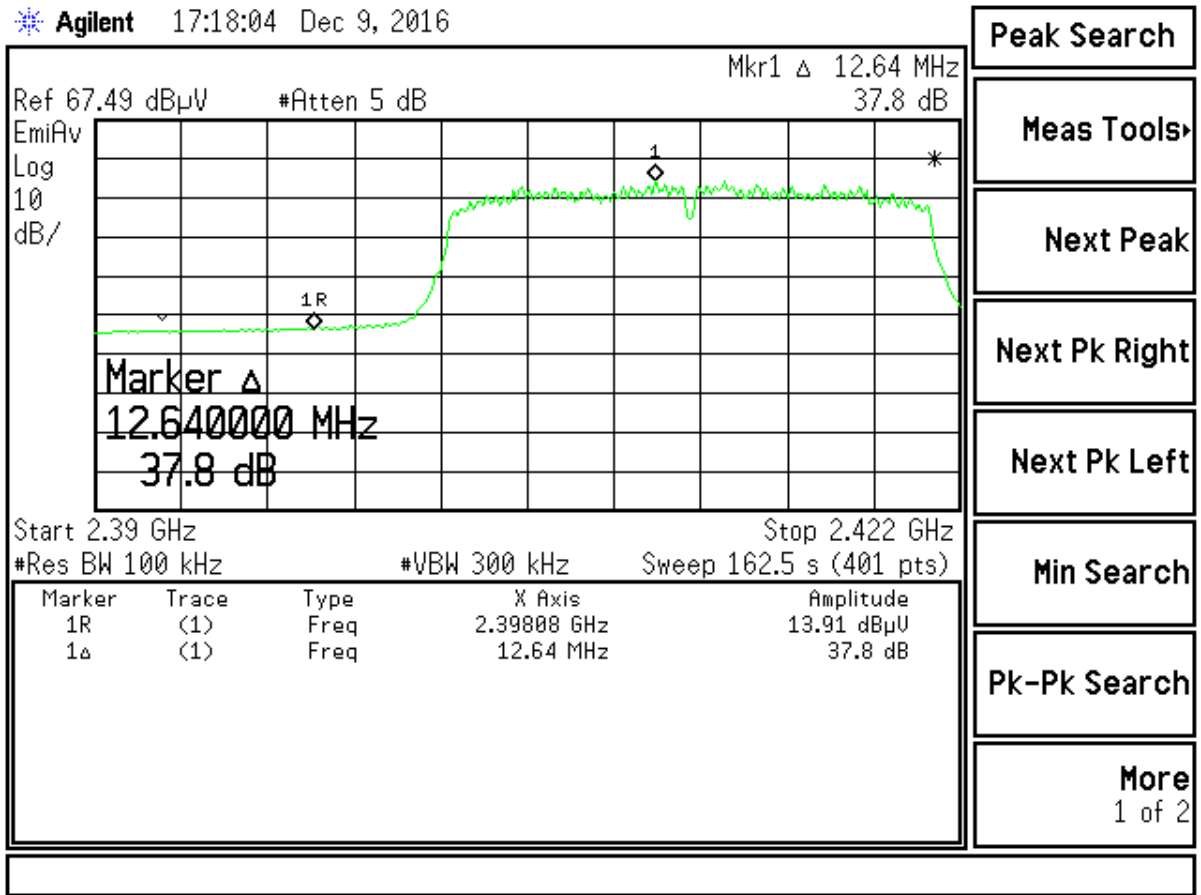


Figure 18. 802.11n Band Edge Compliance, Low Channel Delta - Average

Low Channel Corrected Measured Value from Table 10	81.48	dBuV
Low Channel Band Edge Delta from Figure 18	37.80	dB
Calculated Result	43.68	dBuV/m
Band Edge Limit	54.00	dBuV/m
Calculated Result	43.68	dBuV/m
Band Edge Margin	10.32	dBuV/m

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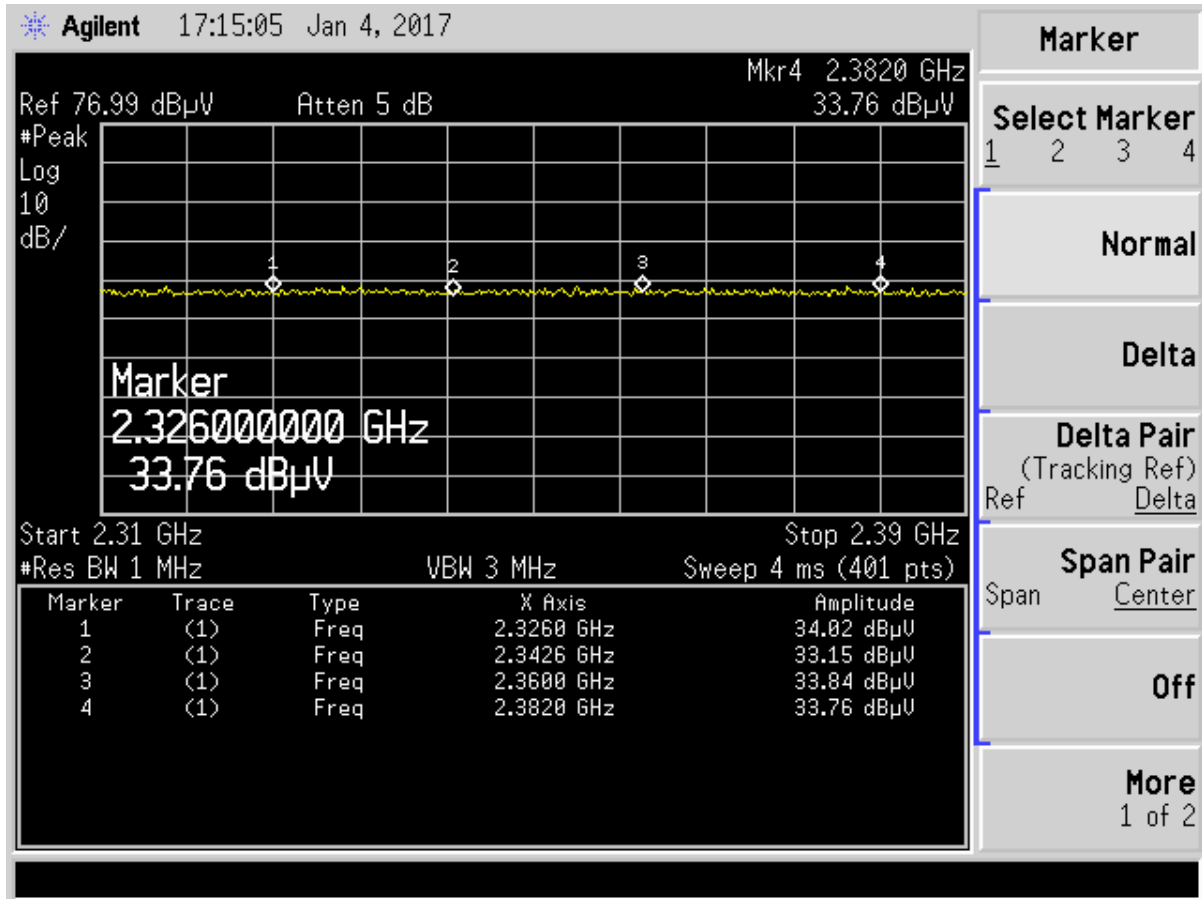


Figure 19. 802.11n Radiated Restricted Band 2310 MHz to 2390 MHz, Peak

Table 19. 802.11n Radiated Restricted Band 2310 MHz to 2390 MHz, Peak

2310 MHz to 2390 MHz Restricted Band Peak Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
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
2326.00	34.02	29.49	63.51	74.0	3.0m./HORZ	10.5	PK
2342.60	33.15	29.49	62.64	74.0	3.0m./HORZ	11.4	PK
2360.00	33.84	29.49	63.33	74.0	3.0m./HORZ	10.7	PK
2382.00	33.76	30.00	63.76	74.0	3.0m./HORZ	10.2	PK

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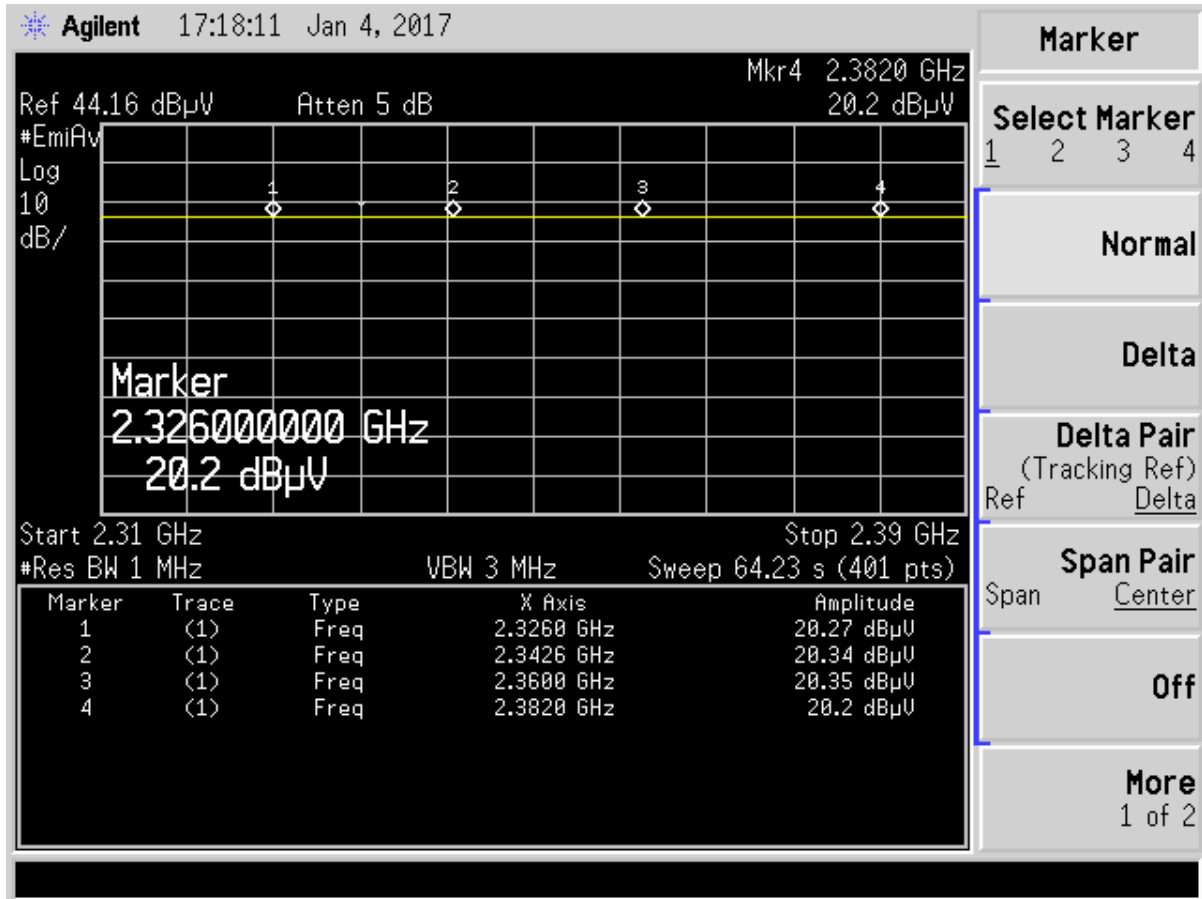


Figure 20. 802.11n Radiated Restricted Band 2310 MHz to 2390 MHz, Average

Table 20. 802.11n Radiated Restricted Band 2310 MHz to 2390 MHz, Average

2310 MHz to 2390 MHz Restricted Band Peak Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
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
2326.00	20.27	29.49	49.76	54.0	3.0m./HORZ	4.2	AVG
2342.60	20.34	29.49	49.83	54.0	3.0m./HORZ	4.2	AVG
2360.00	20.35	29.49	49.84	54.0	3.0m./HORZ	4.2	AVG
2382.00	20.2	30.00	50.20	54.0	3.0m./HORZ	3.8	AVG

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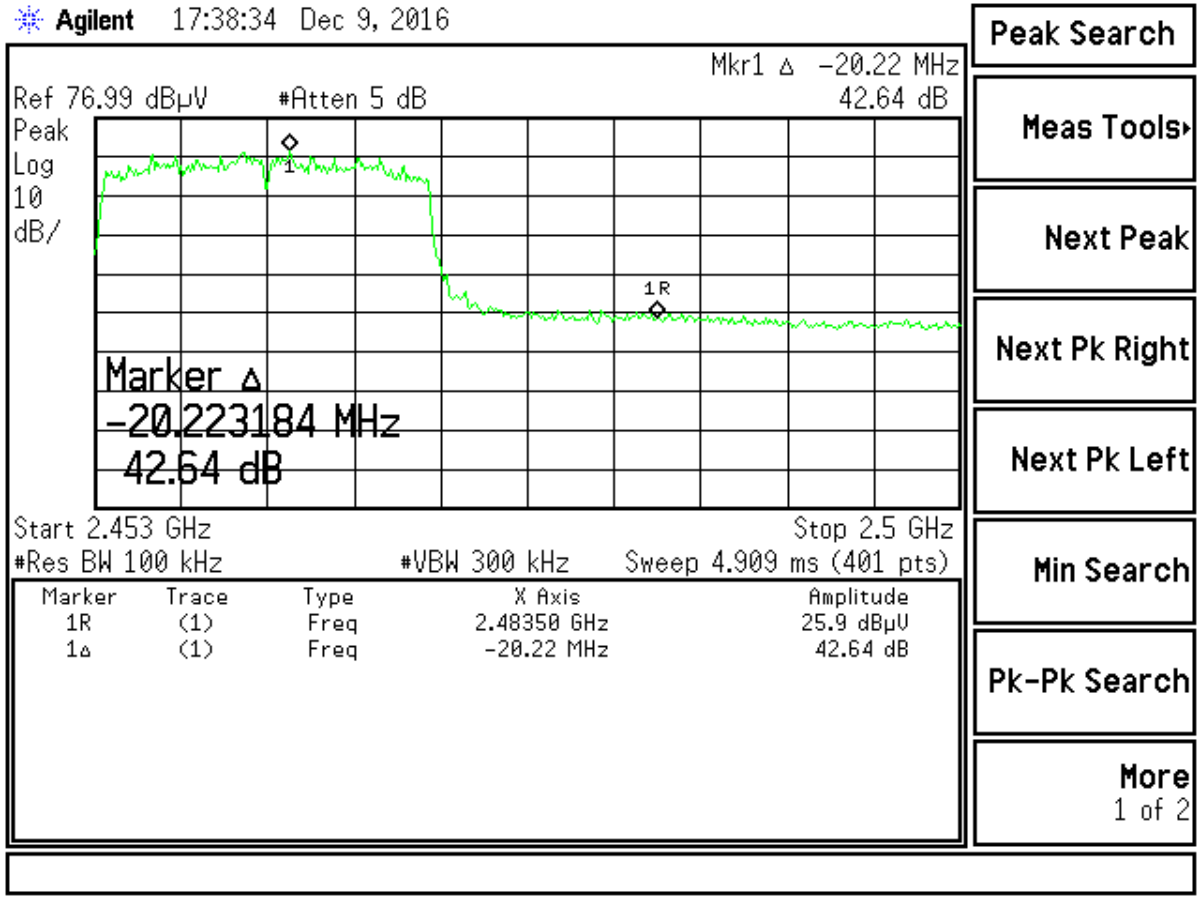


Figure 21. 802.11n Band Edge Compliance, High Channel Delta – Peak

High Channel Corrected Measured Value from Table 9	96.89	dBuV
High Channel Band Edge Delta from Figure 21	42.64	dB
Calculated Result	54.25	dBuV/m
Band Edge Limit	74.00	dBuV/m
Calculated Result	54.25	dBuV/m
Band Edge Margin	19.75	dBuV/m

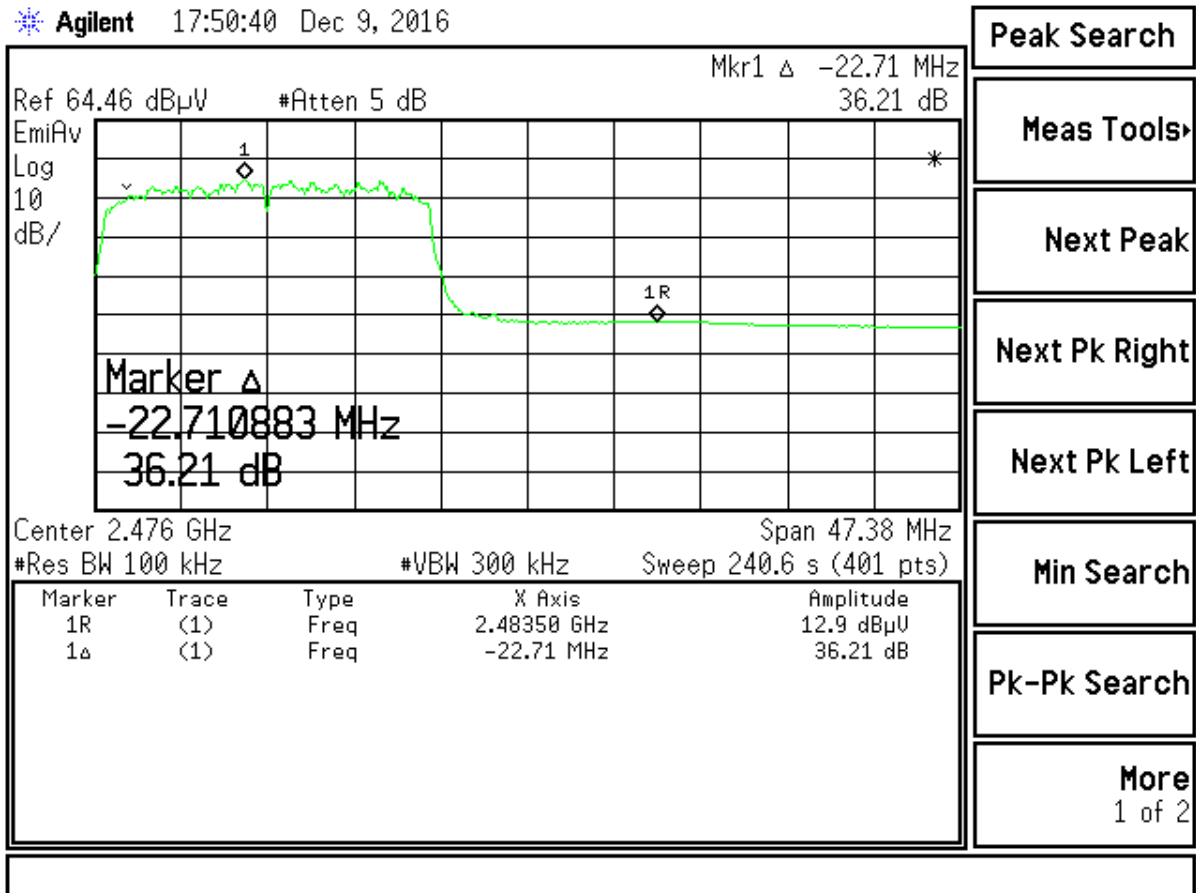


Figure 22. 802.11n Band Edge Compliance, High Channel Delta – Average

High Channel Corrected Measured Value from Table 9	77.47	dBuV
High Channel Band Edge Delta from Figure 22	36.21	dB
Calculated Result	41.26	dBuV/m
Band Edge Limit	54.00	dBuV/m
Calculated Result	41.26	dBuV/m
Band Edge Margin	12.74	dBuV/m

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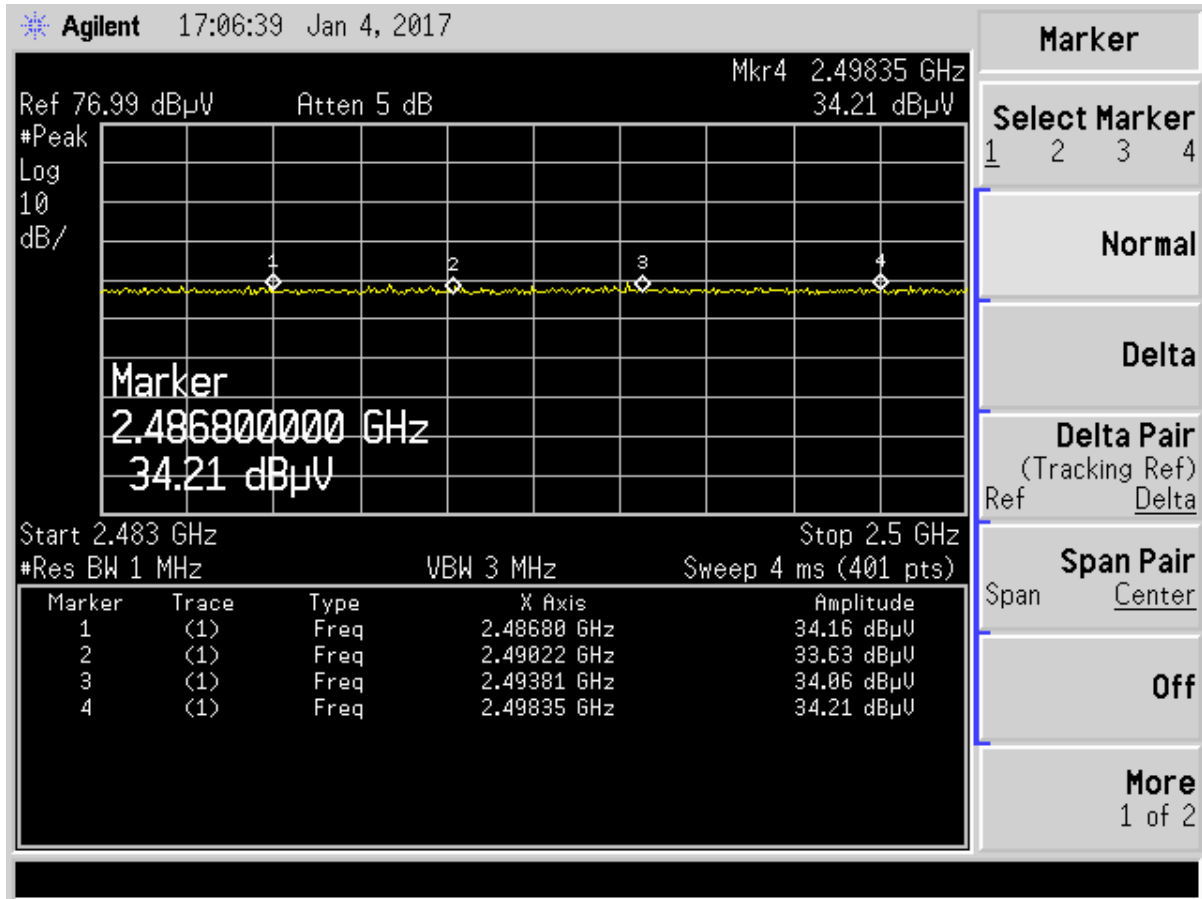


Figure 23. 802.11n Radiated Restricted Band 2483.5 MHz to 2500 MHz, Peak

Table 21. 802.11n Radiated Restricted Band 2483.5 MHz to 2500 MHz, Peak

2483.5 MHz to 2500 MHz Restricted Band Peak Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
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
2486.80	34.16	30.13	64.29	74.0	3.0m./HORZ	9.7	PK
2490.22	33.63	30.13	63.76	74.0	3.0m./HORZ	10.2	PK
2493.81	34.06	30.13	64.19	74.0	3.0m./HORZ	9.8	PK
2498.35	34.21	30.13	64.34	74.0	3.0m./HORZ	9.7	PK

Test Date: January 4, 2017

Tested By

Signature: 

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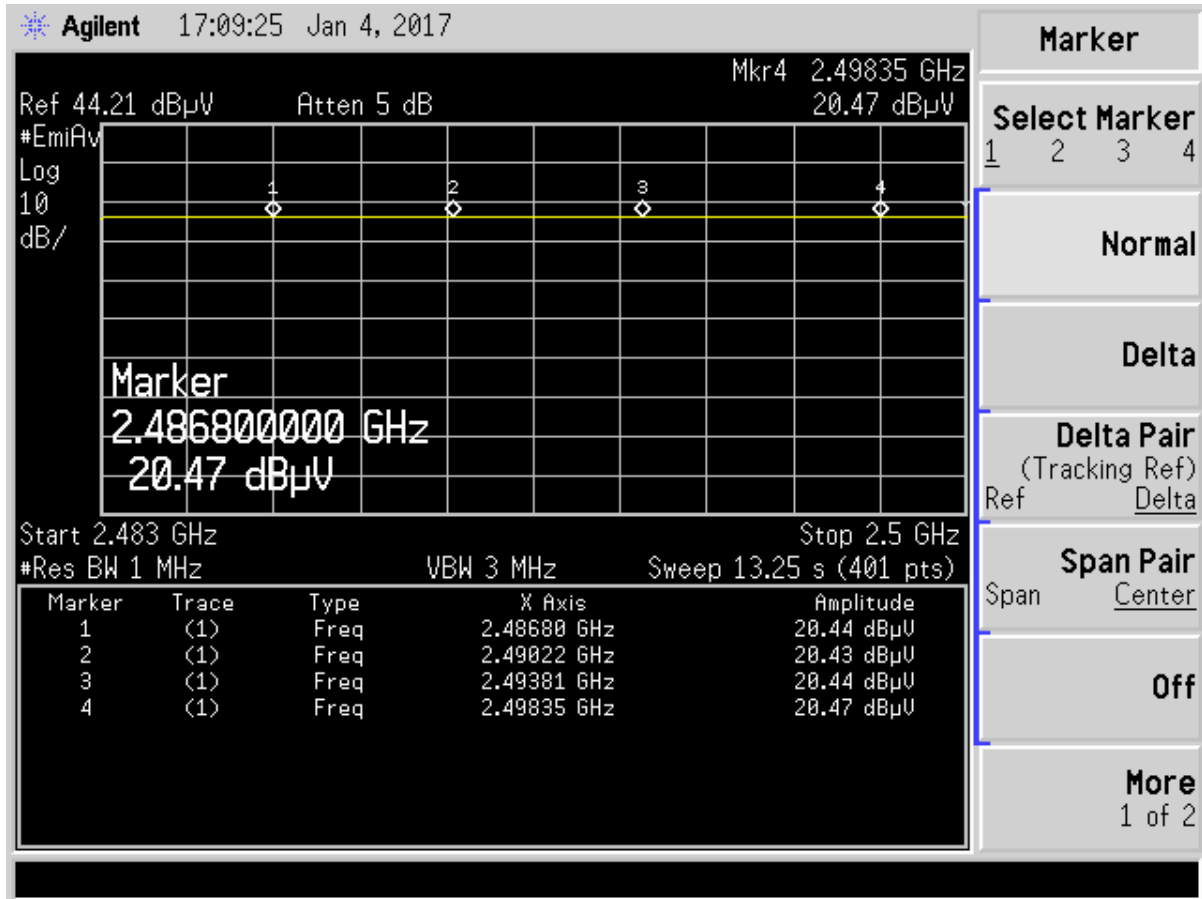


Figure 24. 802.11n Radiated Restricted Band 2483.5 MHz to 2500 MHz, Average

Table 22. 802.11n Radiated Restricted Band 2483.5 MHz to 2500 MHz, Average

2483.5 MHz to 2500 MHz Restricted Band Average Measurements							
Test: Radiated Emissions				Client: Inventek Systems			
Project: 16-0291							
Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP+Duty Cycle (dB/m)	Results (dBuV/m)	AVG Limits (dBuV/m)	Antenna Distance/Polarization	Margin (dB)	Detector PK, or AVG
2486.80	20.44	30.13	50.57	54.0	3.0m./HORZ	3.4	AVG
2490.22	20.43	30.13	50.56	54.0	3.0m./HORZ	3.4	AVG
2493.81	20.44	30.13	50.57	54.0	3.0m./HORZ	3.4	AVG
2498.35	20.47	30.13	50.60	54.0	3.0m./HORZ	3.4	AVG

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2.10 Measurement Uncertainty

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

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 ± 5.21 dB.

3 Test Results

The EUT is found to continue to comply with the requirements of Part 15.247.