Test of Zebra Enterprise Solutions Corp. WLM54AG
802.11 b/g Wireless Module

To: FCC 47 CFR Part 15.247 & IC RSS-210

Test Report Serial No.: GBCC01-U2 Rev A

TEST REPORT

From

Test of: Zebra Enterprise Solutions Corp. WLM54AG 802.11 b/g Wireless Module

To: FCC 47 CFR Part 15.247 & IC RSS-210

Test Report Serial No.: GBCC01-U2 Rev A

This report supersedes: None

Applicant:	Zebra Enterprise Solutions Corp. 2940 N. First Street San Jose, CA 95134 USA
Product Function:	802.11 b/g wireless module
Copy No: pdf	**Issue Date:** 9th December 2010

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
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Pleasanton, CA 94566 USA
Phone: +1 (925) 462-0304
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ACCREDITED
TESTING CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

TABLE OF CONTENTS

1 ACCREDITATION, LISTINGS & RECOGNITION

1.1 TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

ilac-MRA

A2LA World Class Accreditation

The American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

NATIONAL ASSOCIATION FOR LABORATORY ACCREDITATION CORPORATE SEAL 1978 DISTRICT OF COLUMBIA A2LA

Presented this 14th day of April 2010.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2011

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

1.2 RECOGNITION

MiCOM Labs, Inc has widely recognized Electrical testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA** countries. Our test reports are widely accepted for global type approvals.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	Listing #: 4143A
Japan	VCCI	-	-	No. 2959
	MIC	RCB	APEC MRA 2	US0159
Europe	European Union	NB	N/A	
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

**APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.
Phase I - recognition for product testing
Phase II – recognition for both product testing and certification
N/A – Not Applicable

1.3 PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard EN ISO/IEC Guide 65. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

United States of America – Telecommunication Certification Body

TCB Identifier – US0159

Industry Canada – Certification Body

CAB Identifier – US0159

2 DOCUMENT HISTORY

Document History		
Revision	**Date**	**Comments**
Draft		
Rev A	9th December 2010	Initial Release

3 TEST RESULT CERTIFICATE

Applicant:	Zebra Enterprise Solutions Corp. 2940 N. First Street San Jose CA , 95134, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
Product:	802.11 b/g Wireless Module	Telephone:	+1 925 462 0304
Model No.:	WLM54AG	Fax:	+1 925 462 0306
S/No's:	22523657		
Date(s) Tested:	25th Oct to 2nd November 2010	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15.247 & IC RSS-210	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:

ACCREDITED
TESTING CERTIFICATE #2381.01

Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

4 REFERENCES AND MEASUREMENT UNCERTAINTY

4.1 Normative References

Ref.	Publication	Year	Title
i.	47 CFR Part 15, SubPart 15.247	2007	For Digitally Modulated Intentional Radiators
ii.	Industry Canada RSS-210	Issue 7 June 2007	Low Power License-Exempt Radiocommunication Devices (All Frequency Bands)
iii.	Industry Canada RSS-Gen	Issue 2 June 2007	General Requirements and Information for the Certification of Radiocommunication Equipment.
iv.	ANSI C63.4	2009	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
v.	CISPR 22/ EN 55022	2008 2006+A1:2007	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
vi.	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
vii.	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
viii.	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
ix.	A2LA	9th June 2010	Reference to A2LA Accreditation Status – A2LA Advertising Policy

4.2 Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

5 TEST SUMMARY

List of Measurements:

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247** and **Industry Canada RSS-210** and **Industry Canada RSS-Gen.**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(a)(2) **A8.2(1)** **4.4**	6 dB and 99 % Bandwidths	≥500 kHz	Conducted	Complies	7.1
15.247(b)(3) **15.31(e)** **A8.4(4)**	Peak Output Power Voltage Variation	Shall not exceed 1W Variation of supply voltage 85 % -115 %	Conducted	Complies	7.2
15.247(e) **A8.2**	Peak Power Spectral Density	Shall not be greater than +8 dBm in any 3 kHz band	Conducted	Complies	7.3
15.247(i) **5.5**	Maximum Permissible Exposure	Exposure to radio frequency energy levels	Conducted	Complies	7.4
15.247(d) **15.205 /** **15.209** **A8.5** **2.2** **4.7**	Spurious Emissions (30MHz - 26 GHz b/g and 30 MHz – 40 GHz a)	The radiated emission in any 100 kHz of out-band shall be at least 20 dB below the highest in-band spectral density	Conducted	Complies	7.5

List of Measurements (continued)

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247, Industry Canada RSS-210,** and **Industry Canada RSS-Gen.**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(d) **15.205 /** **15.209** **A8.5** **2.2** **2.6** **4.7**	Radiated Emissions Transmitter Radiated Spurious Emissions Radiated Band Edge	Restricted Bands Emissions above 1 GHz Band-edge results Peak Emissions	Radiated	Complies Complies Complies	7.6
Industry Canada only **RSS-Gen §4.10, §6**	Receiver Spurious Emissions	Emissions above 1 GHz	Conducted	Complies	*7.7*
15.205 / **15.209** **2.2**	Radiated Spurious Emissions	Emissions <1 GHz (30M-1 GHz)	Radiated	Complies	*7.8*
15.207 **7.2.2**	AC Wireline Conducted Emissions 150 kHz–30 MHz	Conducted Emissions	Conducted	Complies	*7.9*

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3: *Section 3.7 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

6 PRODUCT DETAILS AND TEST CONFIGURATIONS

6.1 Test Program Scope

The scope of the test program was to test the Zebra Enterprise Solutions Corp. WLM54AG 802.11 b/g wireless module for compliance against FCC 47 CFR Part 15, SubPart 15.247 & IC RSS-210. The WLM54AG 802.11 b/g wireless module was tested in a host device, a Zebra Enterprise WhereLAN III Location Sensor wireless location system.

APPLICANT: Zebra Enterprise Solutions Corp.

PRODUCT: WLM54AG 802.11 b/g Wireless Card

6.2 EUT Details

Detail	Description
Purpose:	Test of the Zebra Enterprise Solutions Corp. WLM54AG 802.11 b/g wireless module for compliance against FCC 47 CFR Part 15, SubPart 15.247 & IC RSS-210
Applicant:	Zebra Enterprise Solutions Corp.
Manufacturer:	Zebra Enterprise Solutions Corp.
Test Laboratory:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	GBCC01-U2
Date EUT received:	25th October 2010
Dates of test (from - to):	25th October to 2nd November 2010
No of Units Tested:	1
Product Name:	802.11 b/g wireless module
Manufacturers Trade Name:	Wireless Network Mini PC adapter
Model No.:	WLM54AG
Equipment Primary Function:	802.11 b/g wireless module
Equipment Secondary Function(s):	None
Type of Technology:	Wireless 802.11b/g
Installation type:	Fixed
Construction/Location for Use:	Indoor/Outdoor
Software/Firmware Release:	Rev B
Hardware Release:	Rev 01
Test Software Release:	Windows XP HyperTerminal and FEPdebugger.exe dated 1/13/2009
Transmit/Receive Operation:	Full Duplex
Output Power Type	Stepped fixed for ISO
AutomaticTransmit Power Control Available:	N/A
Remote Frequency Control Available:	N/A
Operating Frequency:	2,400 to 2483.5 MHz
Rated Input Voltage and Current DC:	5 Vdc, 0.35 (A)
Operating Temperature Range ºC:	Min: -40 Max: +60°C
ITU Emission Designator(s):	802.11b/g
Long Term Frequency Stability:	20 ppm
Equipment Dimensions:	3 in X 2.25 in
Weight:	5 oz

6.3 Operational Power Range

Declared O/P Power Range	Mode 1		Mode 2	
	Max	Max	Min	Min
EUT	10	10	0	0

6.4 Types of Modulation Supported

Modulation / Mode	BW 1
802.11b/g	22 MHz

6.5 Antenna Details

The following is a description of the EUT antennas.

Antenna Type:	Manufacturer	Model	Gain (dBi)	Frequency Range (MHz)
802.11, Dipole	Cisco	AIR-ANT4941	2	2402-2495
802.11, Dipole	Cisco	AIR-ANT2506	5.2	2400-2484
802.11 Yagi	Cisco	AIR-ANT1949	13.5	2400-2484

6.6 Cabling and I/O Ports

The following is a description of the cable and input, output ports available on the Support EUT.

Type of I/O Ports	Description	Screened (Y/N)	Qty
RJ-45	Eithernet	N	1
RJ-22	Timing Ports	N	3
DB-9 Male	Serial Port	N	1
MCX female	RF output ports for ISO24730	Y	2
SMB male	RF output port for WIFI	y	1

6.7 EUT Configurations

Band (GHz)	Mode	Freq Band (MHz)	Freq Range (MHz)	Low ch	Mid ch	High ch	# Ch	Ch Spacing (MHz)	ChBW (MHz)
2.4	802.11 b	2400 - 2483.5	2412 - 2462	2412	2437	2462	11	20	20
2.4	802.11 g	2400 - 2483.5	2412 - 2462	2412	2437	2462	11	20	20

6.8 Equipment Details

The following is a description of EUT and supporting equipment used during the test program.

Type (EUT/Support)	Equipment Description	Manufacturer	Model No.	Part No (s).
EUT	802.11 b/g wireless module	Zebra Enterprise Solutions Corp.	WLM54AG	--
Support	Location Sensor	Zebra Enterprise Solutions Corp.	LOS-5000	LOS-5000-01AA
Support	Remote Telemetry Module	Zebra Enterprise Solutions Corp.	TFF-2225	TFF-2225-00AA
Support	Laptop PC	Dell	PP18L	72MUF A02
Support	Laptop PC	Dell	PPL	9172P

6.9 Test Configurations

Operational Mode(s)	Data Rate Tested	Duty Cycle
b	1 MBit/s	100
g	6 MBit/s	100

6.10 Equipment Modifications

The following modifications were required to bring the equipment into compliance:

- No modifications required.

6.11 Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

- No deviations required.

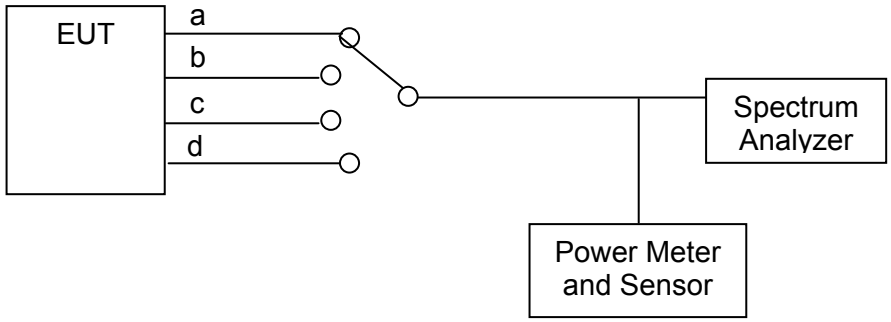
7 TEST RESULTS

7.1 6 dB and 99% Bandwidth

Test Procedure
The test methodology and conditions utilized for each measurement is referenced in the following test results matrix. 6 dB and 99% bandwidth were measured per the Test Configuration identified below.

Testing was restricted to a single port.

Test Configuration



Test configuration for 6 dB & 99% Bandwidth

Specification

Limits

§15.247 (a)(2) & RSS-210 §A8.2(1)
The minimum 6 dB bandwidth shall be at least 500 kHz.

§ IC RSS-Gen 4.4.1 Occupied Bandwidth When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

§ IC RSS-Gen 4.4.2 6 dB Bandwidth Where indicated, the 6 dB bandwidth is measured at the points when the spectral density of the signal is 6 dB down from the in –band spectral density of the modulated signal, with the transmitter modulated by a representative signal.

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0158, 0252, 0313, 0314, 0116, 0117, 0287, 0363

7.1.1 6 dB and 99% Bandwidth Results: 802.11b

Test Conditions:	15.247 (a)(2)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11 b		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	100	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	5.2	dBi
Applied Voltage:	48.00	Vdc			
Notes 1:					
Notes 2:					

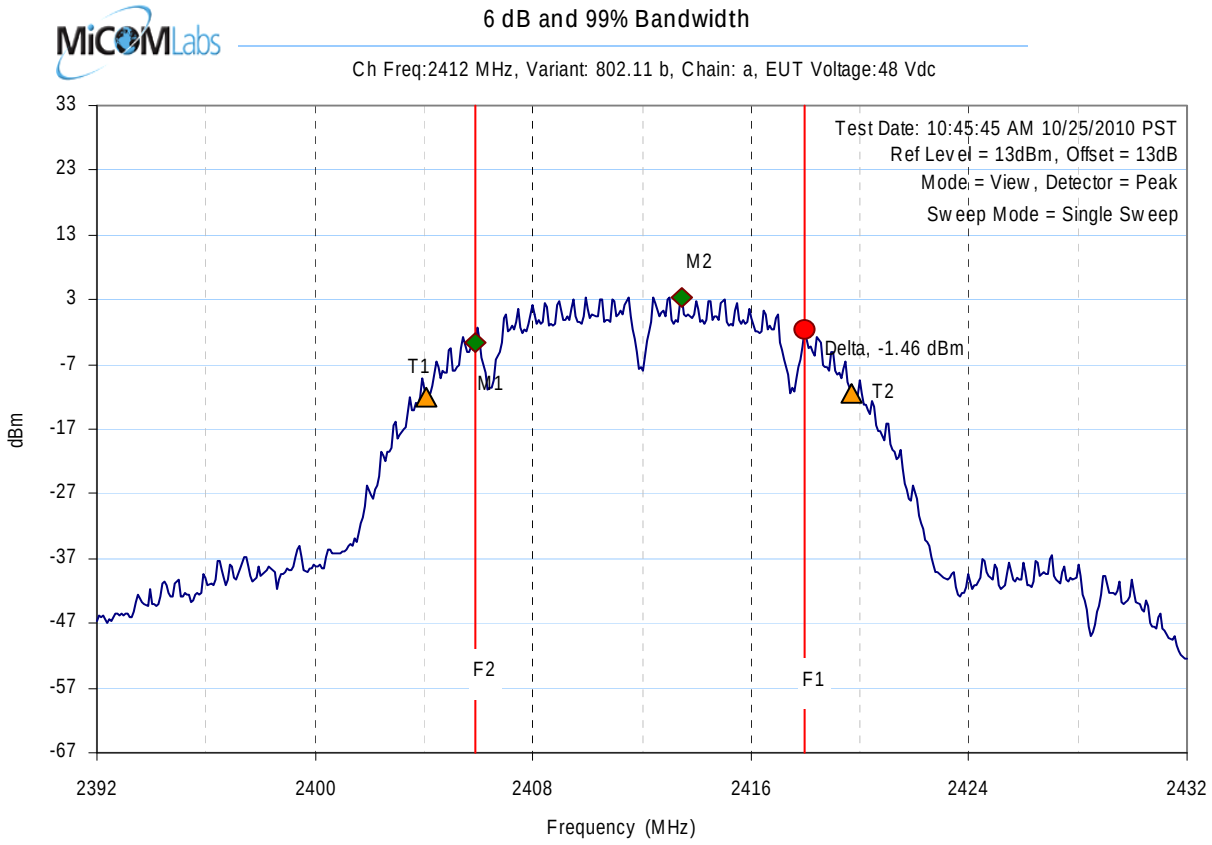
6 dB Bandwidth

Test Frequency	6 dB Bandwidth MHz				Minimum 6dB Bandwidth Limit		Margin
MHz	a	b	c	d	kHz	MHz	MHz
2412.000	12.104000	--	--	--	500	0.5	-11.604000
2437.000	11.142000	--	--	--			-10.642000
2462.000	12.104000	--	--	--			-11.604000

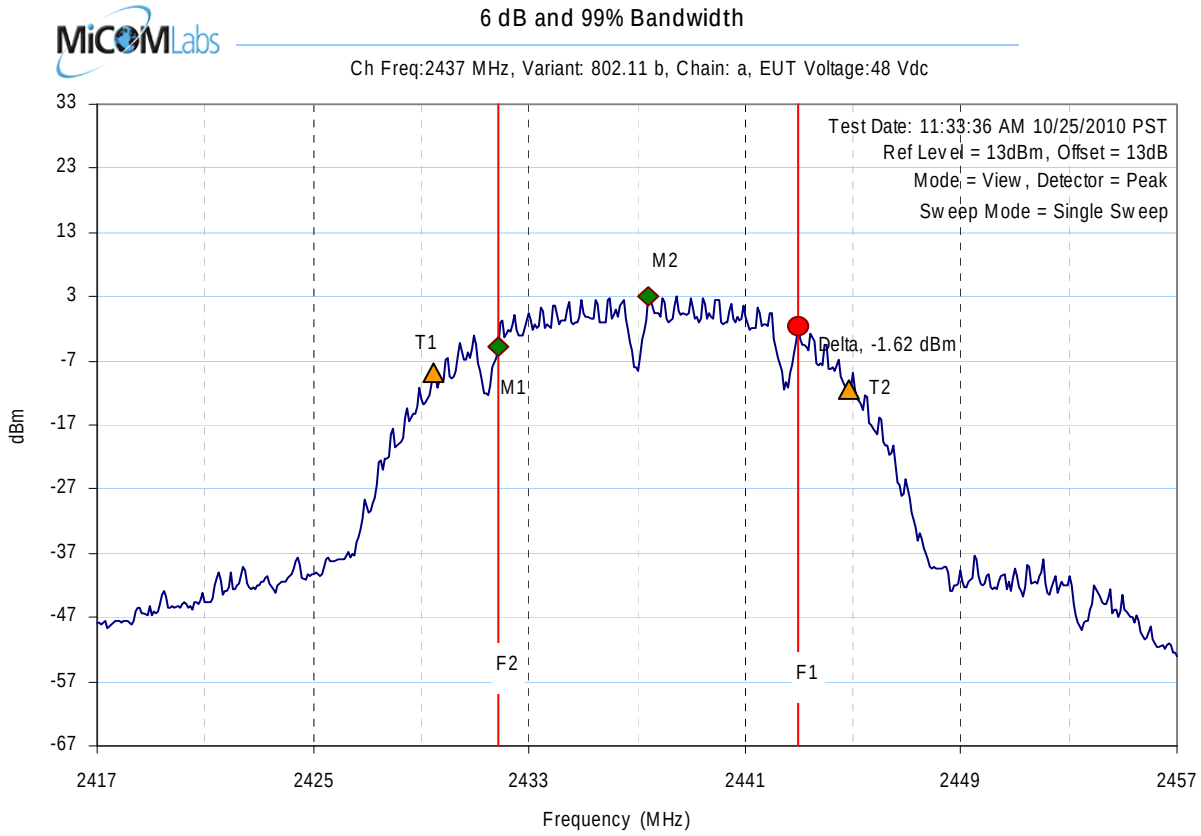
99% Bandwidth

Test Frequency	99 % Bandwidth MHz						
MHz	a	b	c	d			
2412.000	15.631000	--	--	--			
2437.000	15.471000	--	--	--			
2462.000	15.551000	--	--	--			

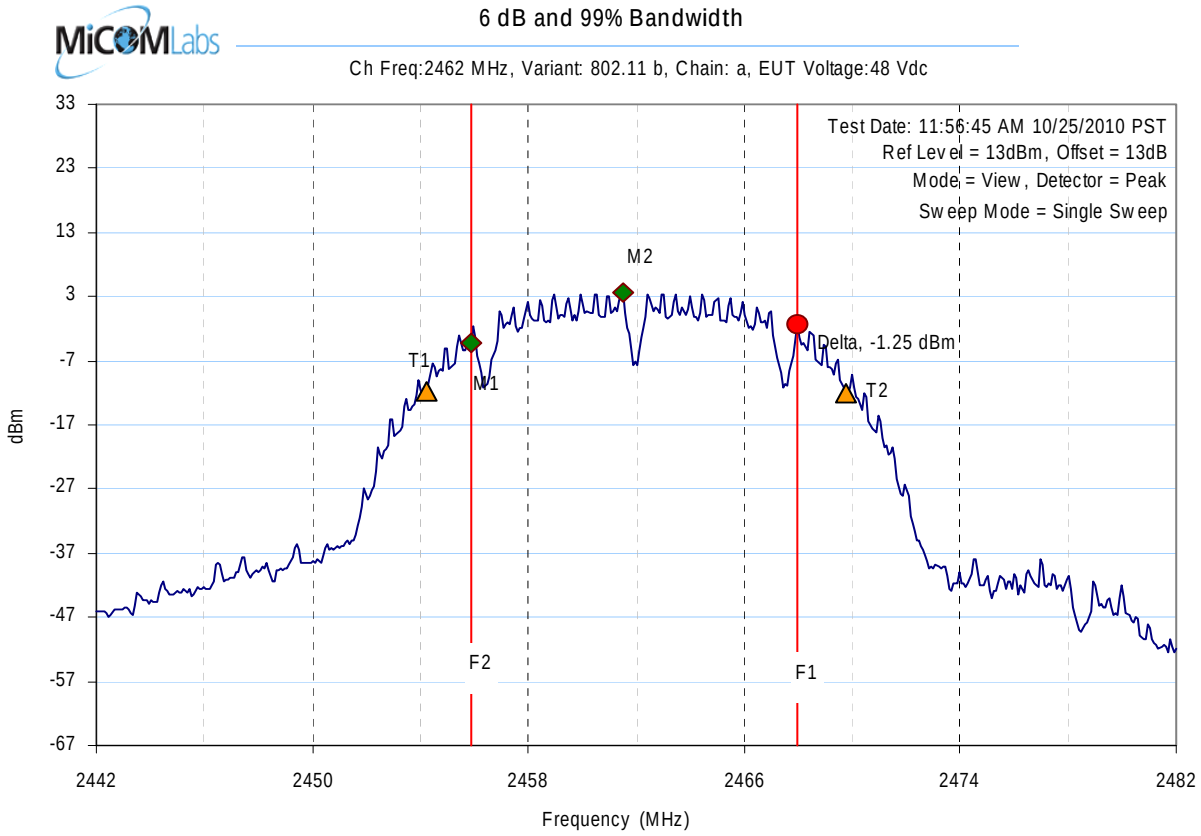
Measurement uncertainty:	±2.81 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2405.867735MHz : -3.719dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 2413.482966MHz : 3.468dBm	6dB BW(Delta-M1) = 12.104208MHz
Sweep time(s) = 20	Delta : 2417.971944MHz : -1.464dBm	99% OBW(T2-T1) = 15.631263MHz
RF Atten (dB) = 10	T1 : 2404.104208MHz : -12.029dBm	
Span = 40.00MHz	T2 : 2419.655311MHz : -11.499dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2431.829659MHz : -4.657dBm	Center frequency = 2437MHz
VBW = 300.00KHz	M2 : 2437.440882MHz : 3.197dBm	6dB BW(Delta-M1) = 11.142285MHz
Sweep time(s) = 20	Delta : 2442.971944MHz : -1.621dBm	99% OBW(T2-T1) = 15.470942MHz
RF Atten (dB) = 10	T1 : 2429.424850MHz : -8.948dBm	
Span = 40.00MHz	T2 : 2444.815631MHz : -11.442dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2455.867735MHz : -4.100dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 2461.478958MHz : 3.557dBm	6dB BW(Delta-M1) = 12.104208MHz
Sweep time(s) = 20	Delta : 2467.971944MHz : -1.255dBm	99% OBW(T2-T1) = 15.551102MHz
RF Atten (dB) = 10	T1 : 2454.264529MHz : -11.777dBm	
Span = 40.00MHz	T2 : 2469.735471MHz : -12.115dBm	

7.1.2 6 dB and 99% Bandwidth Results: 802.11g

Test Conditions:	15.247 (a)(2)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11 g		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	100	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	5.2	dBi
Applied Voltage:	48.00	Vdc			
Notes 1:					
Notes 2:					

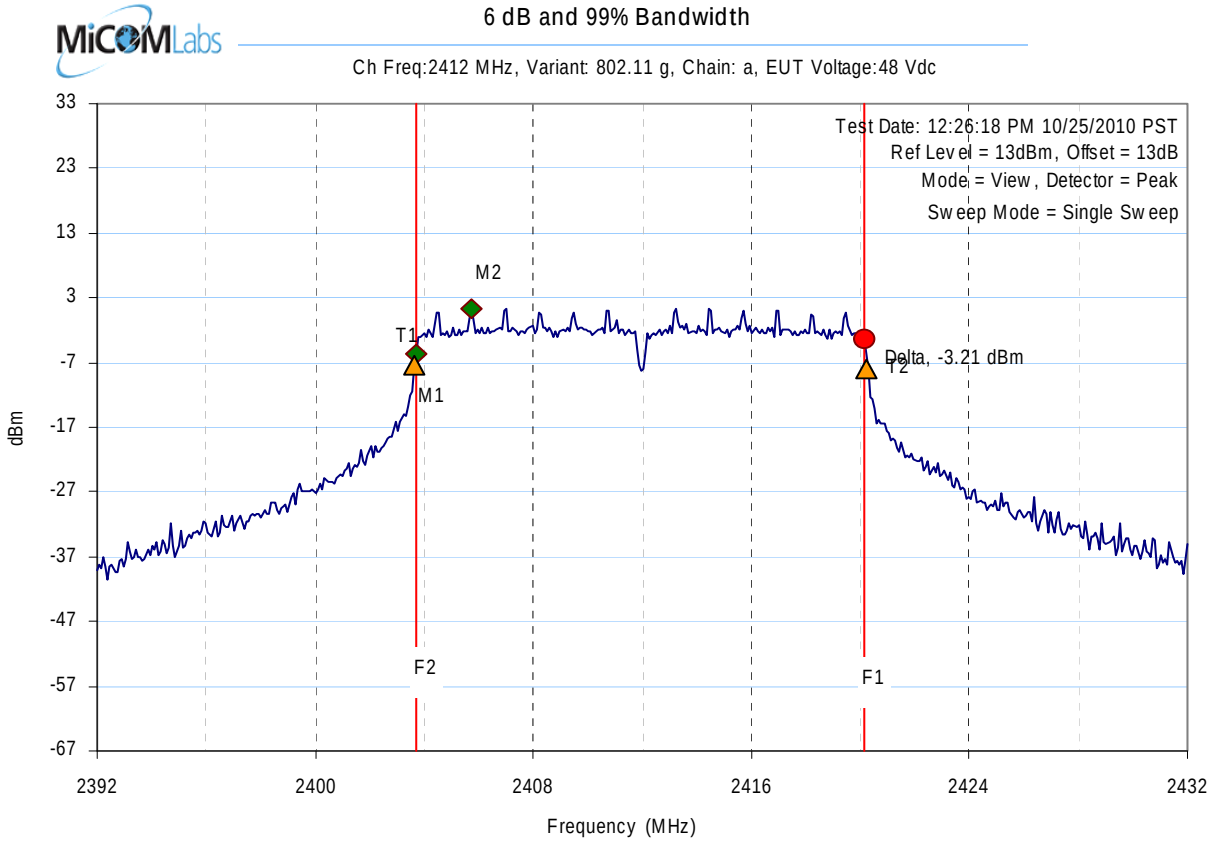
6 dB Bandwidth

Test Frequency	6 dB Bandwidth MHz				Minimum 6dB Bandwidth Limit		Margin
MHz	a	b	c	d	kHz	MHz	MHz
2412.000	16.433000	--	--	--	500	0.5	-15.933000
2437.000	16.433000	--	--	--			-15.933000
2462.000	16.433000	--	--	--			-15.933000

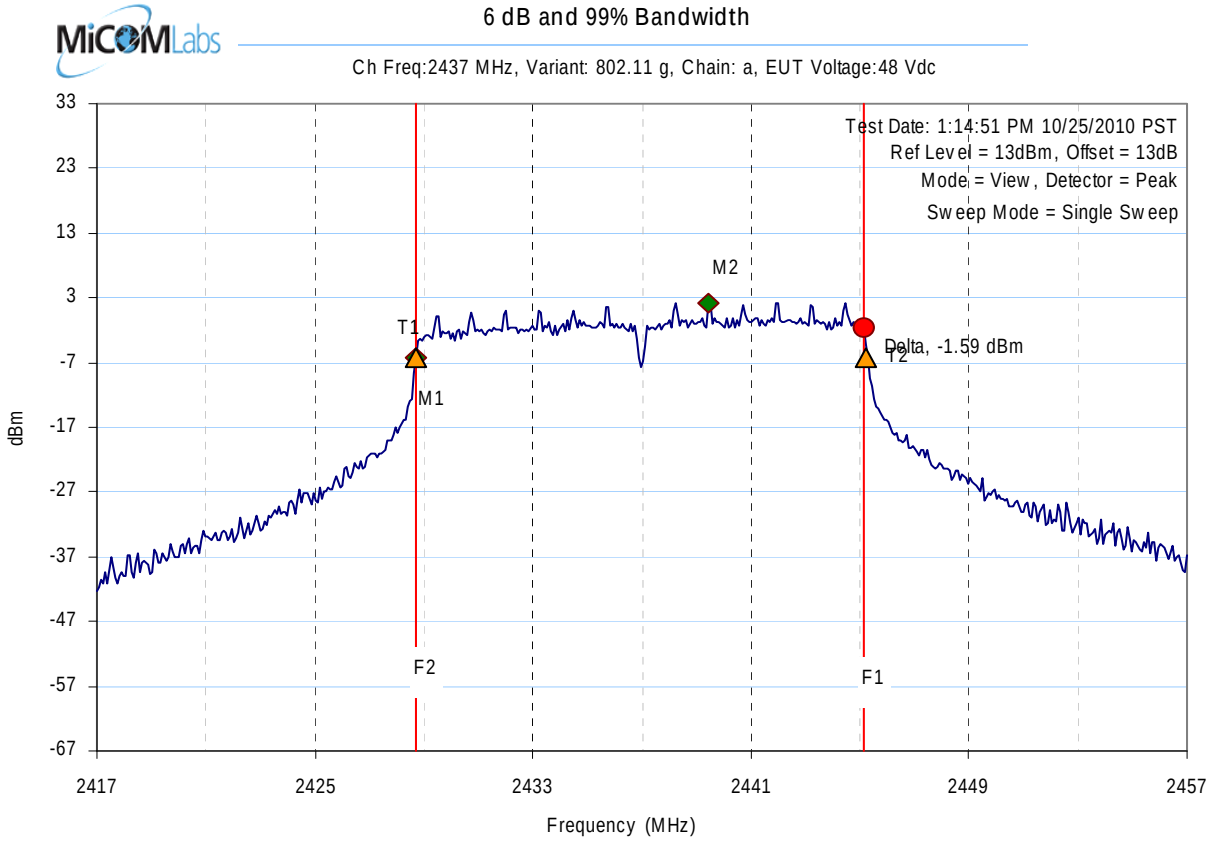
99% Bandwidth

Test Frequency	99 % Bandwidth MHz						
MHz	a	b	c	d			
2412.000	16.673000	--	--	--			
2437.000	16.593000	--	--	--			
2462.000	16.673000	--	--	--			

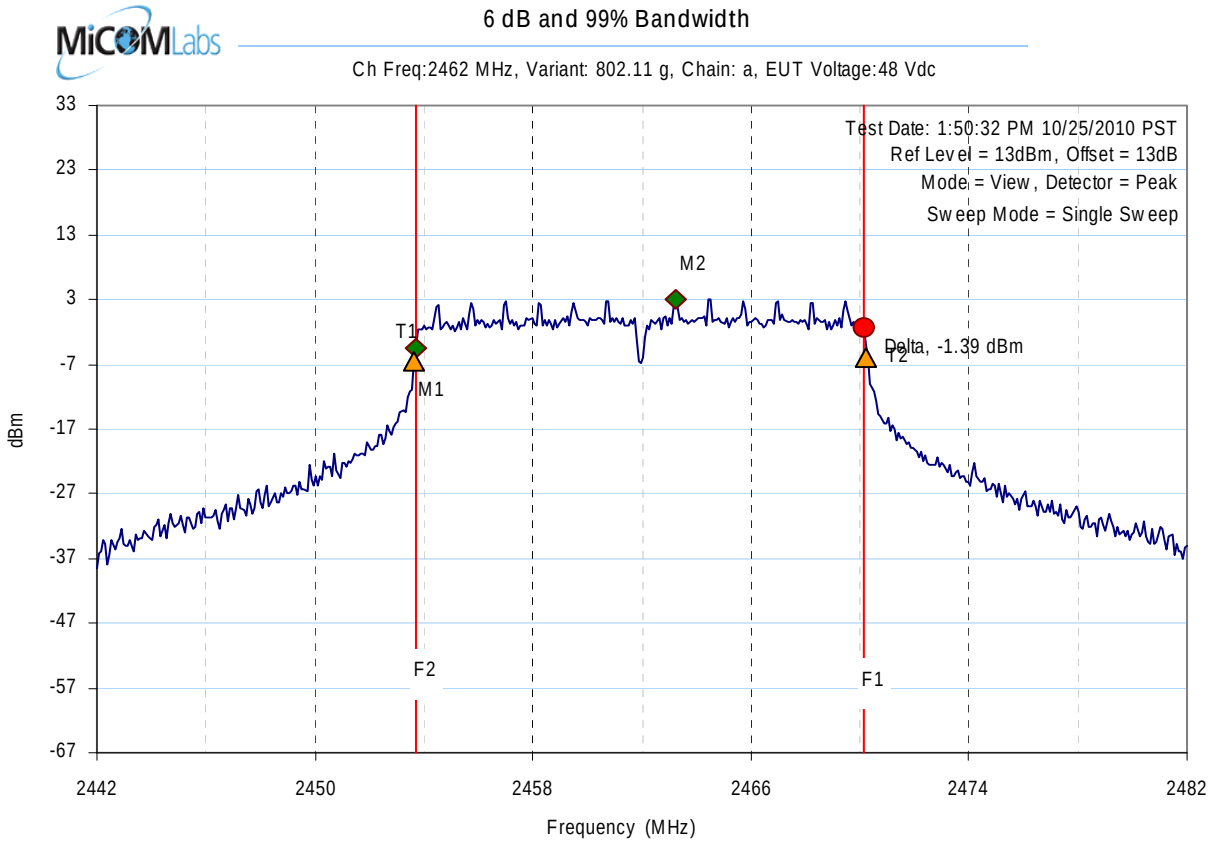
Measurement uncertainty:	±2.81 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2403.703407MHz : -5.670dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 2405.707415MHz : 1.332dBm	6dB BW(Delta-M1) = 16.432866MHz
Sweep time(s) = 20	Delta : 2420.136273MHz : -3.207dBm	99% OBW(T2-T1) = 16.673347MHz
RF Atten (dB) = 10	T1 : 2403.623246MHz : -7.407dBm	
Span = 40.00MHz	T2 : 2420.216433MHz : -7.921dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2428.703407MHz : -6.304dBm	Center frequency = 2437MHz
VBW = 300.00KHz	M2 : 2439.444890MHz : 2.282dBm	6dB BW(Delta-M1) = 16.432866MHz
Sweep time(s) = 20	Delta : 2445.136273MHz : -1.588dBm	99% OBW(T2-T1) = 16.593186MHz
RF Atten (dB) = 10	T1 : 2428.703407MHz : -6.304dBm	
Span = 40.00MHz	T2 : 2445.216433MHz : -6.148dBm	



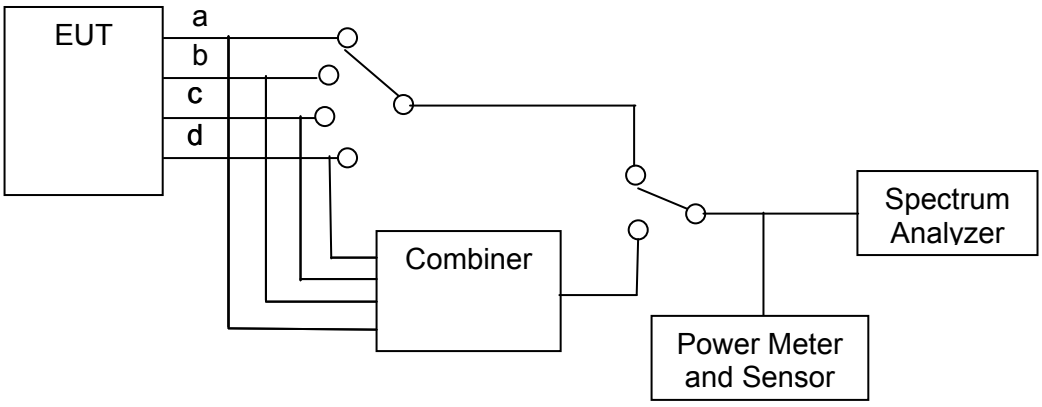
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2453.703407MHz : -4.484dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 2463.242485MHz : 3.100dBm	6dB BW(Delta-M1) = 16.432866MHz
Sweep time(s) = 20	Delta : 2470.136273MHz : -1.387dBm	99% OBW(T2-T1) = 16.673347MHz
RF Atten (dB) = 10	T1 : 2453.623246MHz : -6.406dBm	
Span = 40.00MHz	T2 : 2470.216433MHz : -6.093dBm	

7.2 Peak Output Power

Test Procedure
The test methodology and conditions utilized for each measurement is referenced in the test results matrix. The average output power was measured per the test configuration identified below.

Per the standard measurements were taken at ambient conditions, nominal voltage.

Test Configuration



Measurement set-up for Peak Output Power

Total Power = A + G + Y + 10 log (1/x) dBm

A = Total Power [10 Log_{10} ($10^{a/10}$ + $10^{b/10}$ +$10^{c/10}$ + $10^{d/10}$)], G = Antenna Gain,
Y = Beam Forming Gain, x = Duty Cycle

Specification

Limits

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands: 1.0 watt.

15.247 (b) (4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

15.247 (c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

§15.31 (e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

§ RSS-210 A8.4(4) For systems employing digital modulation techniques operating in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands the maximum peak conducted power shall not exceed 1 watt.

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0252, 0313, 0314, 0223, 0116, 0117, 0287, 0363

7.2.1 Measurement Results: 802.11 b

Test Conditions:	15.247 (b)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11 b		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	100	
Beam Forming Gain	N/A	dB	**Antenna Gain:**	5.2	dBi
Applied Voltage:	48.00	Vdc			
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
2412	13.06	--	--	--	13.06	--	30.00	-16.94
2437	12.24	--	--	--	12.24	--	30.00	-17.76
2462	13.08	--	--	--	13.08	--	30.00	-16.92

Measurement uncertainty:	±1.33 dB

7.2.2 Measurement Results: 802.11 g

Test Conditions:	15.247 (b)		**Rel. Humidity (%):**	35	to	42
Variant:	802.11 g		**Ambient Temp. (ºC):**	19	to	22
TPC:	HIGH		**Pressure (mBars):**	998	to	1003
Modulation:	ON		**Duty Cycle (%):**	100		
Beam Forming	N/A	dB	**Antenna Gain:**	5.2	dBi	
Applied Voltage:	48.00	Vdc				
Notes 1:						
Notes 2:						

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
2412	11.43	--	--	--	11.43	--	30.00	-18.57
2437	12.15	--	--	--	12.15	--	30.00	-17.85
2462	12.77	--	--	--	12.77	--	30.00	-17.23

Measurement uncertainty:	±1.33 dB

7.3 Peak Power Spectral Density

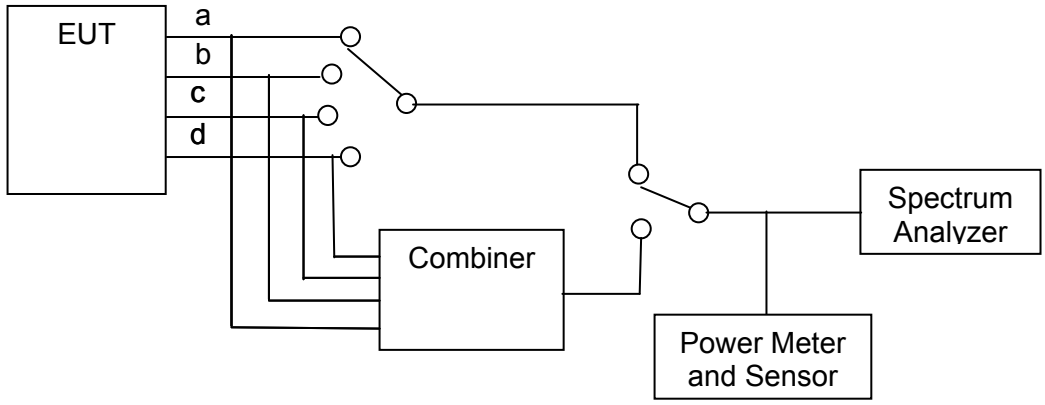
Test Procedure

The test methodology and conditions utilized for each measurement is referenced in the following test results matrix. RF output power, transmit power control and power density were measured per the Test Configuration identified below.

Testing was performed on the highest and lowest power settings of the equipment.

Per the standard measurements were taken at ambient and extreme temperature conditions at nominal and extreme voltage levels.

Test Configuration



Measurement set-up for Peak Power Spectral Density

Specification

Peak Power Spectral Density Limits

§15.247 (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission

RSS-210 §**A8.2(2)** The transmitter power spectral density (into the antenna) shall not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0 second duration.

Traceability

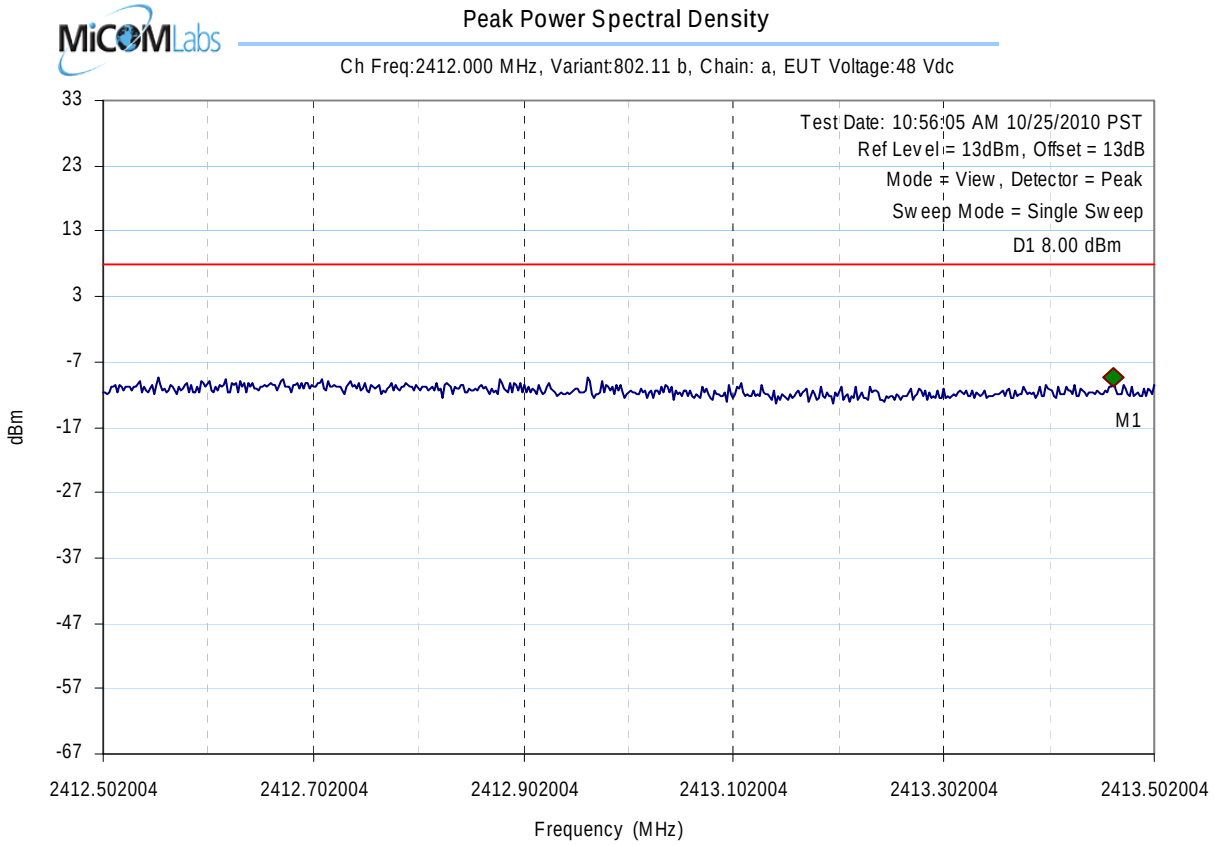
Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0252, 0313, 0314, 0223, 0116, 0117, 0287, 0363

7.3.1 Measurement results for 802.11 b

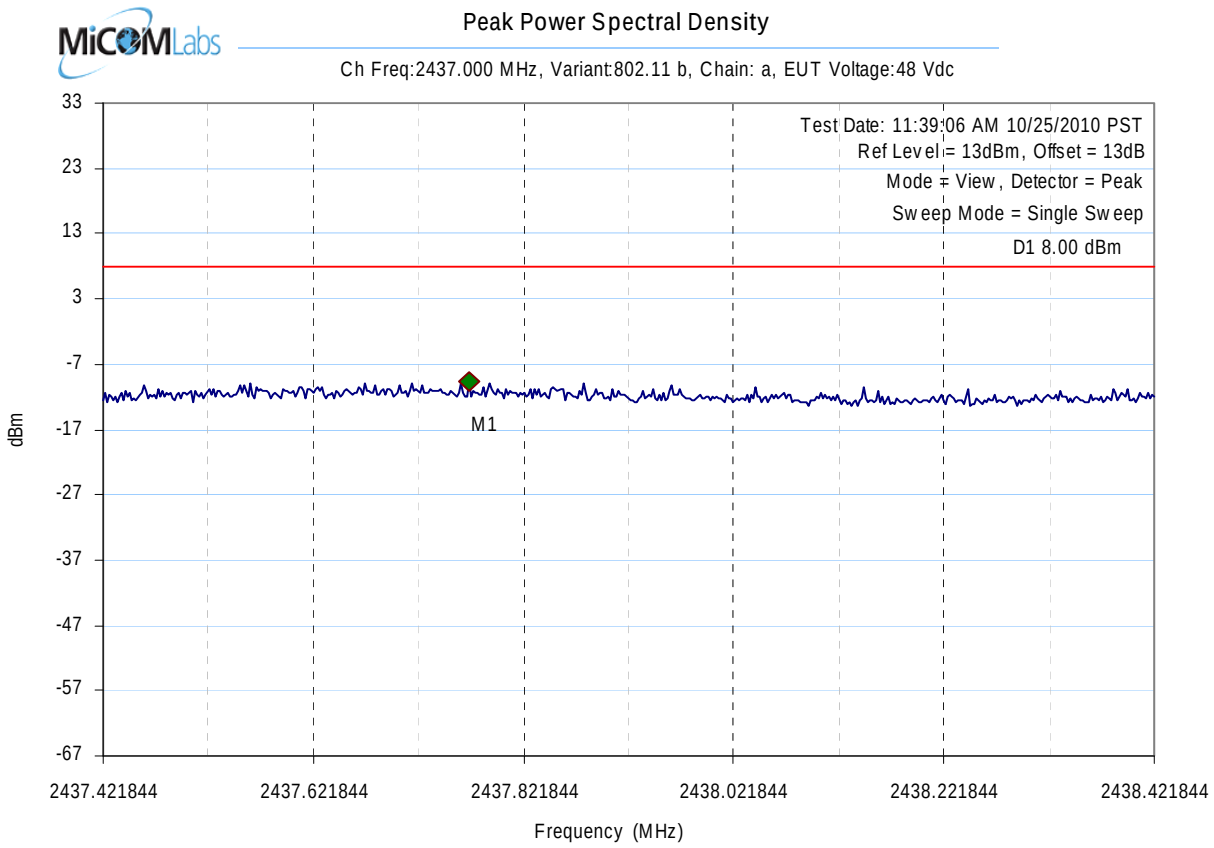
Test Conditions:	15.247 (e)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11 b		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	100	
Beam Forming	N/A	dB	**Antenna Gain:**	5.2	dBi
Applied Voltage:	48.00	Vdc			
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density RF Port (dBm)				Total Peak Power Spectral Density (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
2412.000	-9.22	--	--	--	-9.22	--	8.00	-17.22
2437.000	-9.69	--	--	--	-9.69	--	8.00	-17.69
2462.000	-8.65	--	--	--	-8.65	--	8.00	-16.65

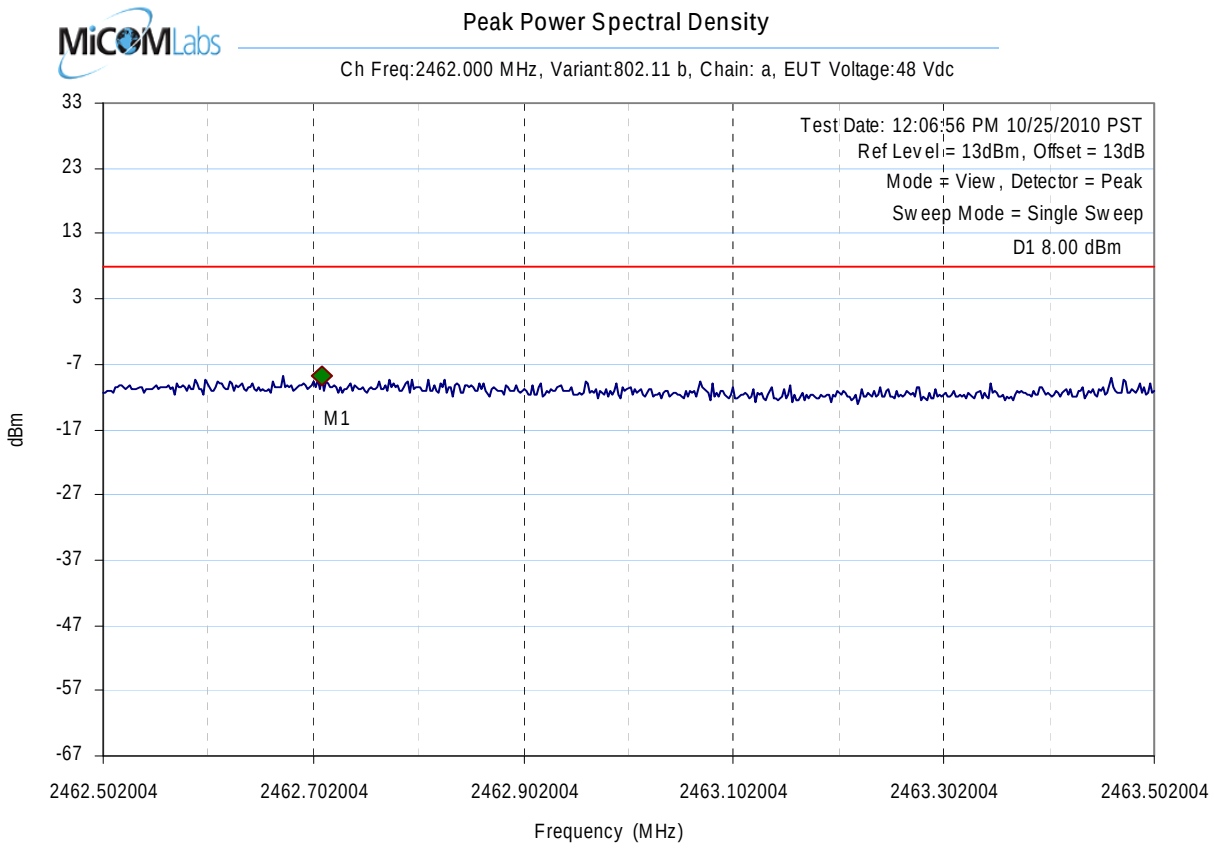
Measurement uncertainty:	± 1.33 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2413.463928MHz : -9.223dBm	Center frequency = 2412MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2437.770541MHz : -9.688dBm	Center frequency = 2437MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		



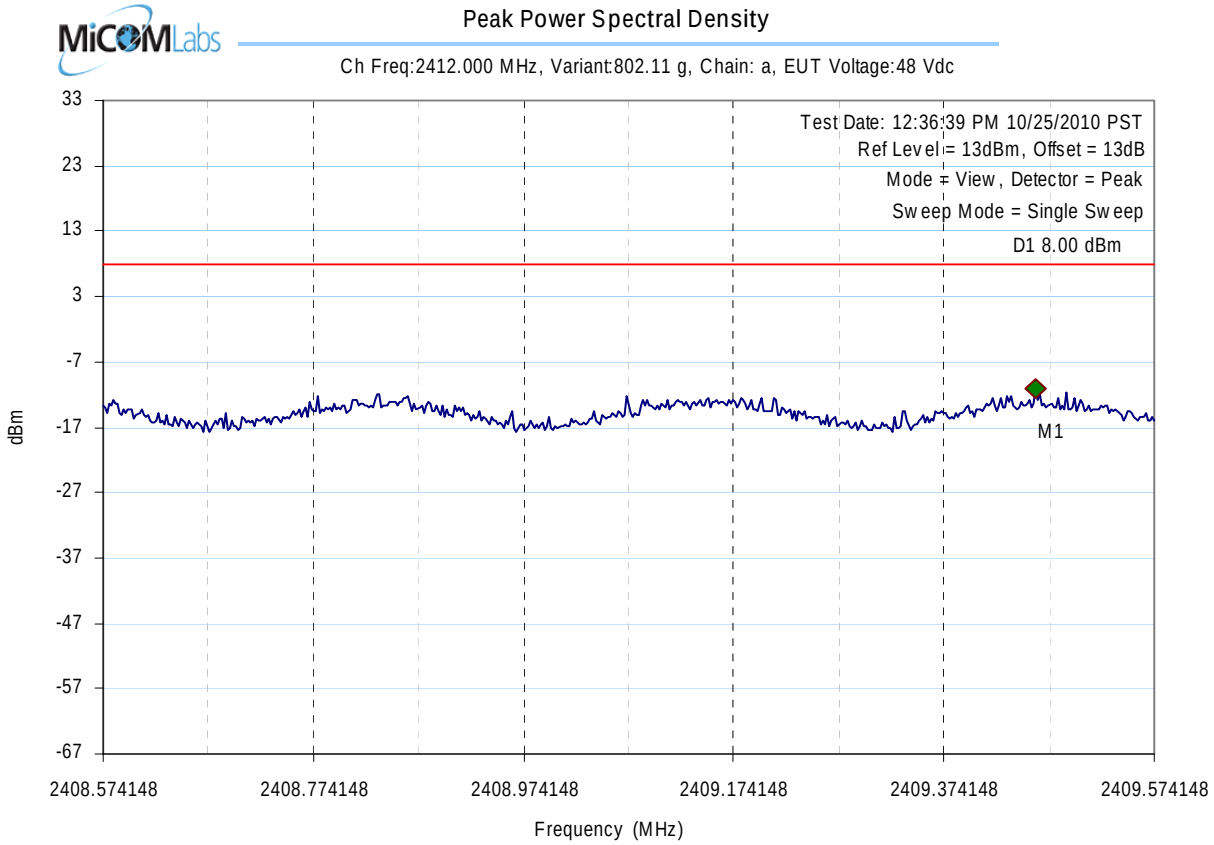
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2462.710421MHz : -8.649dBm	Center frequency = 2462MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		

7.3.2 Measurement results for 802.11 g

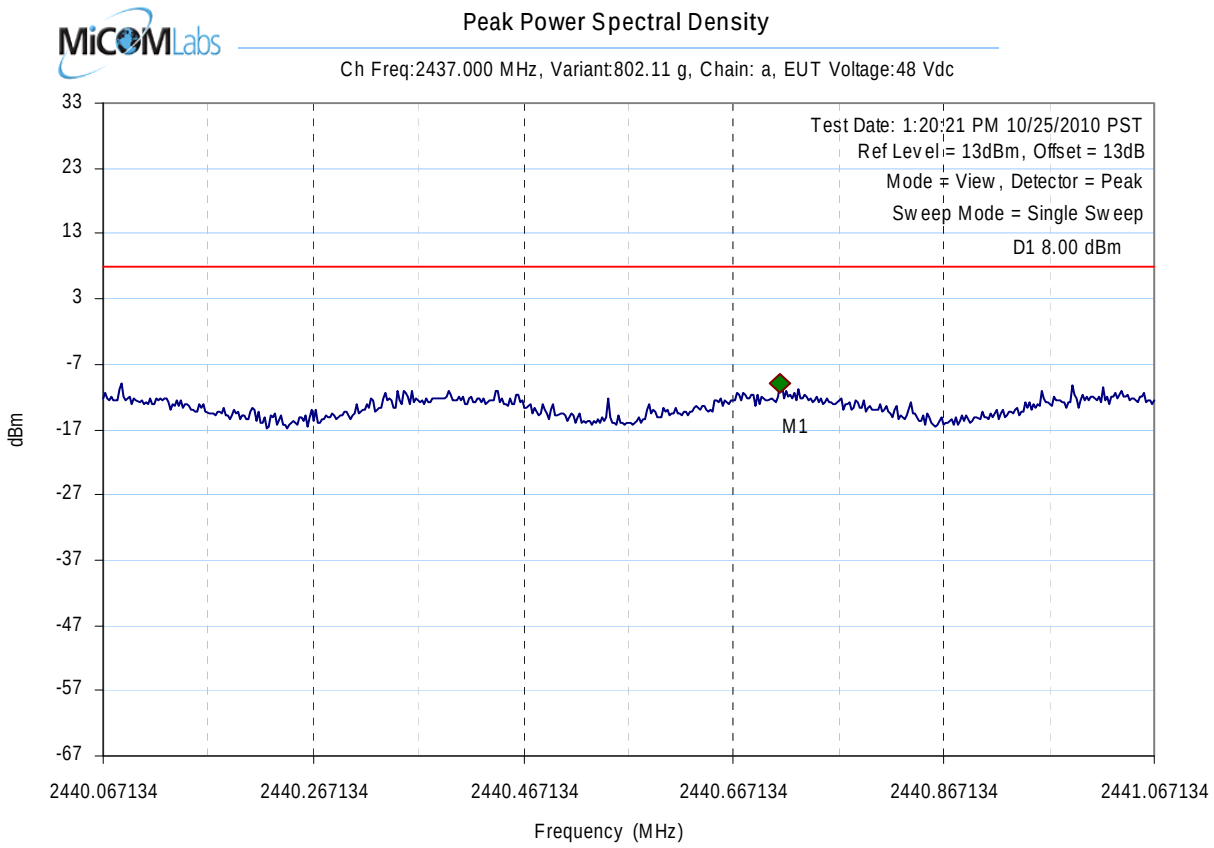
Test Conditions:	15.247 (e)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11 g	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	100
Beam Forming	N/A dB	**Antenna Gain:**	5.2 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

Test Frequency	Measured Power Density RF Port (dBm)				Total Peak Power Spectral Density (dBm)		Limit	Margin
MHz	a	b	c	d	Combined	Calculated	dBm	dB
2412.000	-11.19	--	--	--	-11.19	--	8.00	-19.19
2437.000	-9.80	--	--	--	-9.80	--	8.00	-17.80
2462.000	-9.28	--	--	--	-9.28	--	8.00	-17.28

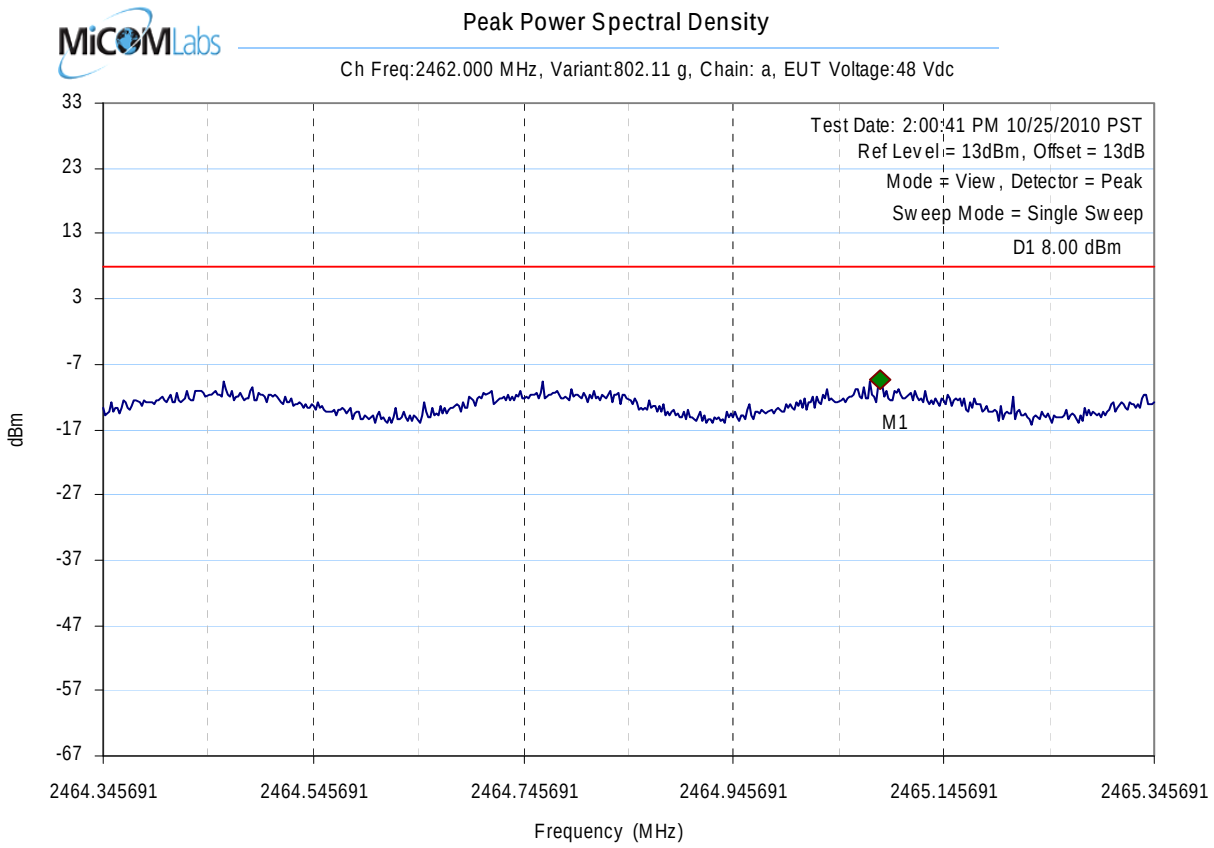
Measurement uncertainty:	± 1.33 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2409.461924MHz : -11.189dBm	Center frequency = 2412MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2440.710421MHz : -9.800dBm	Center frequency = 2437MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2465.085170MHz : -9.284dBm	Center frequency = 2462MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		

7.4 Maximum Permissible Exposure

FCC, Part 15 Subpart C §15.407(f)
Industry Canada RSS-Gen §5.5

Calculations for Maximum Permissible Exposure Levels

Power Density = Pd (mW/cm2) = EIRP/(4πd2)
EIRP = P * G
P = Peak output power (mW)
G = Antenna numeric gain (numeric)
d = Separation distance (cm)
Numeric Gain = 10 ^ (G (dBi)/10)

The peak power in the table below is calculated by assuming a worst case scenario where all of the EUT transmitters are operating simultaneously in the same band. The Peak Power in mW is the highest transmitter power measured and summed across all transmitters.

Because the EUT belongs to the General Population/Uncontrolled Exposure the limit of power density is 1.0 mW/cm2

Freq. Band (MHz)	Antenna Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance @ 1mW/cm^2 Limit(cm)	Minimum Separation Distance (cm)
2400 – 2500	13.5	22.39	13.24	21.09	6.2	20.00

*Note: for mobile or fixed location transmitters the minimum separation distance is 20cm, even if calculations indicate the MPE distance to be less.

Specification

Maximum Permissible Exposure Limits

§15.247(i) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency levels in excess of the Commission's guidelines.

FCC §1.1310 Limit = 1mW / cm2 from 1.310 Table 1

RSS-Gen §5.5 Before equipment certification is granted, the application requirements of RSS-102 shall be met.

Laboratory Measurement Uncertainty for Power Measurements

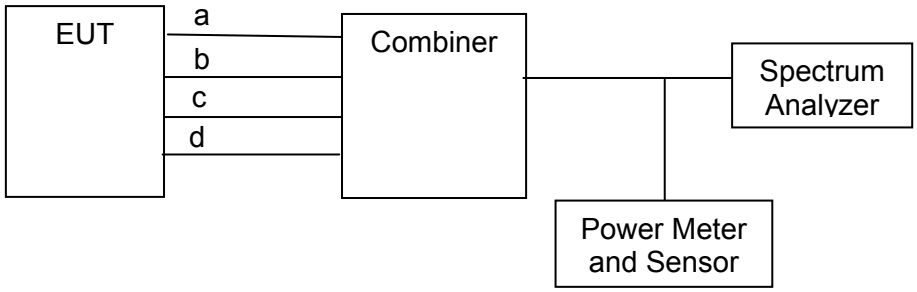
Measurement uncertainty	±1.33 dB

7.5 Conducted Spurious

Test Procedure
Conducted emissions were measured at a limit of 20 dB below the highest in-band spectral density measured with a spectrum analyzer connected to the antenna terminal. Emissions at the band edge were measured and recorded. Measurements were made while EUT was operating in transmit mode of operation at the appropriate center frequency.

Measurements were made using a combiner with the transmitter tuned to the channel closest to the band-edge being measured. All emissions were maximized during measurement. Limits which were derived from the peak emission.

Test Measurement Set up



Conducted Spurious Emission measurement test configuration

Specification

Limits Band-Edge

Lower Limit Band-edge	Upper Limit Band-edge	Limit below highest level of desired power
2,400 MHz	2,483.5 MHz	≥ 20 dB
5725 MHz	5850 MHz	

§15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

§15.247(d)
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section §15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(a)).

RSS-210 §A8.5 If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

RSS-Gen §4.7
The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate of carrier frequency), or from 30 MHz , whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0158, 0252, 0313, 0314, 0223, 0116, 0117, 0287, 0363.

7.5.1 Measurement Results for 802.11 b

Test Conditions:	15.247 (a)(2)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11 b		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	100	
Beam Forming Gain	N/A	dB	**Antenna Gain:**	N/A	dBi
Applied Voltage:	48.00	Vdc			
Notes 1:					
Notes 2:					

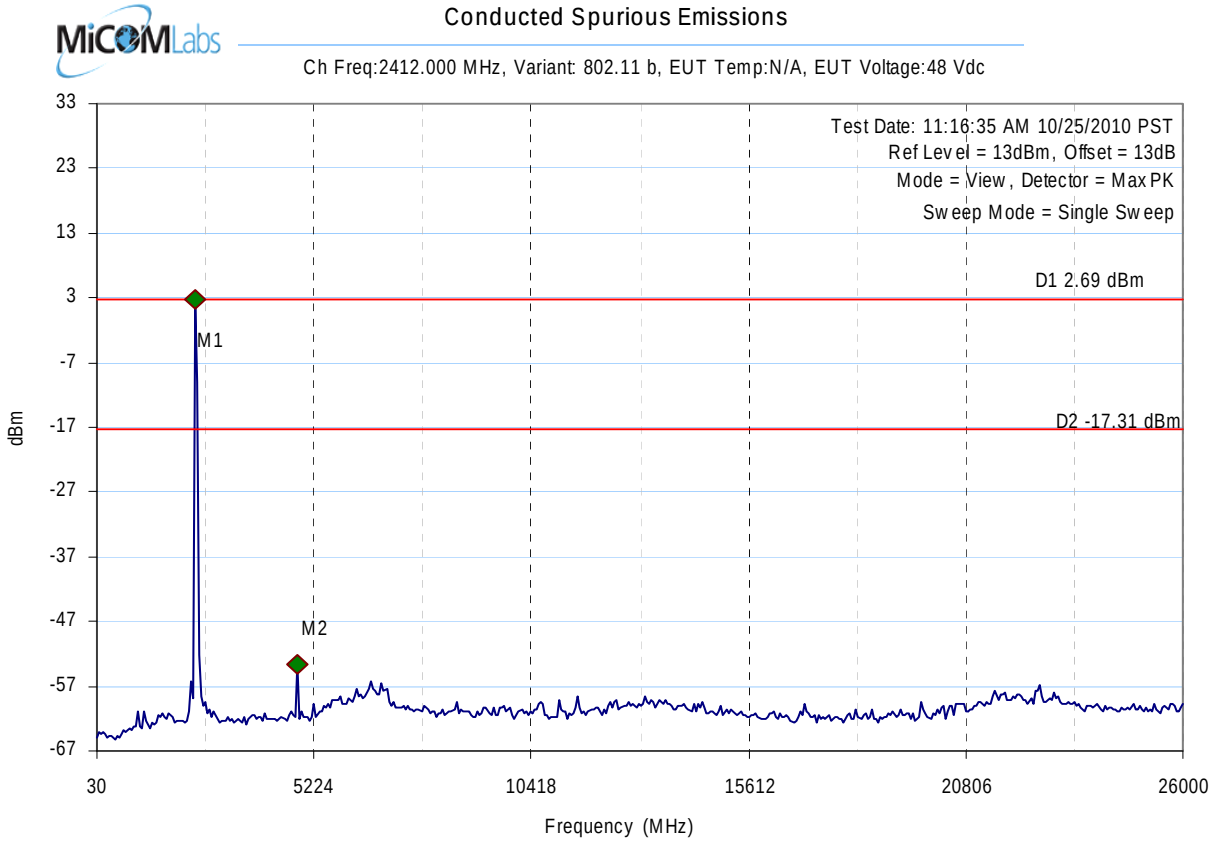
Conducted Spurious Measurment

Test Frequency	Start Frequency	Stop Frequency	Maximum Observed Emission	Limit (20 dB below peak of fundamental)
MHz	MHz	MHz	dBm	dBm
2412.000	30.00	26000.00	-53.67	-17.31
2437.000	30.00	26000.00	-54.13	-18.13
2462.000	30.00	26000.00	-55.43	-17.67

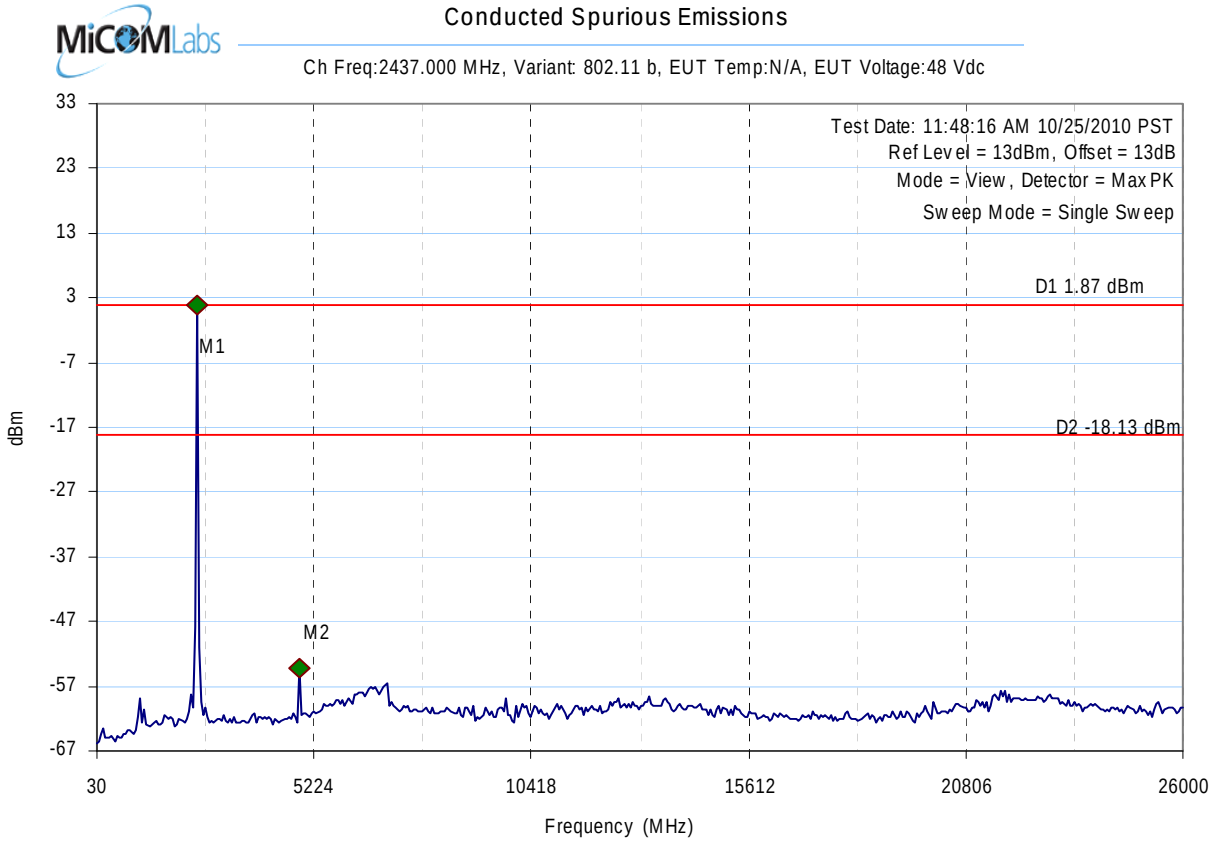
Band-edge Measurment

Test Frequency	Band-edge Frequency	Emission Amplitude @ Band-edge	Limit (20 dB below peak of fundamental)	Margin
MHz	MHz	dBm	dBm	dB
2412.000	2400.00	-37.81	-16.85	-20.96
2462.000	2483.50	-55.02	-16.37	-38.65

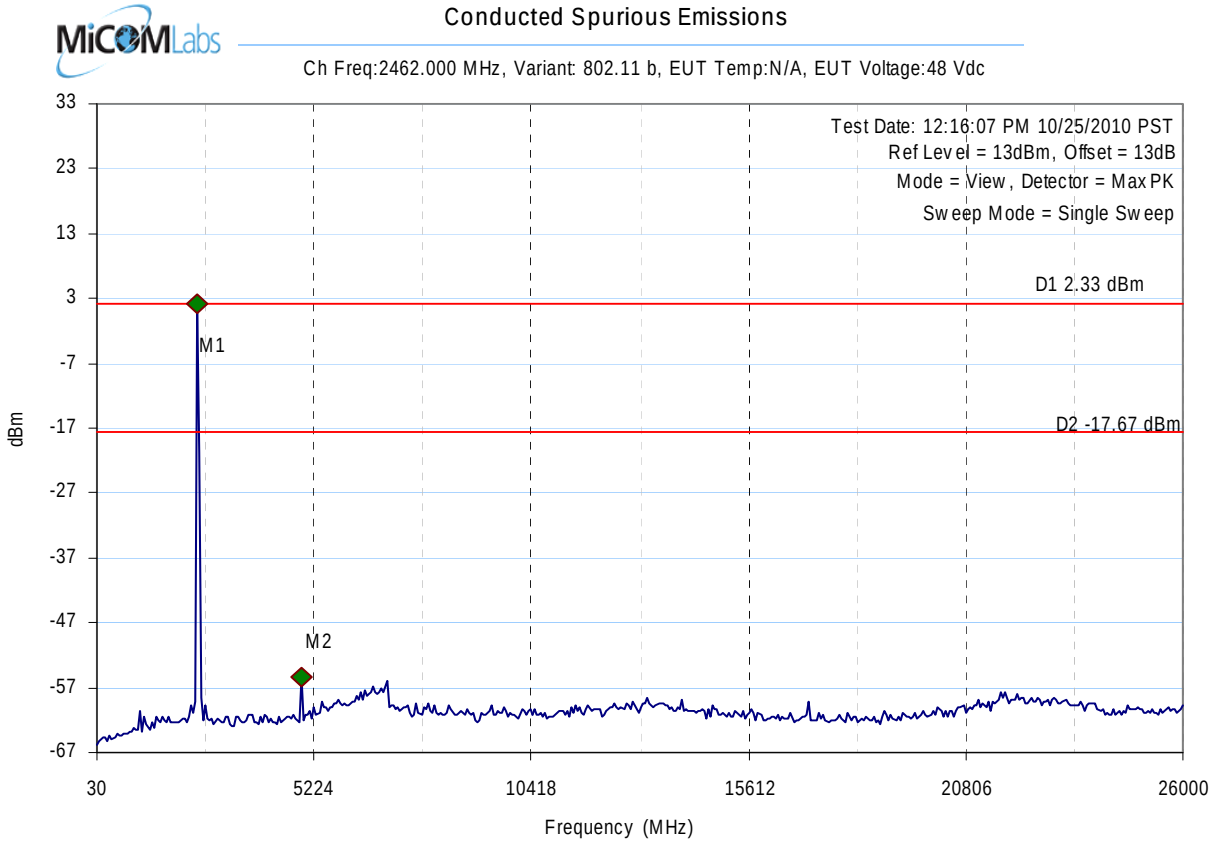
Measurement uncertainty:	±2.81 dB



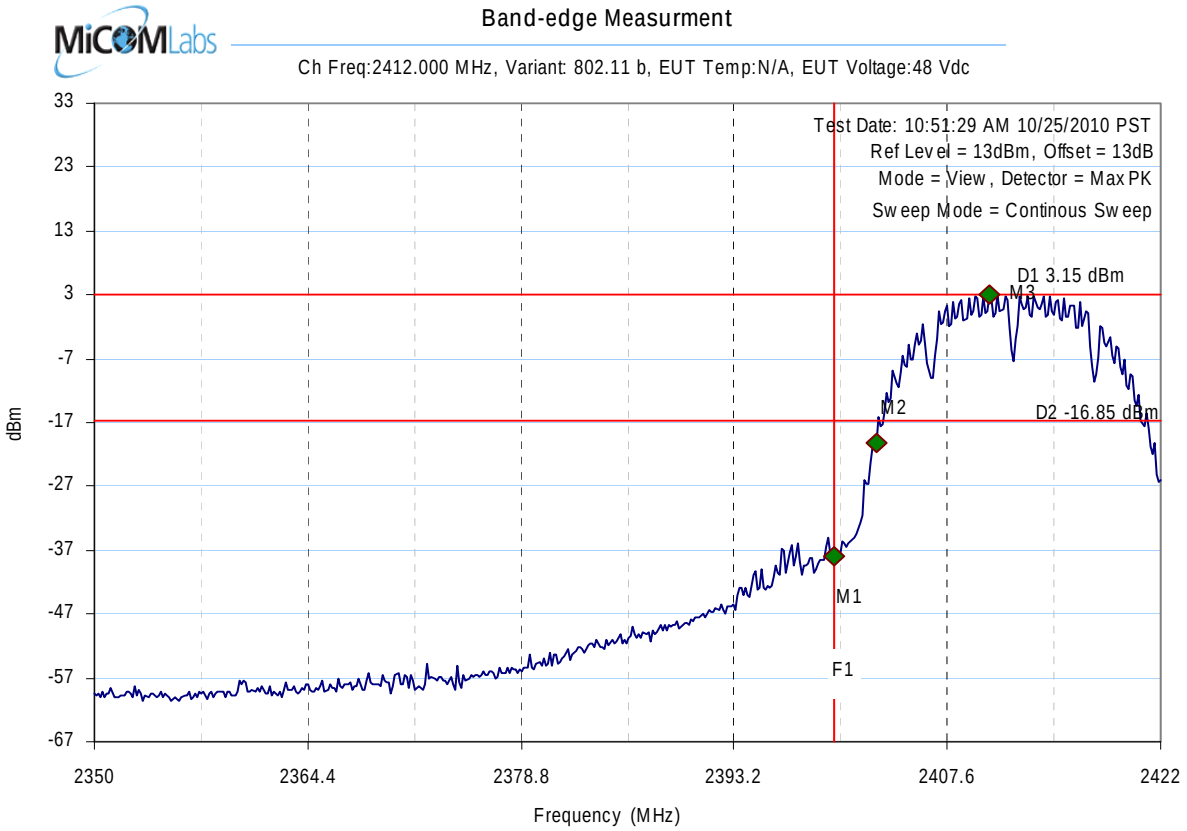
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2371.983968MHz : 2.689dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 4818.056112MHz : -53.666dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 25.97GHz		



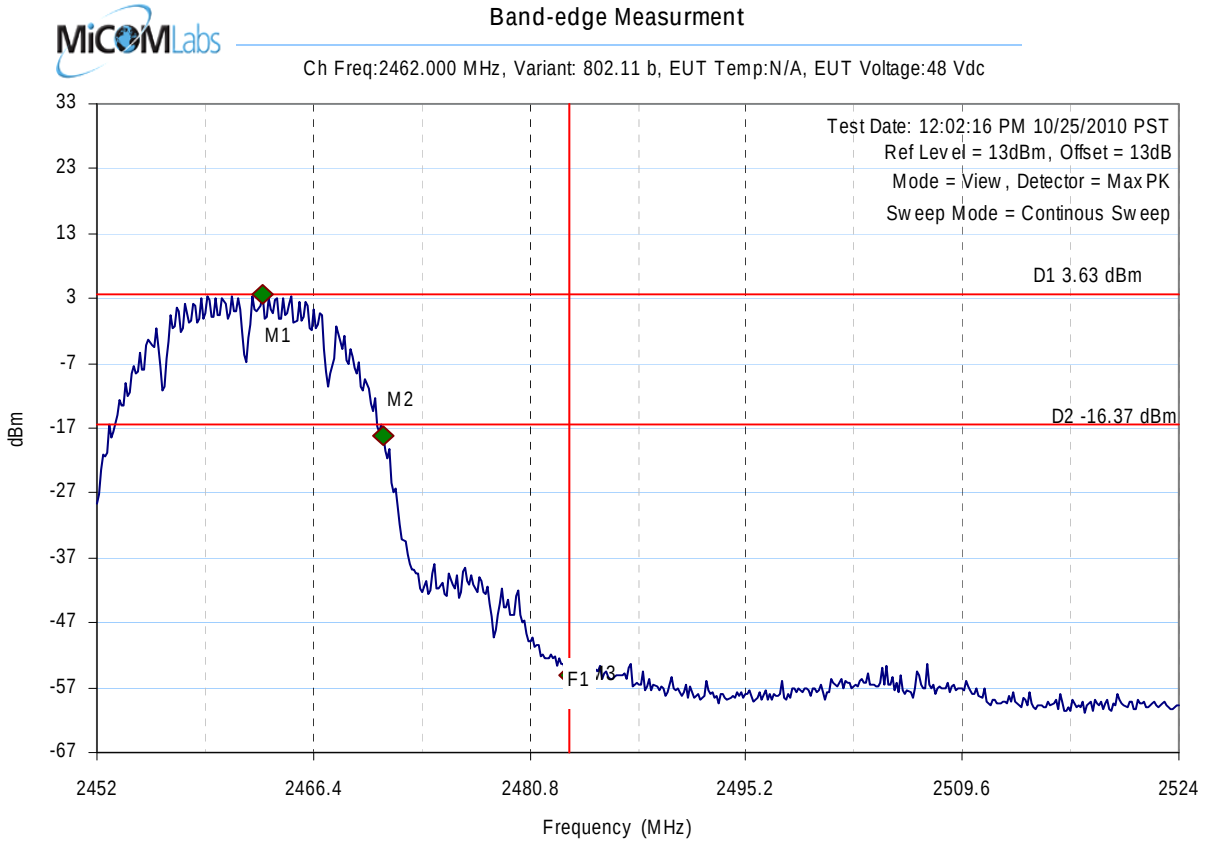
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2424.028056MHz : 1.871dBm	Center frequency = 2437MHz
VBW = 300.00KHz	M2 : 4870.100200MHz : -54.134dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 25.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2424.028056MHz : 2.331dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 4922.144289MHz : -55.434dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 25.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2400.000000MHz : -37.811dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 2402.809619MHz : -20.264dBm	
Sweep time(s) = 20	M3 : 2410.456914MHz : 3.151dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2462.965932MHz : 3.626dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 2471.046092MHz : -18.265dBm	
Sweep time(s) = 20	M3 : 2483.500000MHz : -55.023dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		

7.5.2 Measurement Results for 802.11 g

Test Conditions:	15.247 (a)(2)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11 g		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	100	
Beam Forming	N/A	dB	**Antenna Gain:**	N/A	dBi
Applied Voltage:	48.00	Vdc			
Notes 1:					
Notes 2:					

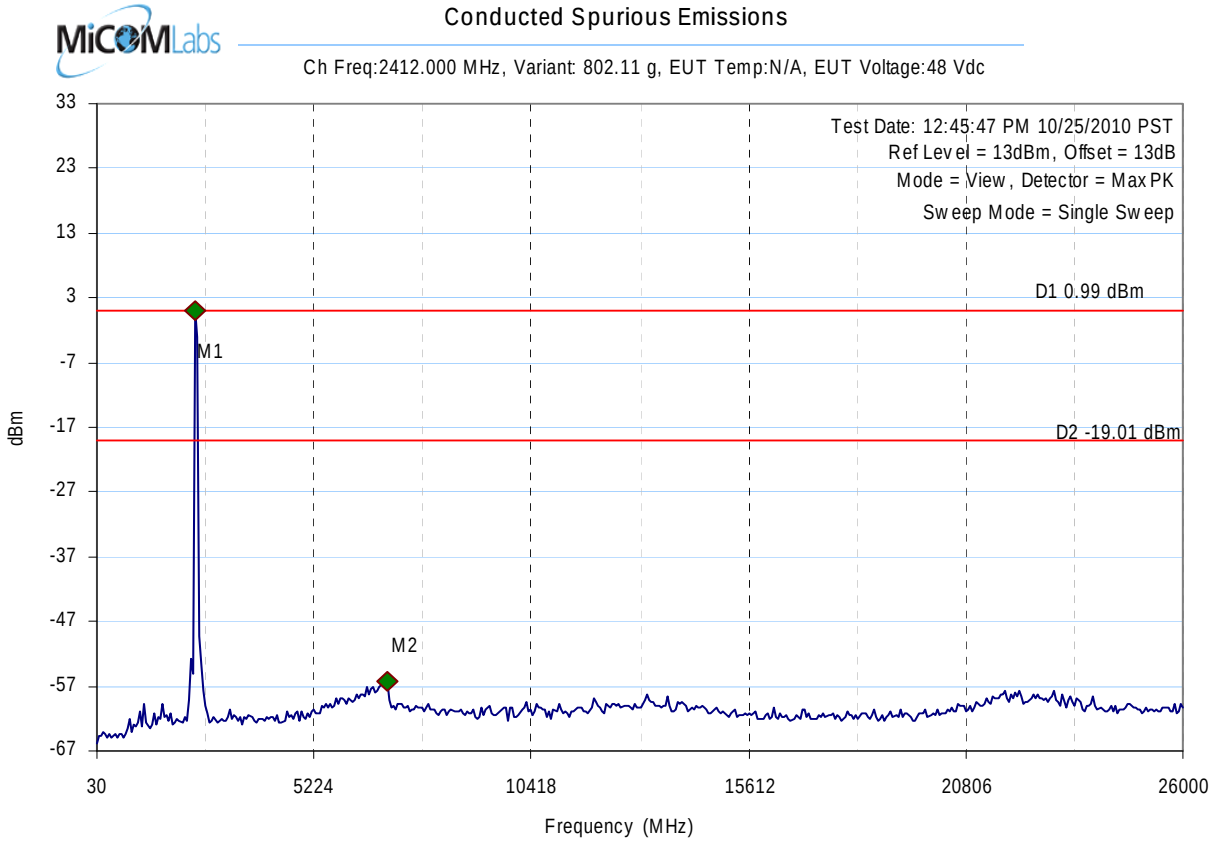
Conducted Spurious Measurment

Test Frequency	Start Frequency	Stop Frequency	Maximum Observed Emission	Limit (20 dB below peak of fundamental)
MHz	**MHz**	**MHz**	**dBm**	**dBm**
2412.000	30.00	26000.00	-56.26	-19.01
2437.000	30.00	26000.00	-56.75	-19.11
2462.000	30.00	26000.00	-55.99	-17.40

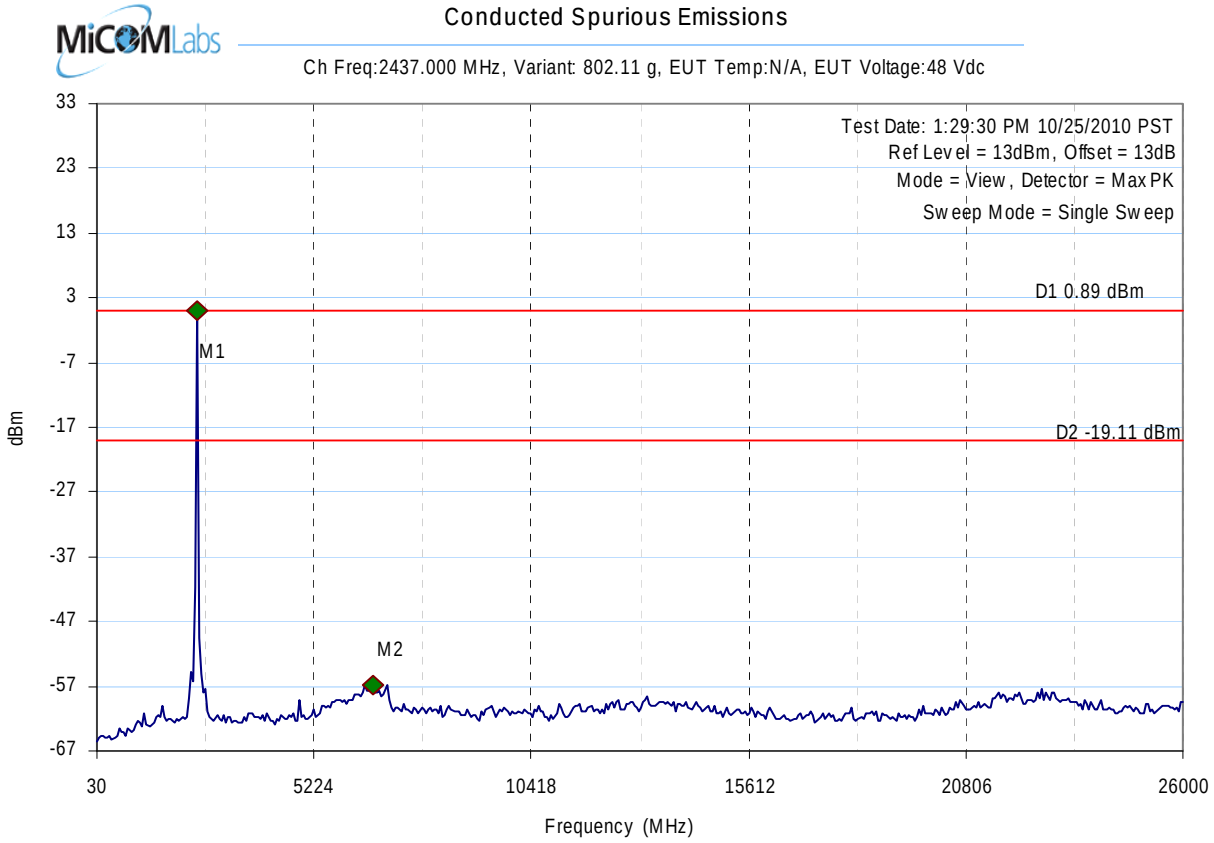
Band-edge Measurment

Test Frequency	Band-edge Frequency	Emission Amplitude @ Band-edge	Limit (20 dB below peak of fundamental)	Margin
MHz	**MHz**	**dBm**	**dBm**	**dB**
2412.000	2400.00	-27.22	-18.36	-8.87
2462.000	2483.50	-38.60	-17.04	-21.56

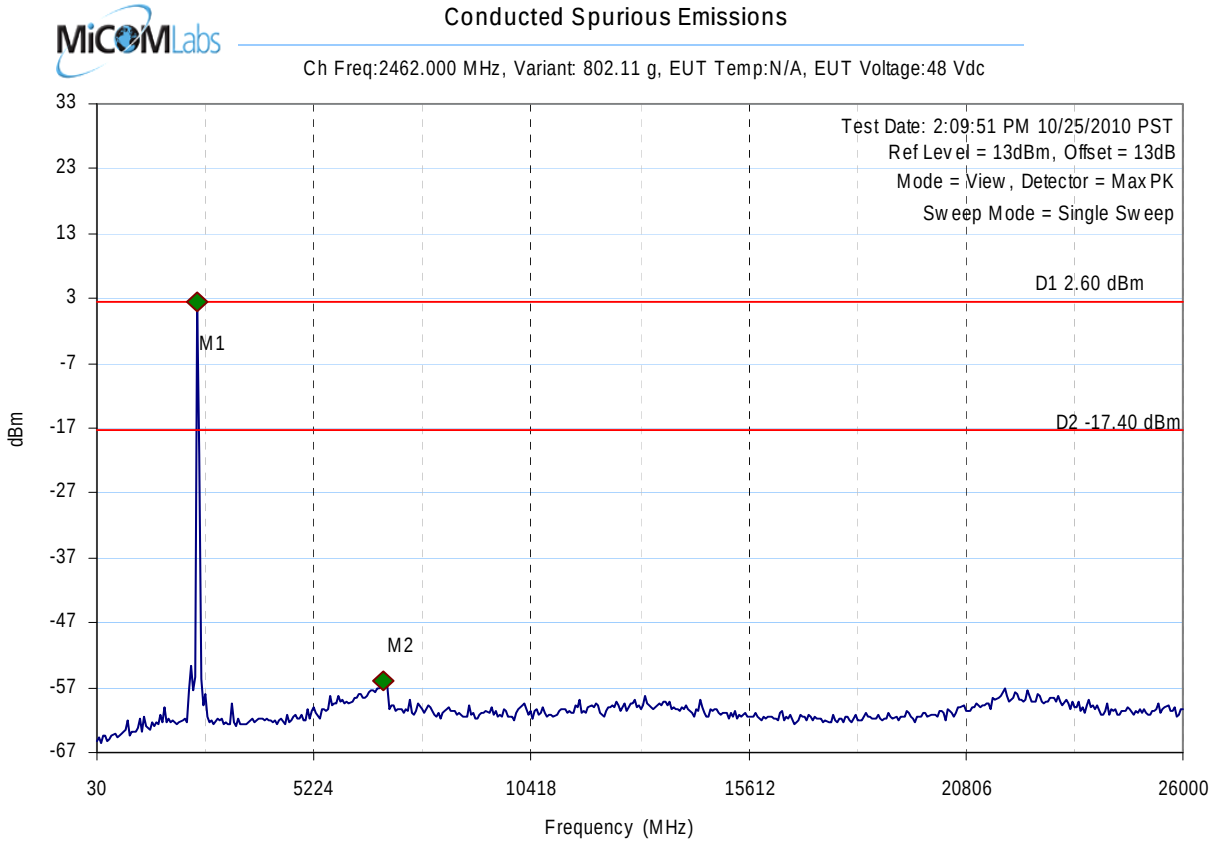
Measurement uncertainty:	±2.81 dB



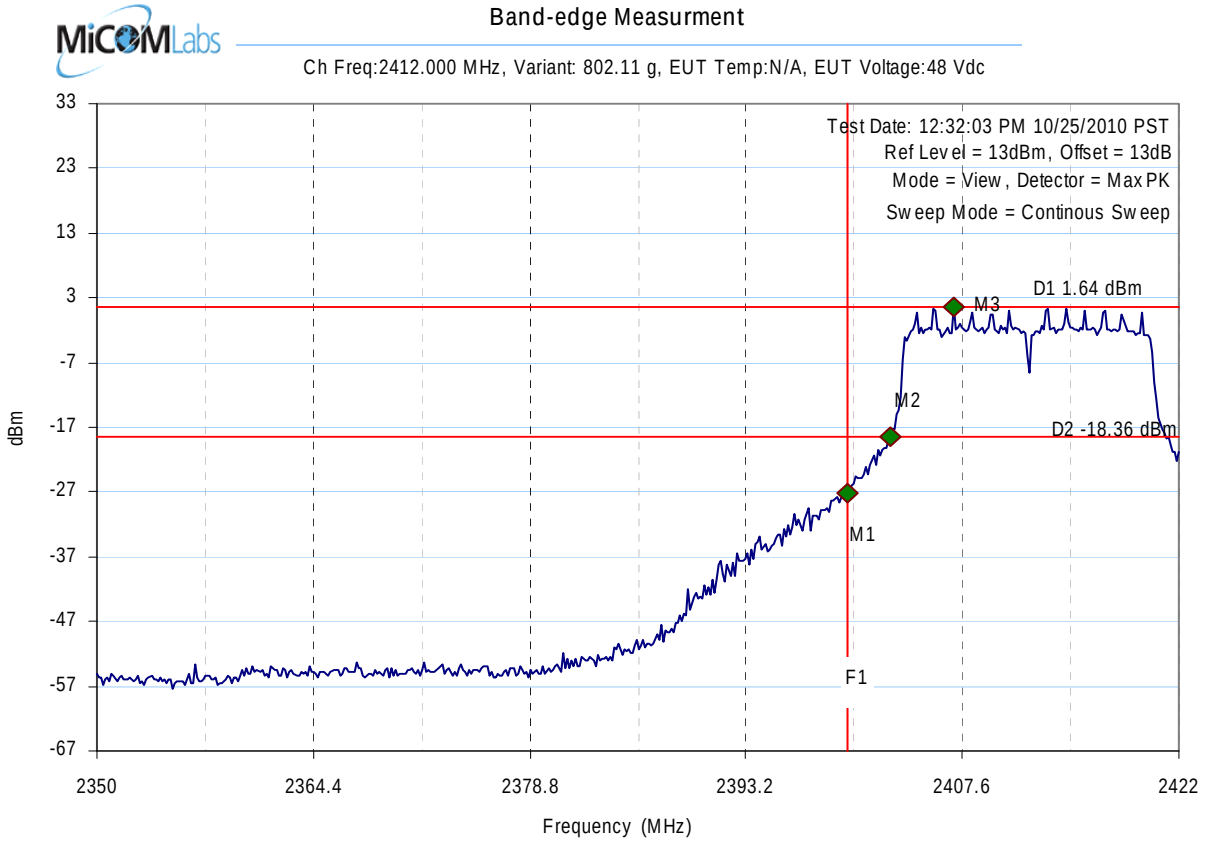
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2371.983968MHz : .991dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 6951.863727MHz : -56.263dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 25.97GHz		



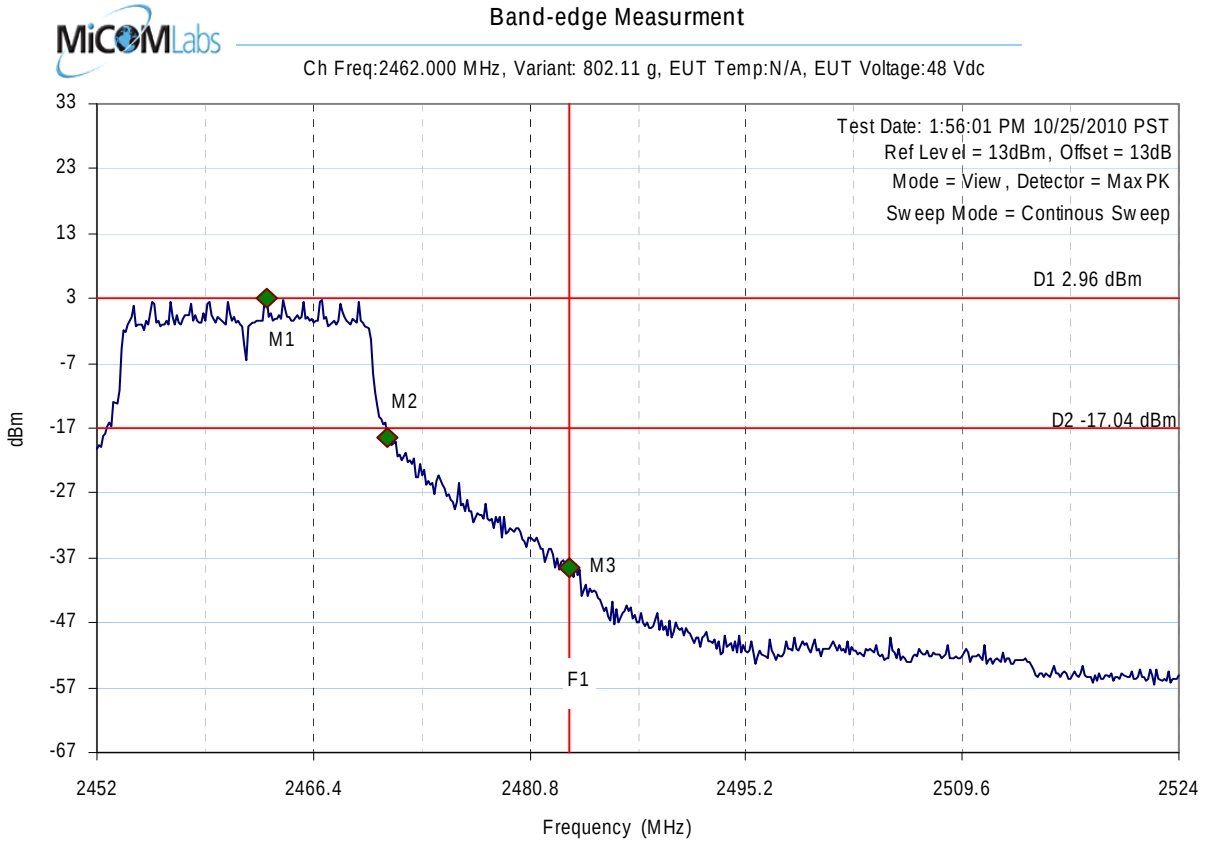
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2424.028056MHz : .891dBm	Center frequency = 2437MHz
VBW = 300.00KHz	M2 : 6639.599198MHz : -56.747dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 25.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2424.028056MHz : 2.601dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 6899.819639MHz : -55.993dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 25.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2400.000000MHz : -27.221dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 2402.809619MHz : -18.505dBm	
Sweep time(s) = 20	M3 : 2406.993988MHz : 1.644dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2463.254509MHz : 2.963dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 2471.334669MHz : -18.456dBm	
Sweep time(s) = 20	M3 : 2483.500000MHz : -38.596dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		

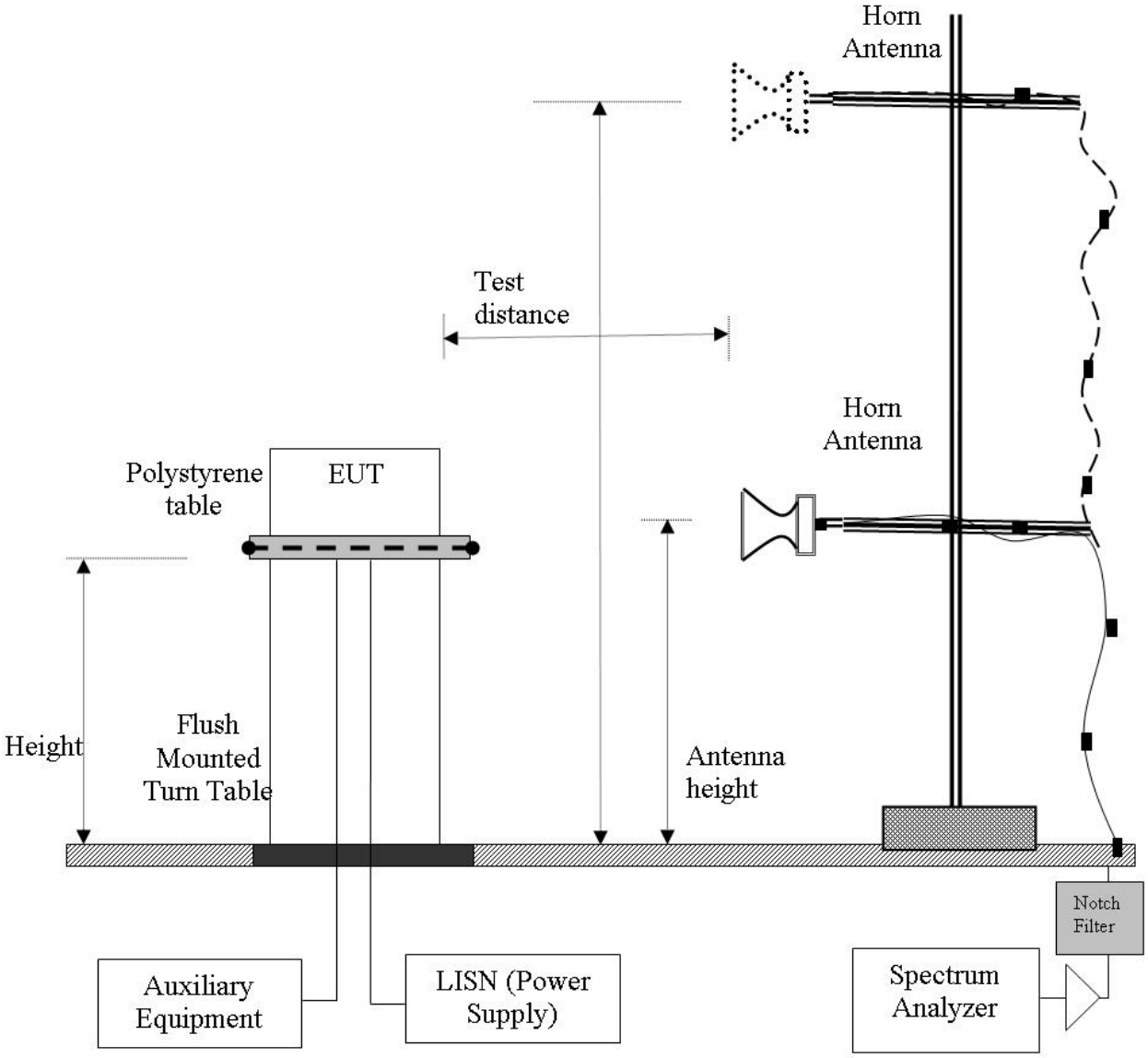
7.6 Radiated Spurious Emissions

Test Procedure

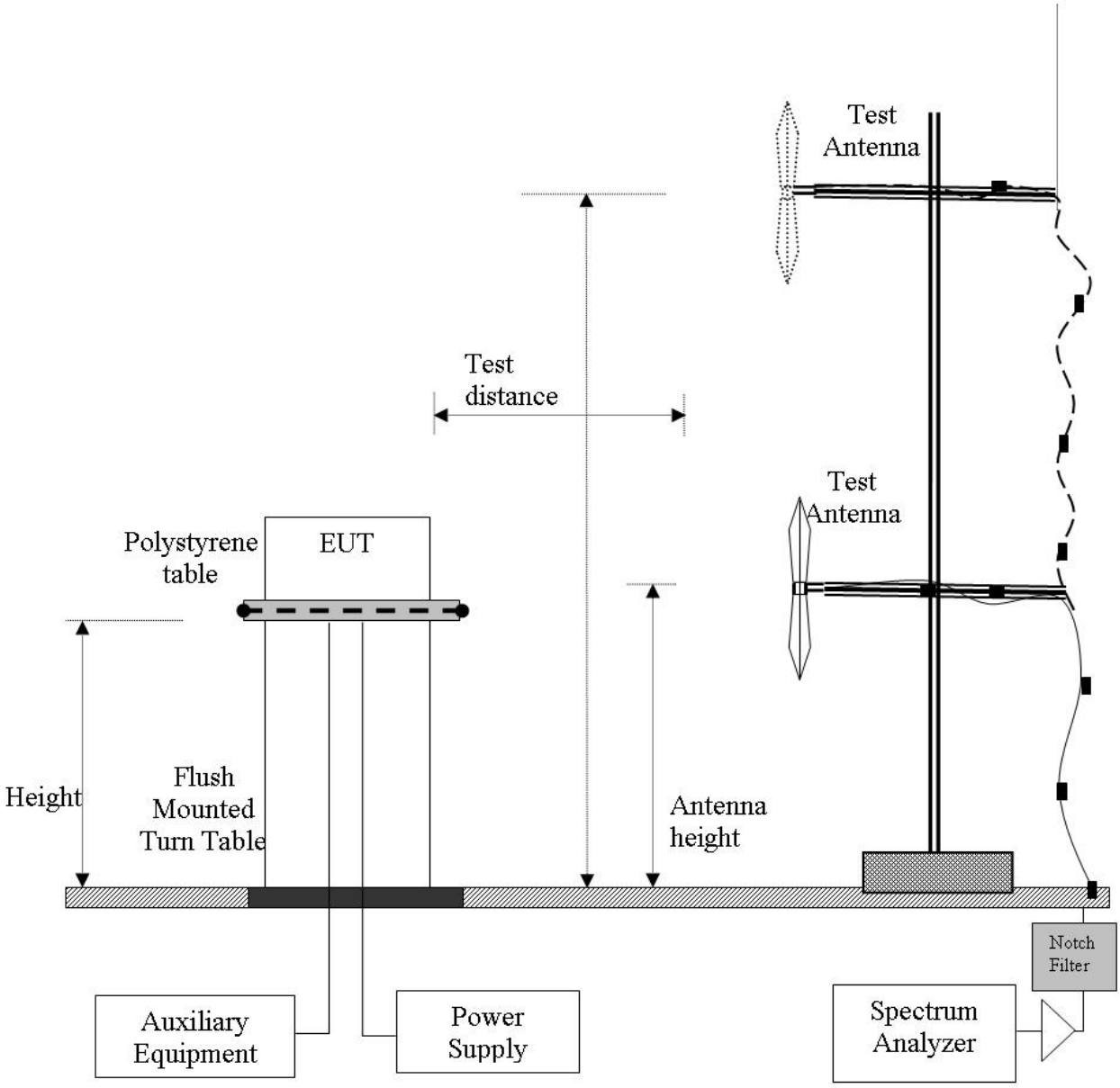
Testing was performed in a 3-meter anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR Compliant receiver. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed.

Radiated Emission Measurement Setup – Above 1 GHz



Radiated Emission Measurement Setup – Below 1 GHz



Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR – FO

FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Specification

FCC §15.247(d) and RSS-210 §A8.5 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

FCC §15.247(d)
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section §15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(a)).

IC RSS-210 §A8.5 If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

IC RSS-Gen §4.7
The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate of carrier frequency), or from 30 MHz , whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

FCC §15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

FCC §15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC §15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

Table 1: FCC 15.209 and RSS-Gen §6 Spurious Emissions Limits

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement Uncertainty	+5.6/ -4.5 dB

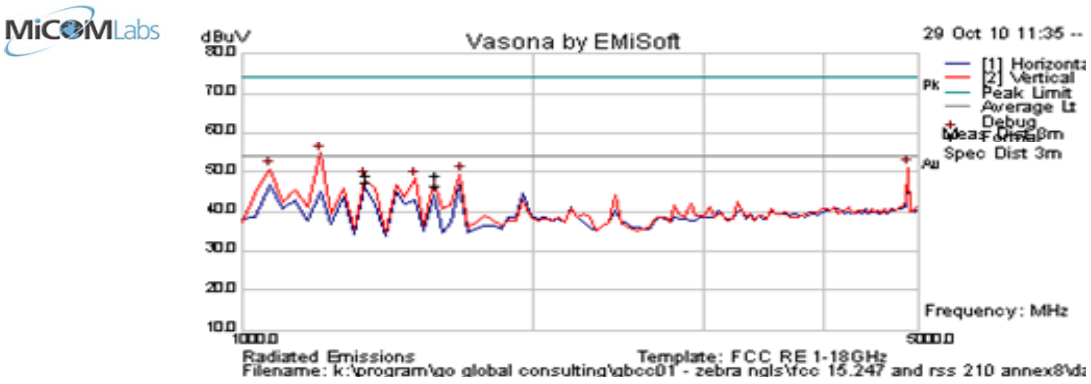
Traceability:

Method	Test Equipment Used
Work instruction WI-03	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

7.6.1 Measurement Results: Transmitter Radiated Spurious Emissions

Emissions profile from 1000 - 5000 MHz. These emissions were present from the device independent of the radio modulation, frequency of transmission, or antenna.

Test Freq.	2412 MHz	**Engineer**	SB
Variant	802.11b/g; 1/6 Mbs	**Temp (ºC)**	22
Freq. Range	1000 MHz - 5000 MHz	**Rel. Hum.(%)**	34
Power Setting	max pow er	**Press. (mBars)**	1005
Antenna	N/A - No Radio Emissions	**Duty Cycle (%)**	100
Test Notes 1	Ref Scan 1 to 5 GHz		
Test Notes 2			



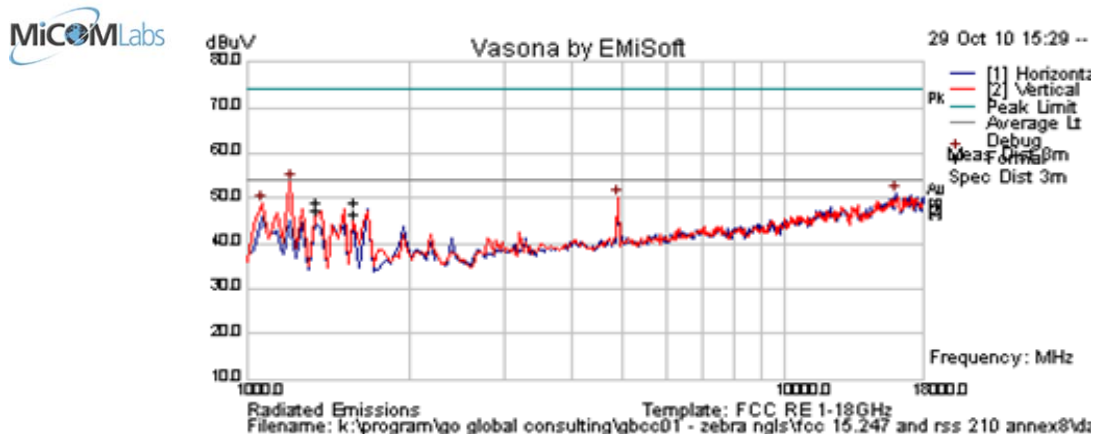
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1220.879	67.1	2.2	-14.5	54.8	Peak	V	152	74	74.0	-19.2	Pass	
4883.517	57.4	4.5	-9.3	52.6	Peak	V	151	237	74.0	-21.4	Pass	
1375.130	52.8	2.3	-13.9	41.2	Peak	V	98	274	74	-32.8	Pass	
1709.233	63.1	2.5	-13.4	52.3	Peak	V	98	337	74	-21.8	Pass	
1098.808	63.0	2.1	-16.3	48.8	Peak	V	152	33	74	-25.2	Pass	
1587.126	61.1	2.4	-14.5	49.0	Peak	V	98	206	74.0	-25.0	Pass	
1342.972	61.1	2.3	-14.1	49.2	Peak	V	202	223	74.0	-24.8	Pass	
1220.879	65.9	2.2	-14.5	53.5	Average	V	152	74	54	-0.5	Pass	
4883.517	54.4	4.5	-9.3	49.6	Average	V	151	237	54	-4.4	Pass	
1375.130	45.6	2.3	-13.9	34.0	Average	V	98	274	54	-20.0	Pass	
1709.233	61.0	2.5	-13.4	50.1	Average	V	98	337	54	-3.9	Pass	
1098.808	60.9	2.1	-16.3	46.6	Average	V	152	33	54	-7.4	Pass	
1587.126	58.6	2.4	-14.5	46.6	Average	V	98	206	54	-7.4	Pass	
1342.972	59.1	2.3	-14.1	47.2	Average	V	202	223	54	-6.8	Pass	
1272.545	62.7	2.2	-14.0	50.9	Peak [Scan]	V	200	0	54	-3.1	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

7.6.2 Measurement Results AIR-ANT1949: Transmitter Radiated Spurious Emissions

Test Freq.	2412 MHz	**Engineer**	SB
Variant	802.11b; 1 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT1949	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			

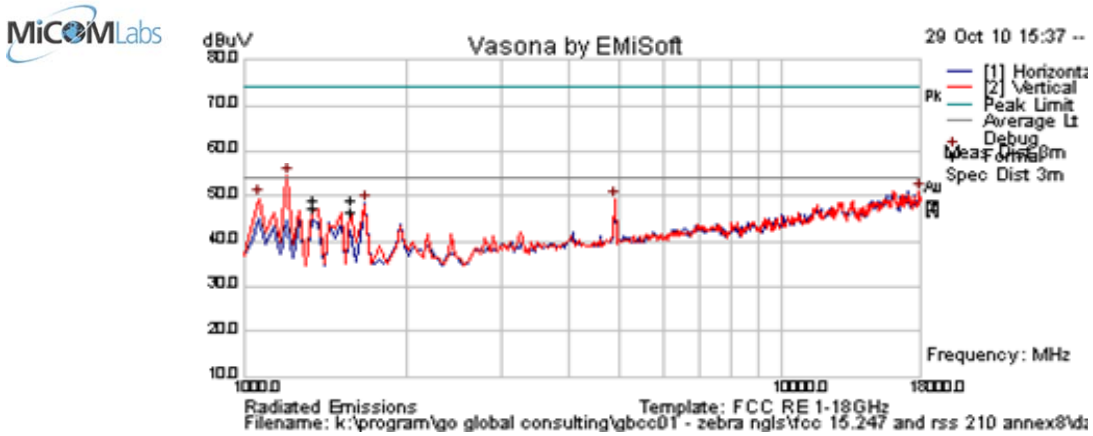


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
16458.116	41.9	8.8	0.1	50.8	Peak [Scan]	H	150	0	54.0	-3.2	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Test Freq.	2437 MHz	**Engineer**	SB
Variant	802.11b; 1 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT1949	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			

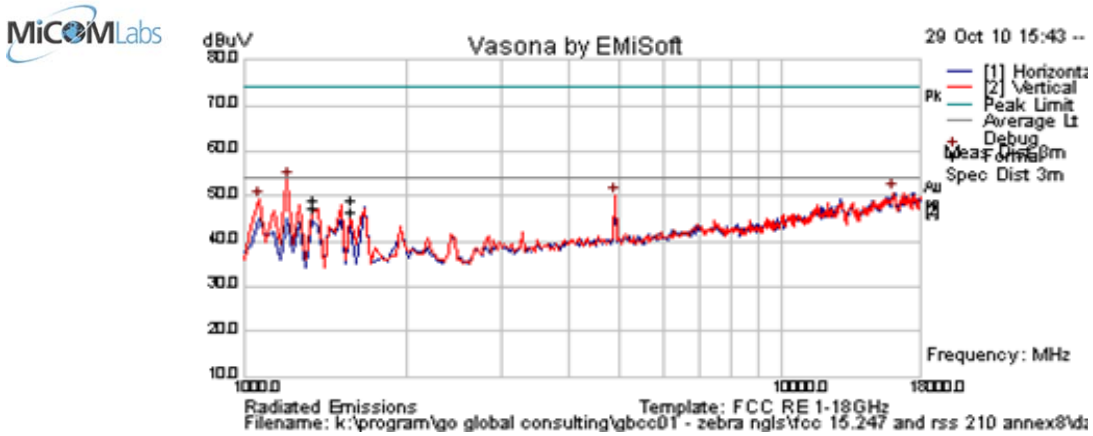


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
17931.864	40.9	8.8	1.4	51.0	Peak [Scan]	V	100	0	54.0	-3.0	Pass	Noise Floor

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Test Freq.	2462 MHz	**Engineer**	SB
Variant	802.11b; 1 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT1949	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			

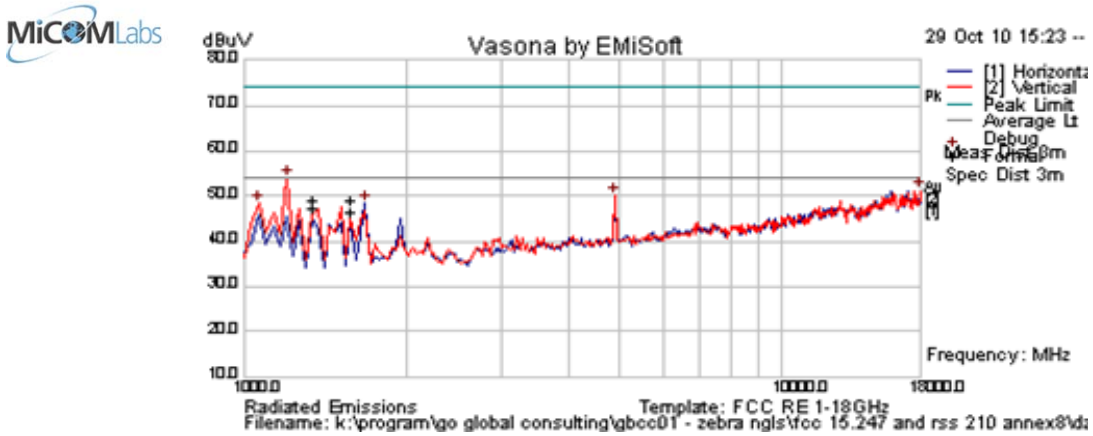


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
16258.116	40.7	8.9	1.0	50.7	Peak [Scan]	V	150	0	54.0	-3.3	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Test Freq.	2412 MHz	**Engineer**	SB
Variant	802.11g; 6 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT1949	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			

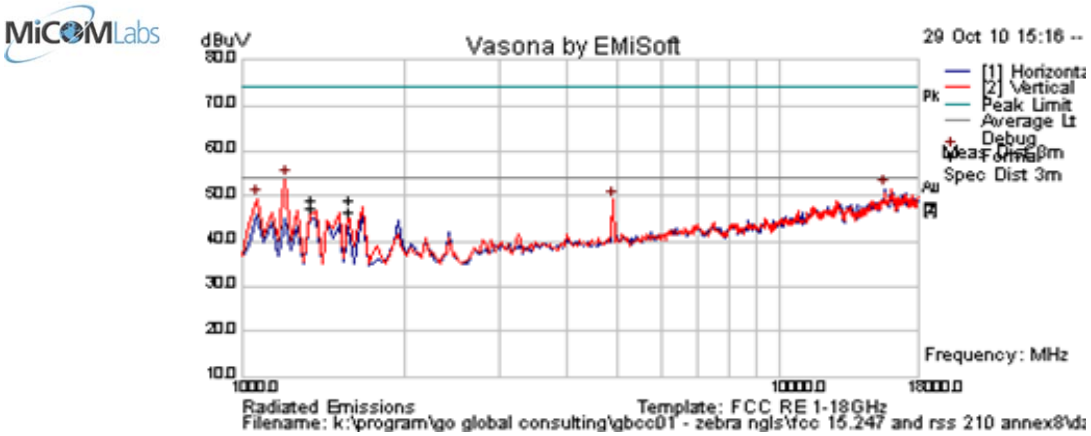


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
18000.000	41.5	8.8	1.0	51.3	Peak [Scan]	V	200	0	54.0	-2.7	Pass	Noise Floor

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Test Freq.	2437 MHz	**Engineer**	SB
Variant	802.11g; 6 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT1949	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			

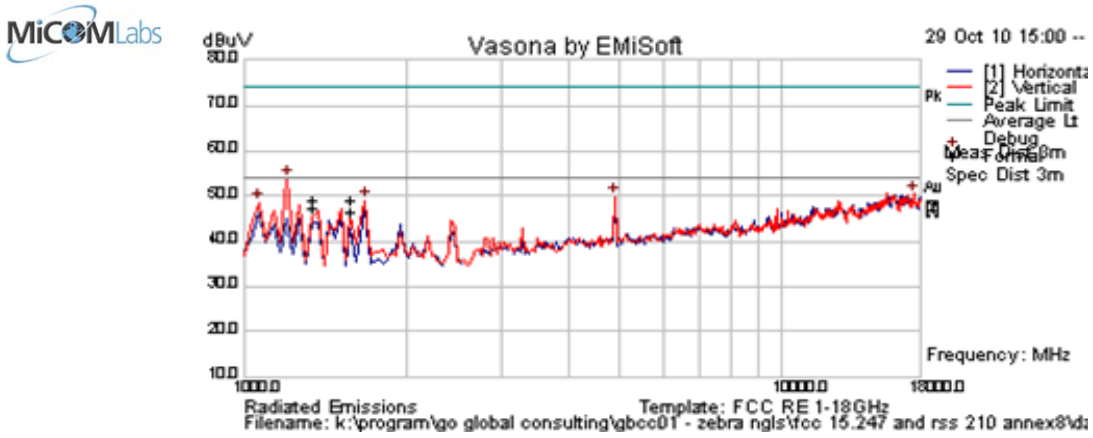


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
16615.230	41.9	8.7	0.9	51.6	Peak [Scan]	H	200	0	54.0	-2.4	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Test Freq.	2462 MHz	**Engineer**	SB
Variant	802.11g; 6 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT1949	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			



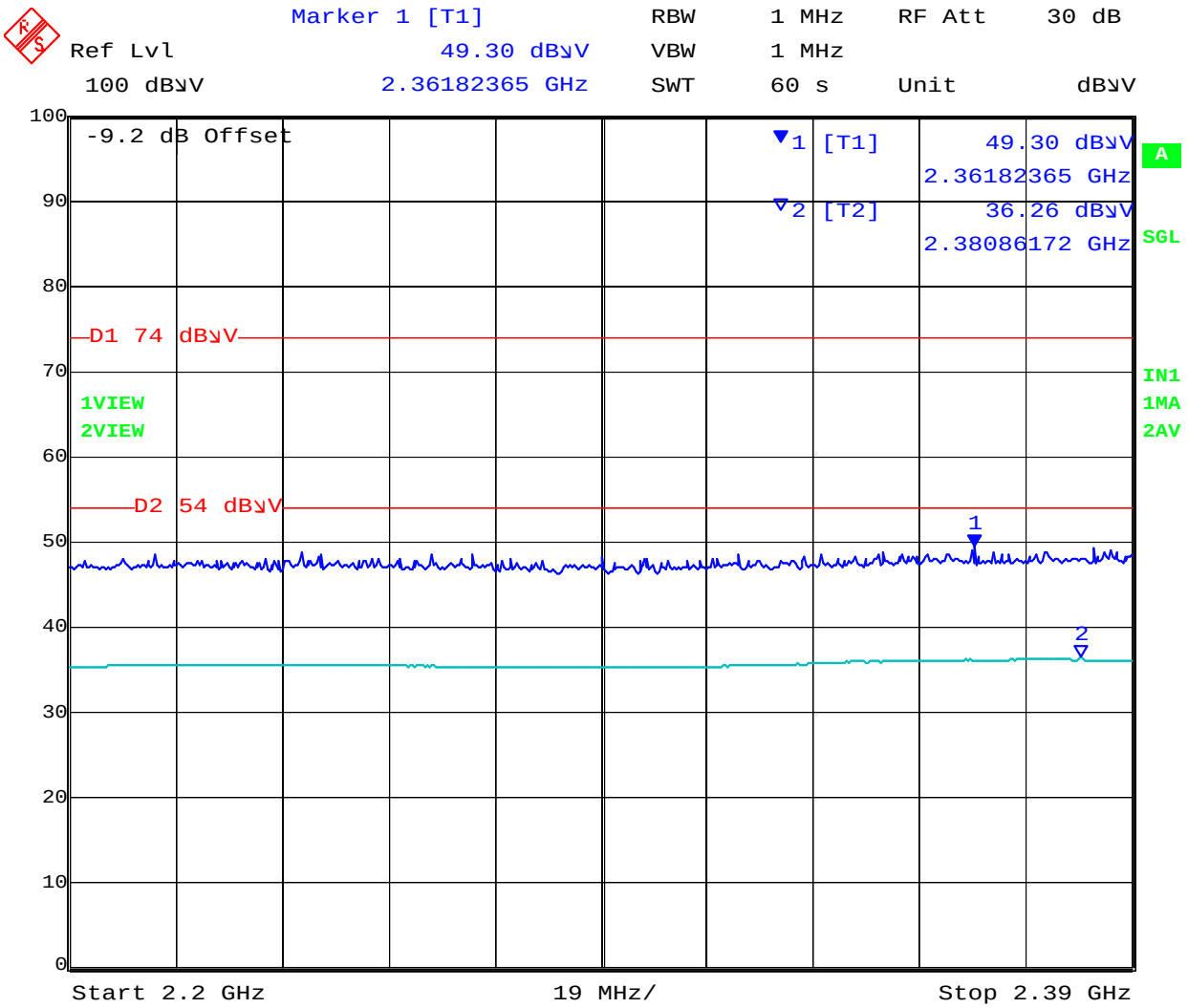
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
17523.046	40.5	8.8	1.3	50.6	Peak [Scan]	V	200	0	54.0	-3.4	Pass	NRB

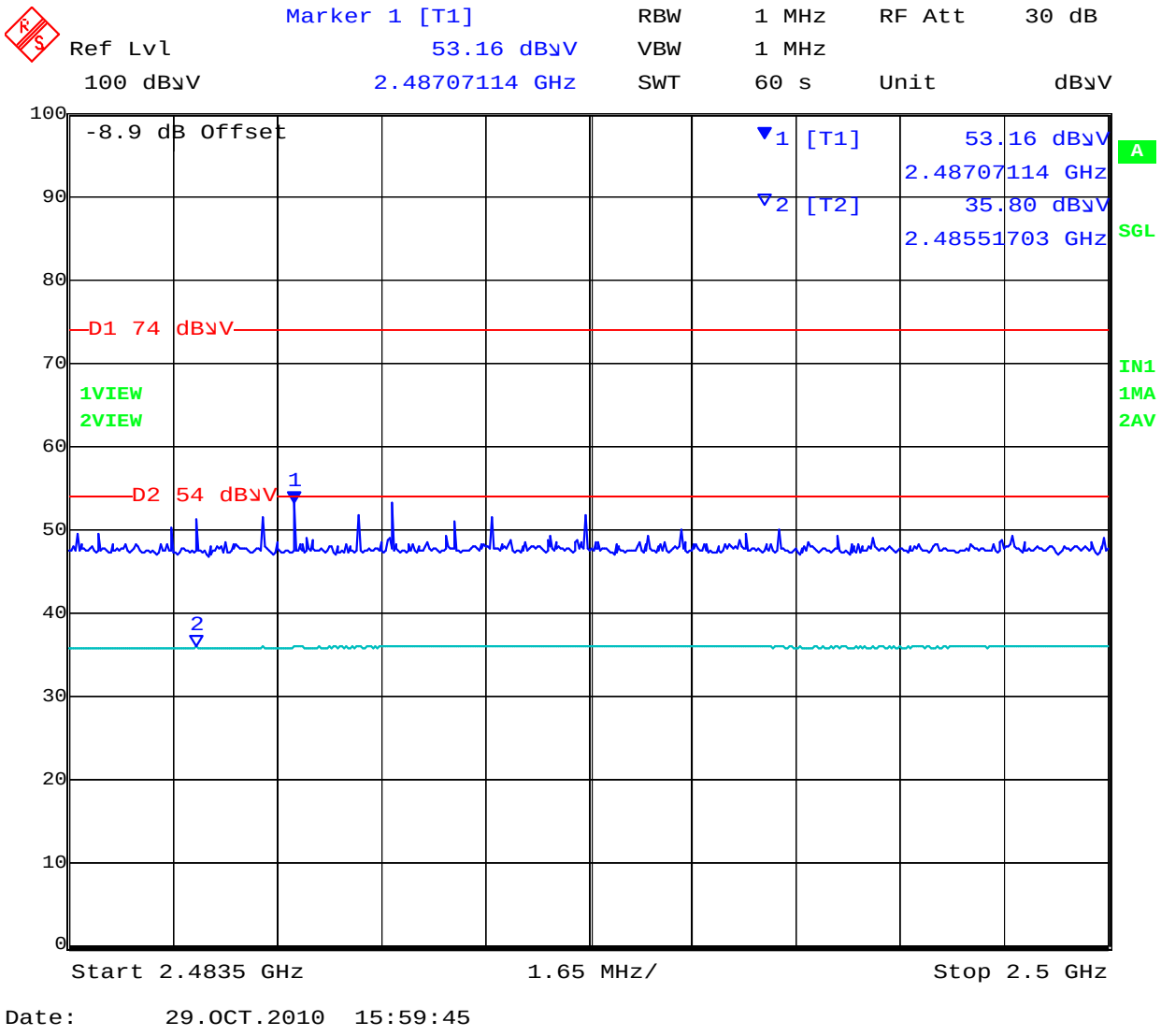
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

7.6.3 Measurement Results AIR-ANT1949: Band Edge

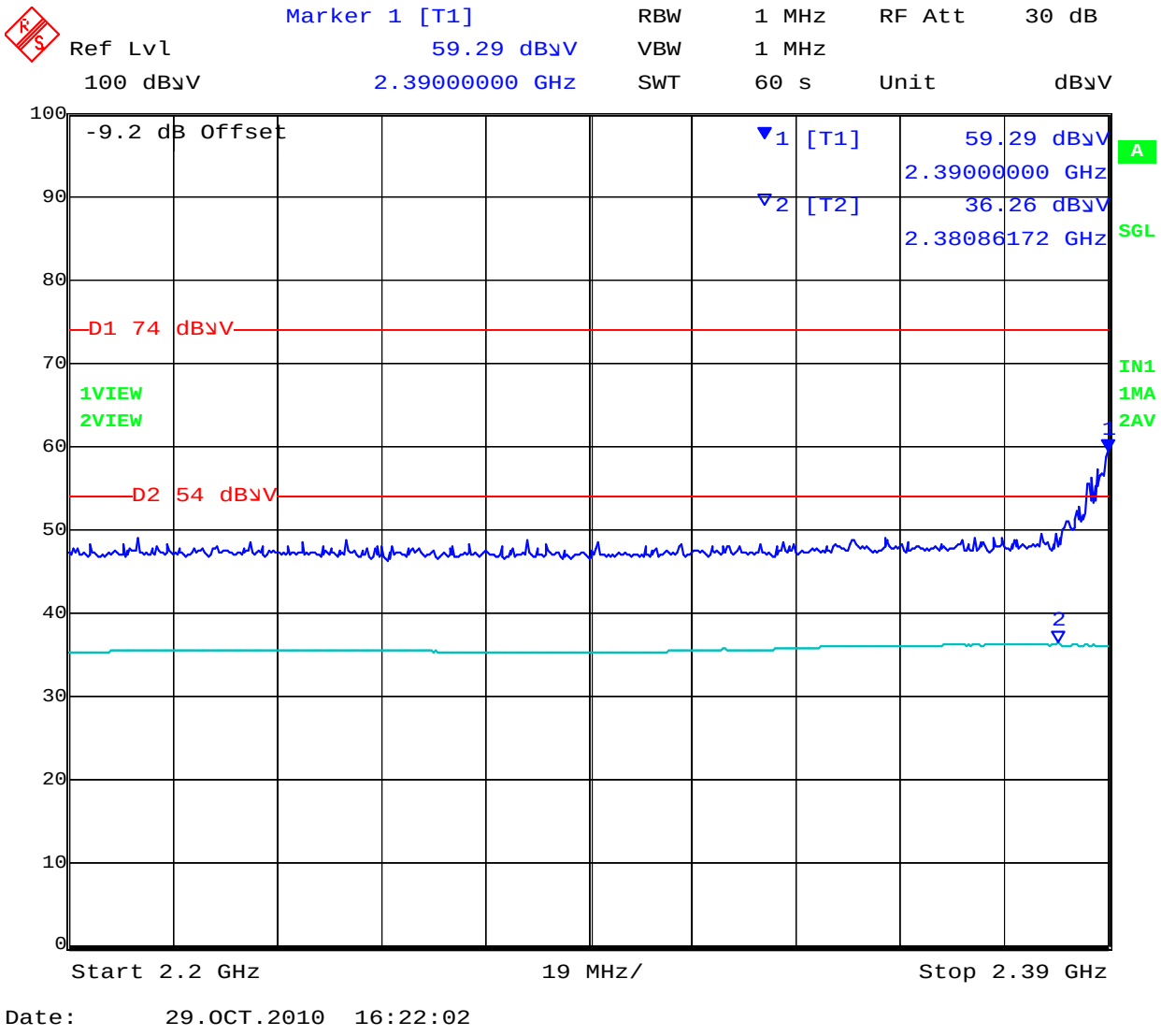
Band Edge 2200-2390MHz 802.11b ch1 h=100cm azt=359



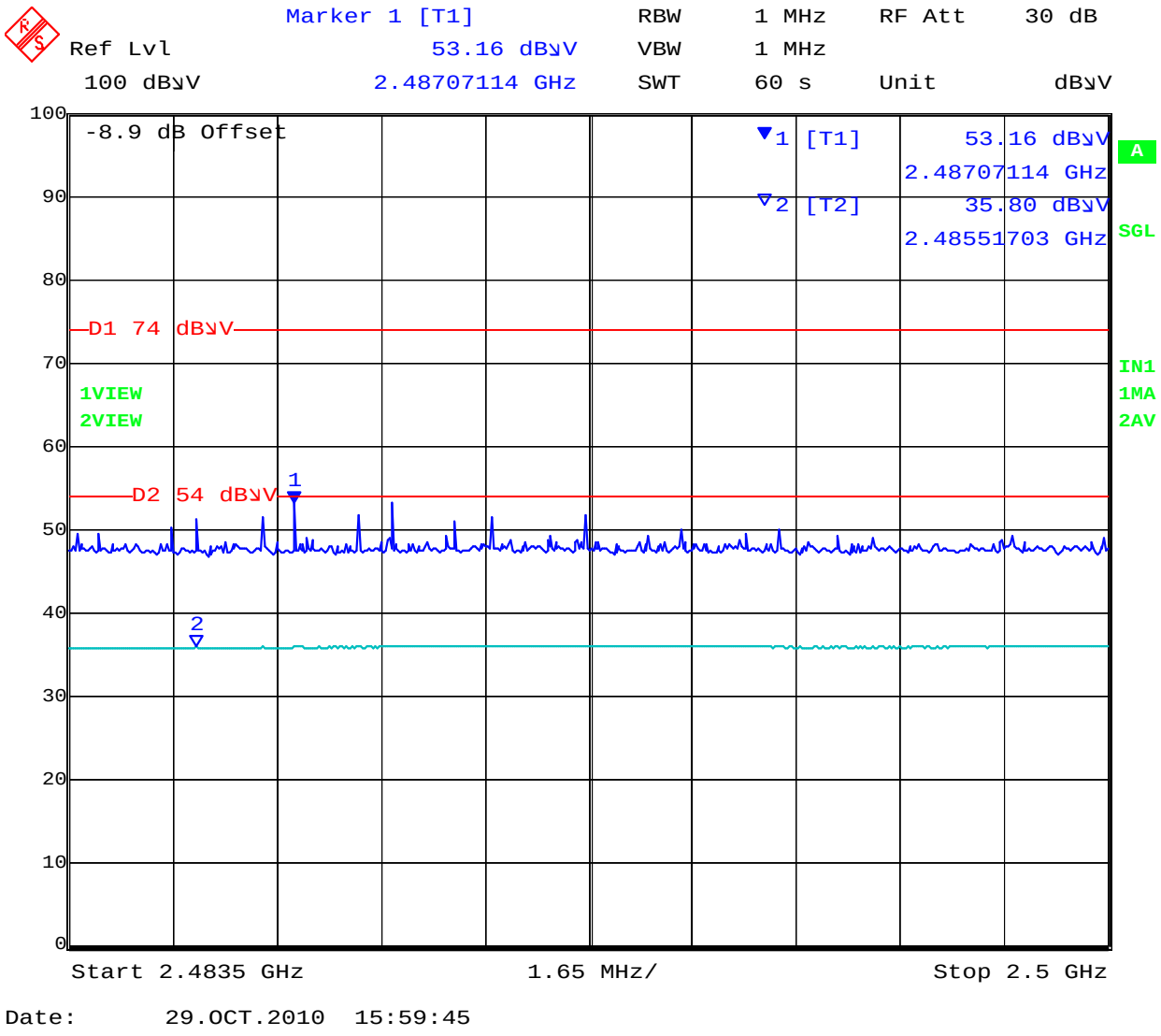
Band Edge 24835.5-2500MHz 802.11b ch11 h=100cm azt=180



Band Edge 2200-2390MHz 802.11g ch1 h=100cm azt=264

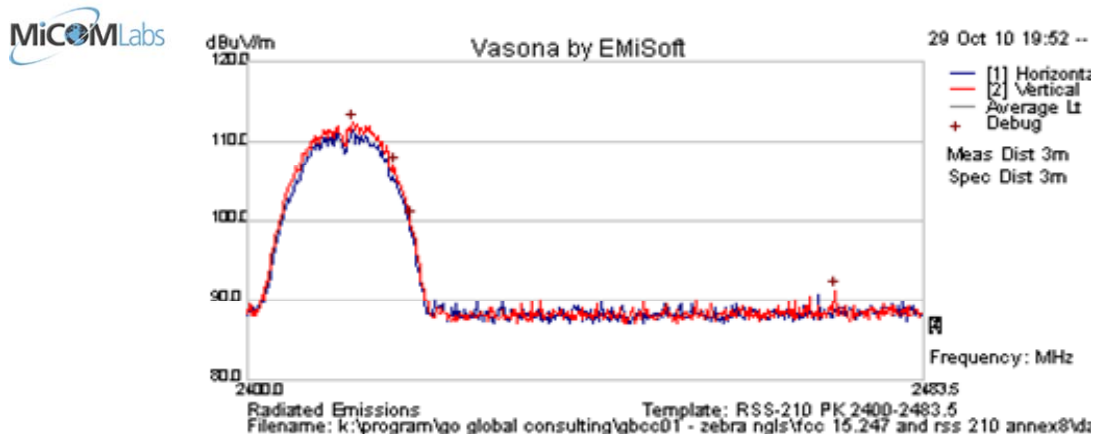


Band Edge 24835.5-2500MHz 802.11b ch11 h=100cm azt=180



7.6.4 Measurement Results AIR-ANT1949: Peak Emissions

Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11b; 1 Mbs	**Temp (°C)**	25
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	32
Power Setting	Max. Power	**Press. (mBars)**	1001
Antenna	AIR ANT1949	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

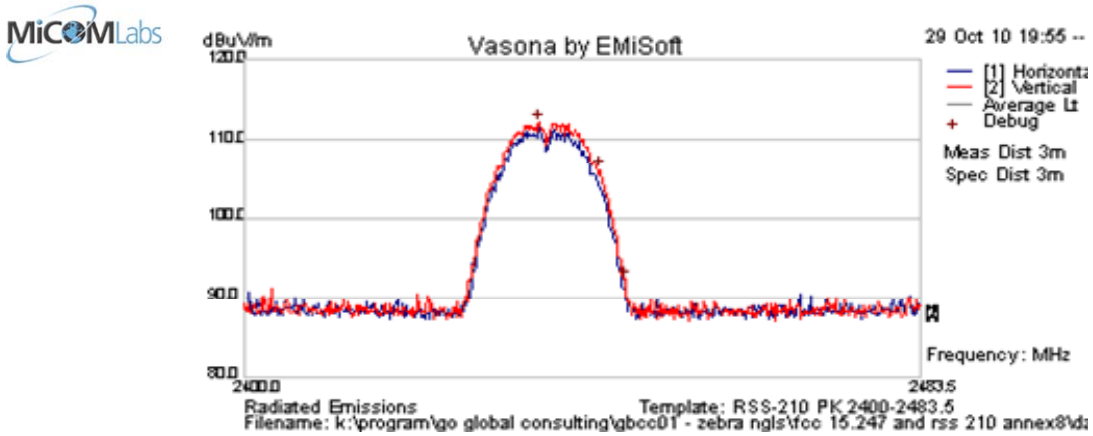


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2412.885	67.2	13.0	32.2	112.4	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11b; 1 Mbs	**Temp (°C)**	25
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	32
Power Setting	Max. Power	**Press. (mBars)**	1001
Antenna	AIR ANT1949	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

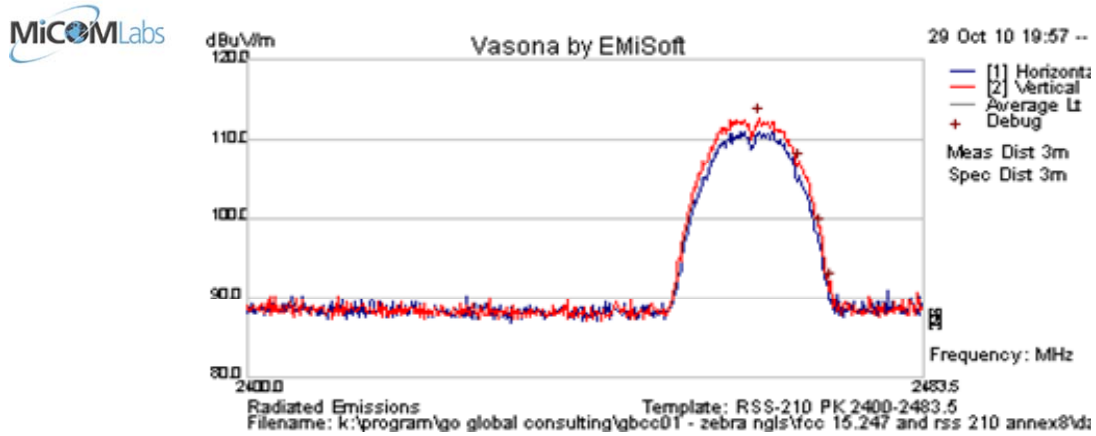


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2436.144	66.9	13.0	32.2	112.1	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

Test Freq.	2462 MHz	**Engineer**	GMH
Variant	802.11b; 1 Mbs	**Temp (°C)**	25
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	32
Power Setting	Max. Power	**Press. (mBars)**	1001
Antenna	AIR ANT1949	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

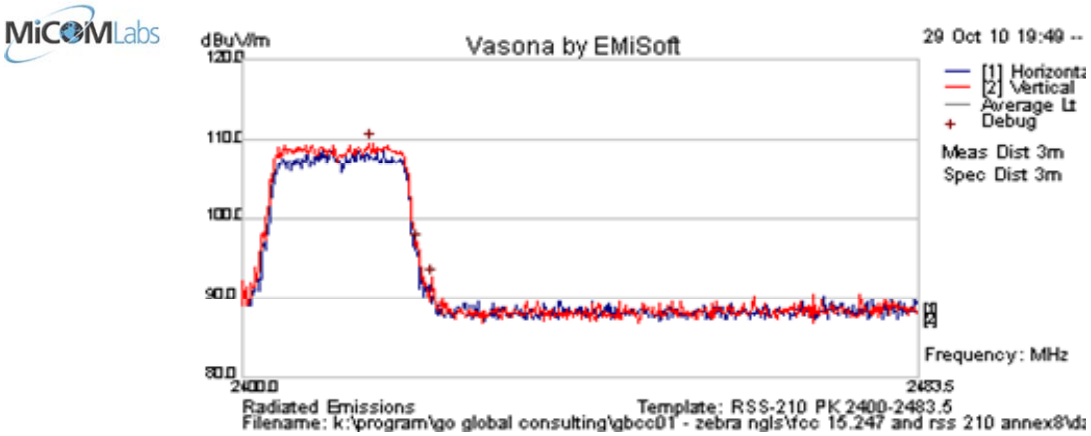


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2462.918	67.6	13.0	32.3	112.8	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (°C)**	25
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	33
Power Setting	Max. Power	**Press. (mBars)**	1001
Antenna	AIR ANT1949	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

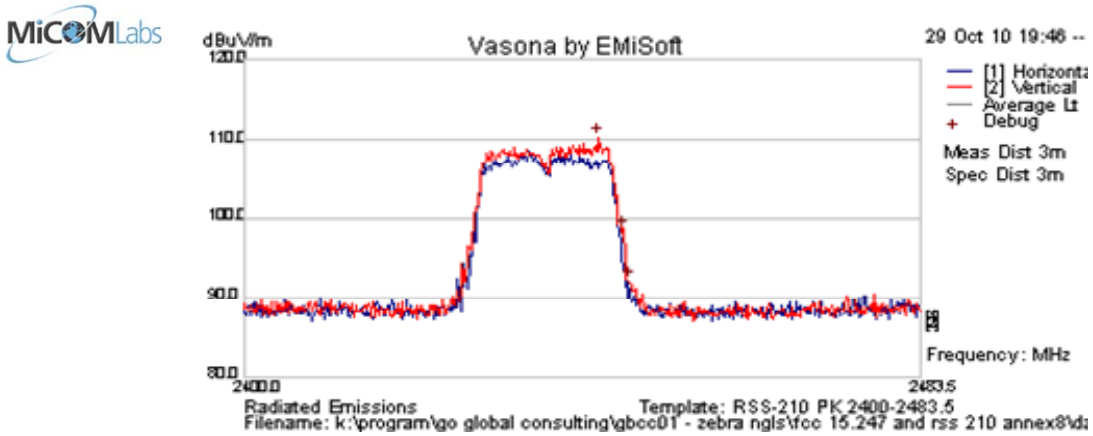


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2415.562	64.5	13.0	32.2	109.6	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (°C)**	25
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	33
Power Setting	Max. Power	**Press. (mBars)**	1001
Antenna	AIR ANT1949	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

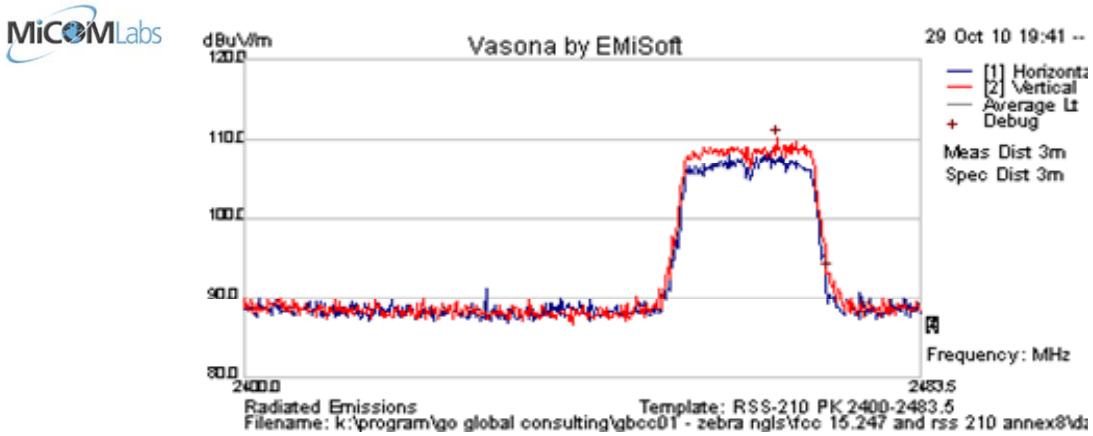


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2443.340	65.2	13.0	32.3	110.4	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

Test Freq.	2462 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (°C)**	25
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	33
Power Setting	Max. Power	**Press. (mBars)**	1001
Antenna	AIR ANT1949	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



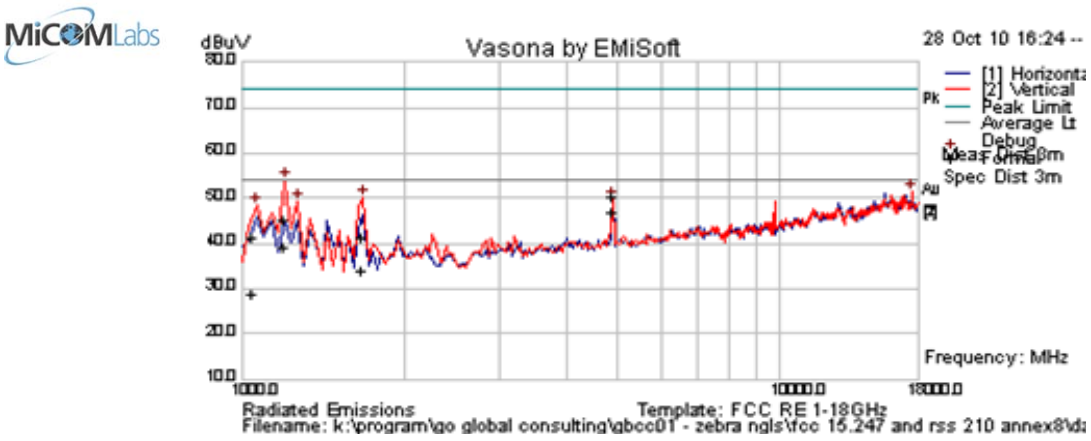
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2465.595	64.9	13.0	32.3	110.2	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

7.6.5 Measurement Results AIR-ANT2506: Transmitter Radiated Spurious Emissions

Test Freq.	2412 MHz	**Engineer**	SB
Variant	802.11b; 1 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			

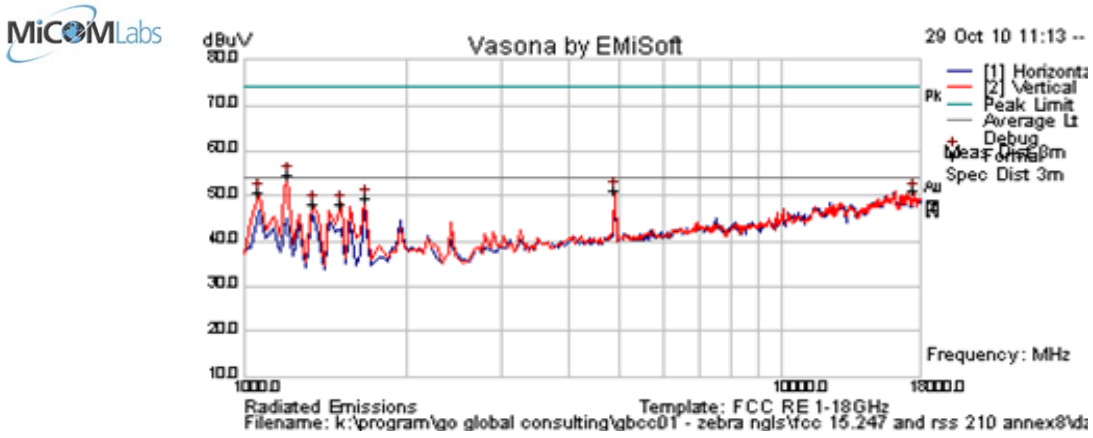


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
1200.020	57.8	2.1	-14.9	45.0	Peak	V	98	222	74.0	-29.0	Pass	
1678.808	52.4	2.5	-13.6	41.2	Peak	V	98	332	74.0	-32.8	Pass	
4883.492	55.2	4.5	-9.3	50.4	Peak	V	151	288	74	-23.6	Pass	
1050.060	55.3	2.0	-16.1	41.3	Peak	V	98	7	74	-32.7	Pass	
1200.020	51.9	2.1	-14.9	39.2	Average	V	98	222	54	-14.8	Pass	
1678.808	45.0	2.5	-13.6	33.9	Average	V	98	332	54	-20.1	Pass	
4883.492	51.5	4.5	-9.3	46.7	Average	V	151	288	54	-7.3	Pass	
1050.060	42.8	2.0	-16.1	28.7	Average	V	98	7	54	-25.3	Pass	
17591.182	41.4	8.8	1.1	51.4	Peak [Scan]	V	200	0	54	-2.7	Pass	NRB
1272.545	61.0	2.2	-14.0	49.3	Peak [Scan]	V	100	0	54	-4.7	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Test Freq.	2437 MHz	**Engineer**	SB
Variant	802.11b; 1 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			

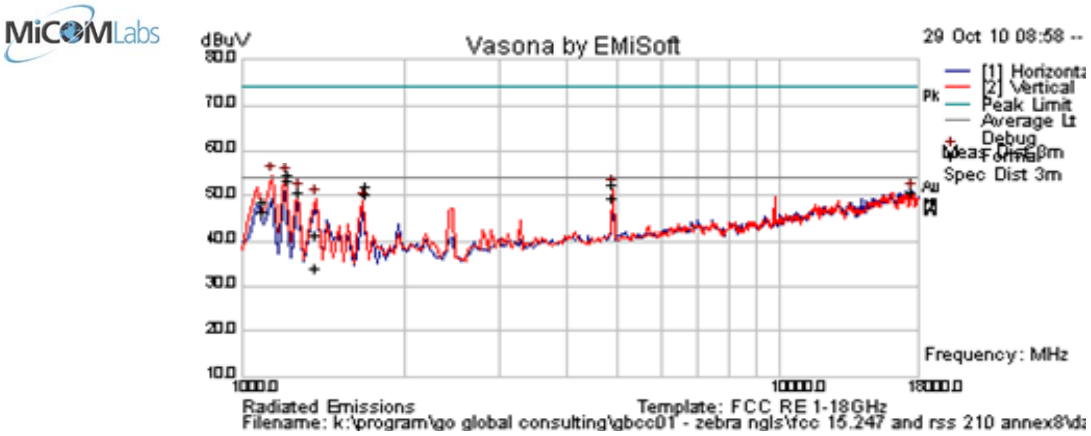


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
1587.126	61.1	2.4	-14.5	49.0	Peak	V	98	206	74.0	-25.0	Pass	
1342.972	61.1	2.3	-14.1	49.2	Peak	V	202	223	74.0	-24.8	Pass	
1587.126	58.6	2.4	-14.5	46.6	Average	V	98	206	54	-7.4	Pass	
1342.972	59.1	2.3	-14.1	47.2	Average	V	202	223	54	-6.8	Pass	
17523.046	41.0	8.8	1.3	51.0	Peak [Scan]	V	200	0	54	-3.0	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Test Freq.	2462 MHz	**Engineer**	SB
Variant	802.11b; 1 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			

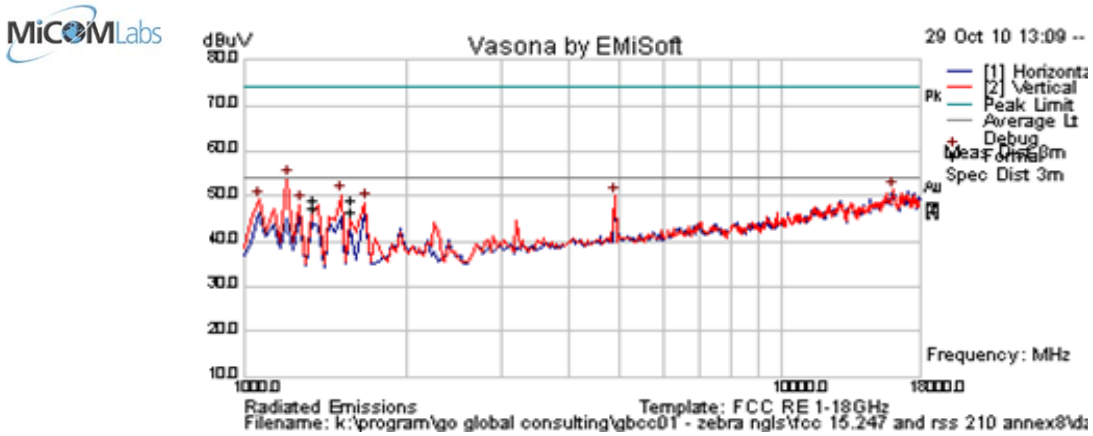


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
1220.879	67.1	2.2	-14.5	54.8	Peak	V	152	74	74.0	-19.2	Pass	
4883.517	57.4	4.5	-9.3	52.6	Peak	V	151	237	74.0	-21.4	Pass	
1375.130	52.8	2.3	-13.9	41.2	Peak	V	98	274	74	-32.8	Pass	
1709.233	63.1	2.5	-13.4	52.3	Peak	V	98	337	74	-21.8	Pass	
1098.808	63.0	2.1	-16.3	48.8	Peak	V	152	33	74	-25.2	Pass	
1220.879	65.9	2.2	-14.5	53.5	Average	V	152	74	54	-0.5	Pass	
4883.517	54.4	4.5	-9.3	49.6	Average	V	151	237	54	-4.4	Pass	
1375.130	45.6	2.3	-13.9	34.0	Average	V	98	274	54	-20.0	Pass	
1709.233	61.0	2.5	-13.4	50.1	Average	V	98	337	54	-3.9	Pass	
1098.808	60.9	2.1	-16.3	46.6	Average	V	152	33	54	-7.4	Pass	
17523.046	40.9	8.8	1.3	50.9	Peak [Scan]	H	150	0	54	-3.1	Pass	NRB
1272.545	62.7	2.2	-14.0	50.9	Peak [Scan]	V	200	0	54	-3.1	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Test Freq.	2412 MHz	**Engineer**	SB
Variant	802.11g; 6 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			

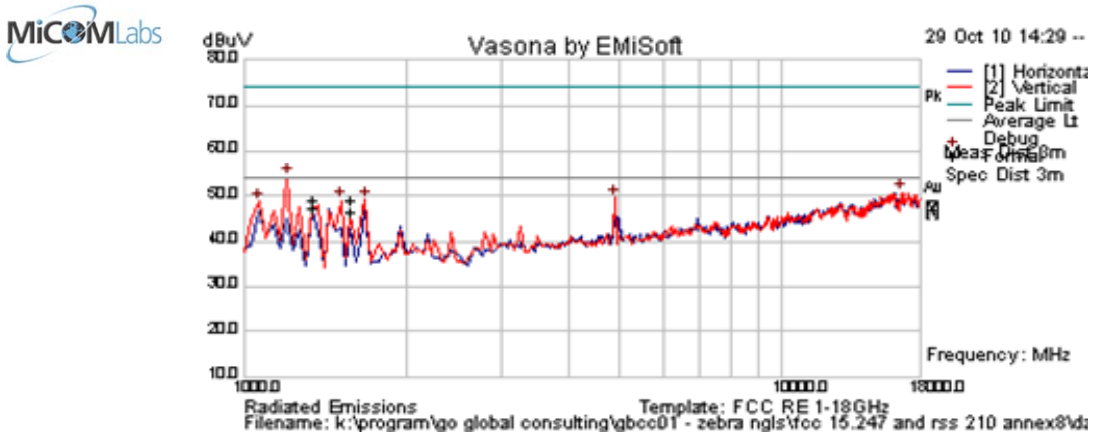


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
16058.116	41.5	9.0	0.8	51.2	Peak [Scan]	V	200	0	54.0	-2.8	Pass	NRB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Test Freq.	2437 MHz	**Engineer**	SB
Variant	802.11g; 6 Mbs	**Temp (ºC)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			

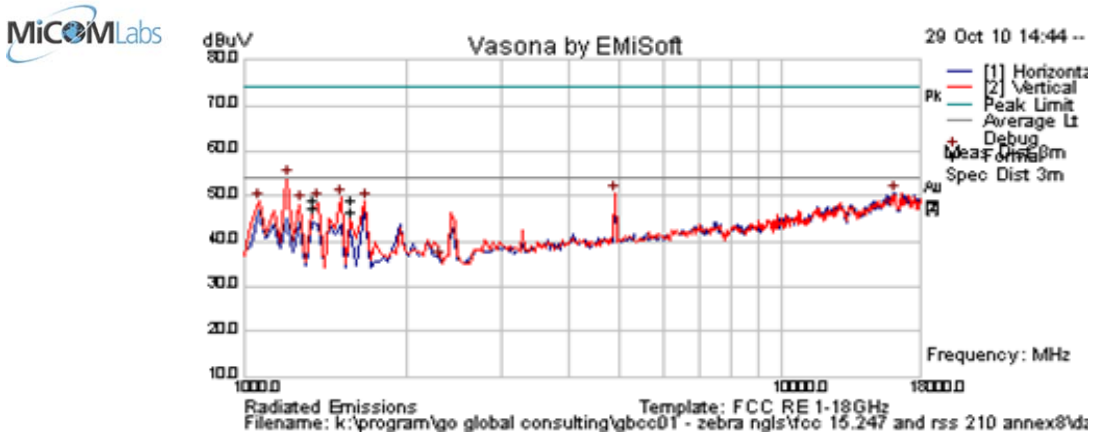


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
16637.275	41.1	8.7	0.9	50.8	Peak [Scan]	V	100	0	54.0	-3.2	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Test Freq.	2462 MHz	**Engineer**	SB
Variant	802.11g; 6 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1	Please See Ref Scan from 1-5GHz document for frequencies in the range 1 to 5 GHz		
Test Notes 2			



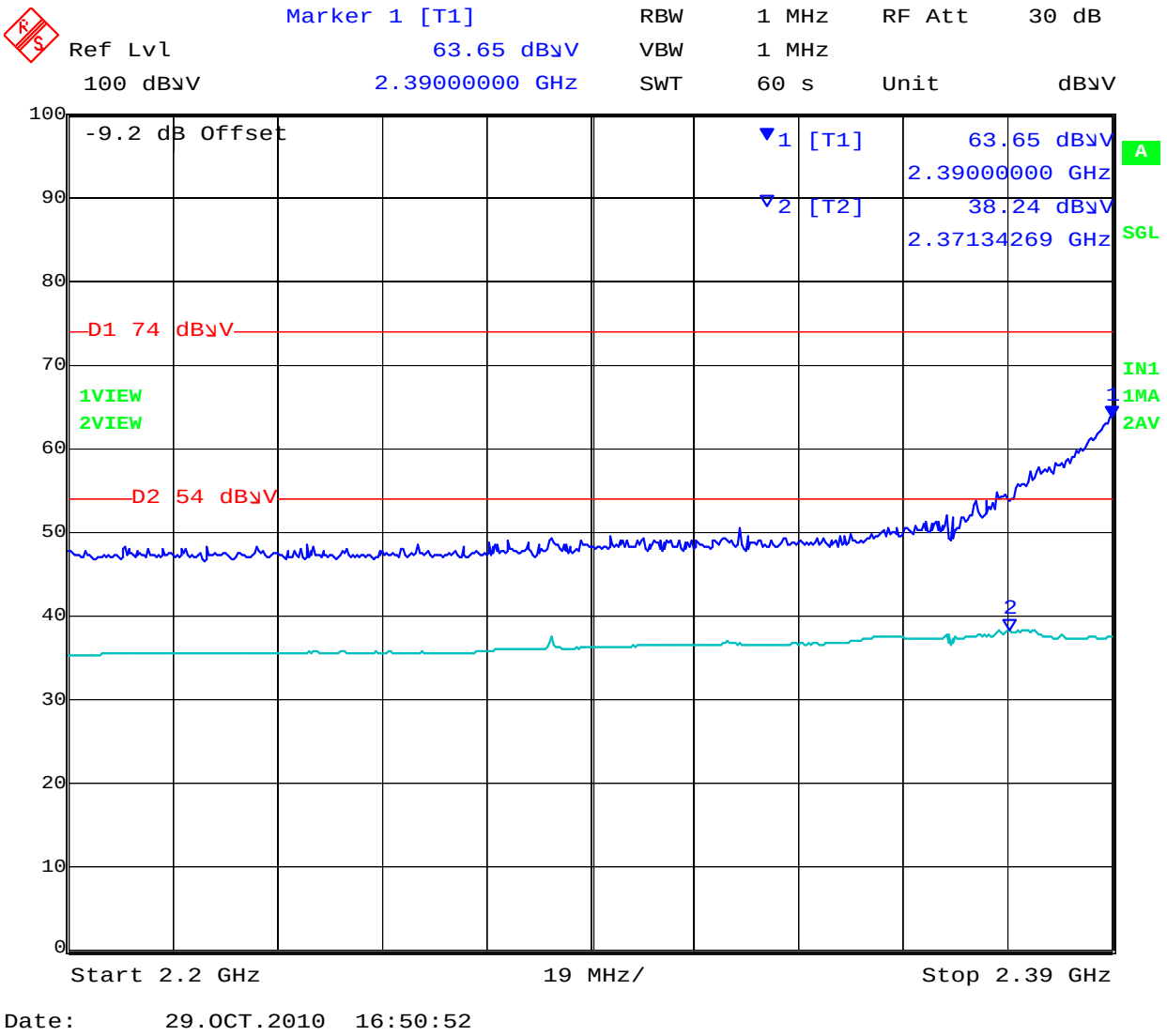
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
16160.321	40.6	9.0	1.0	50.5	Peak [Scan]	H	100	0	54.0	-3.5	Pass	NRB

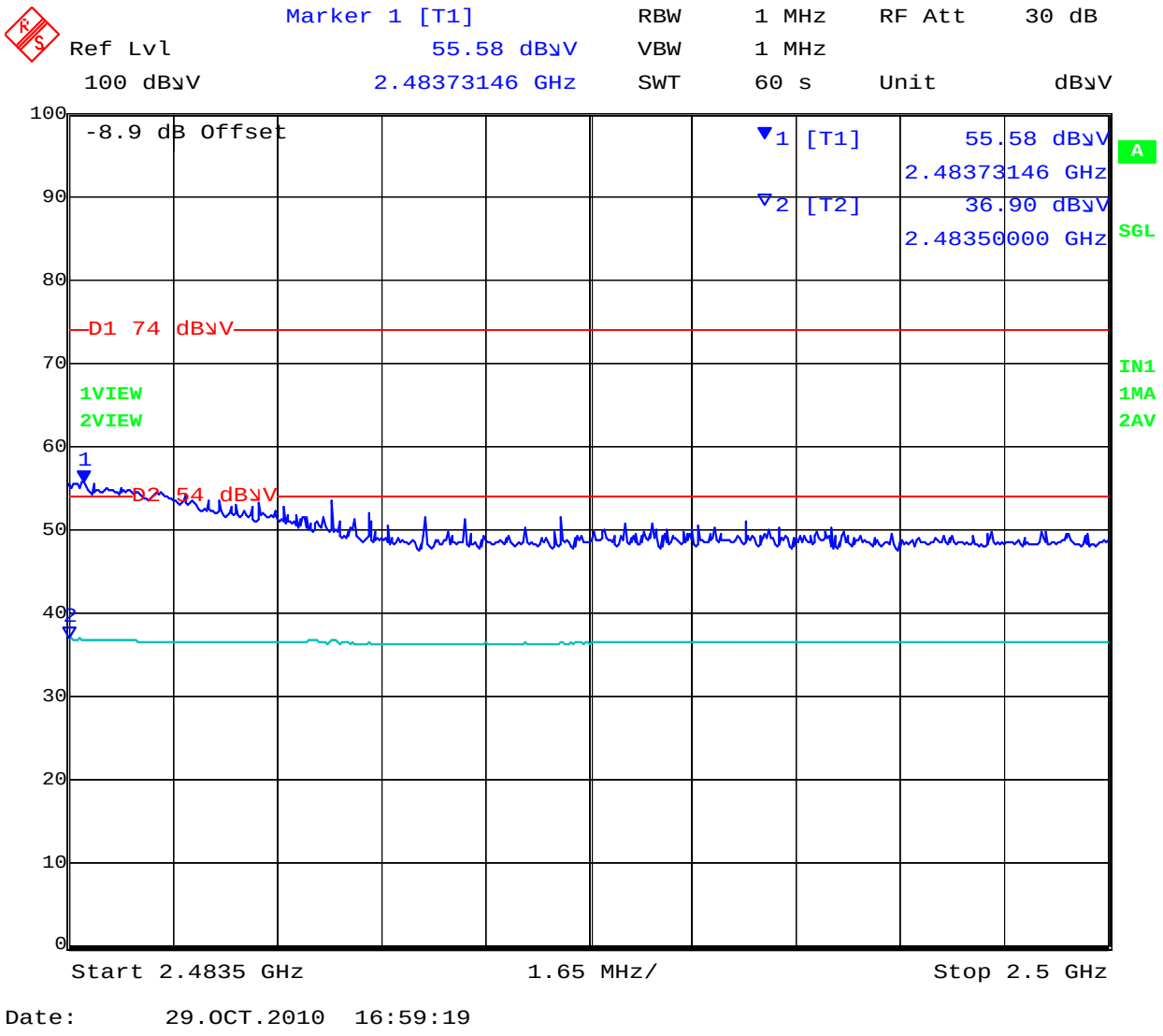
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

7.6.6 Measurement Results AIR-ANT2506: Band Edge

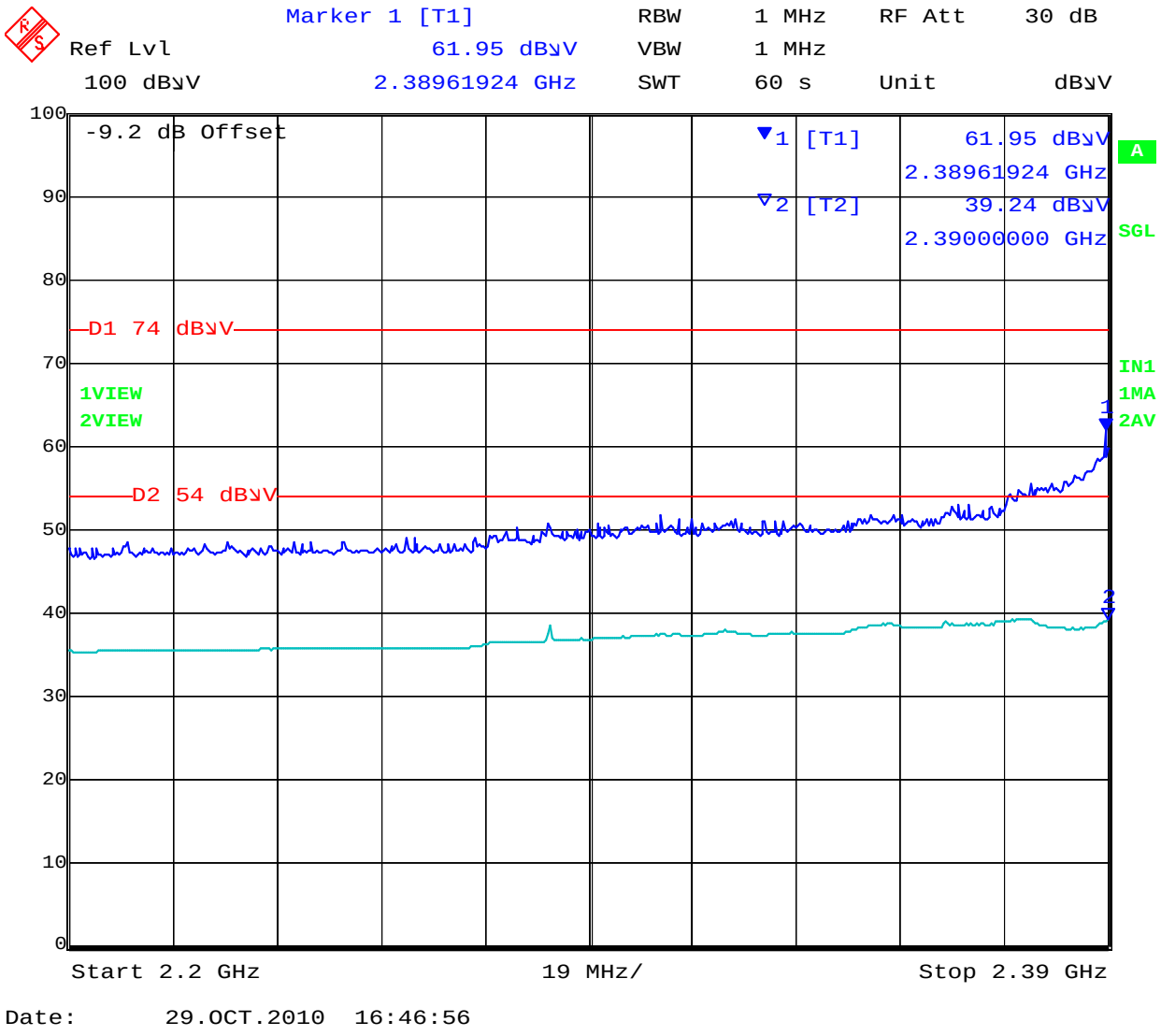
Band Edge 2200-2390MHz 802.11b ch1 h=100cm azt=157



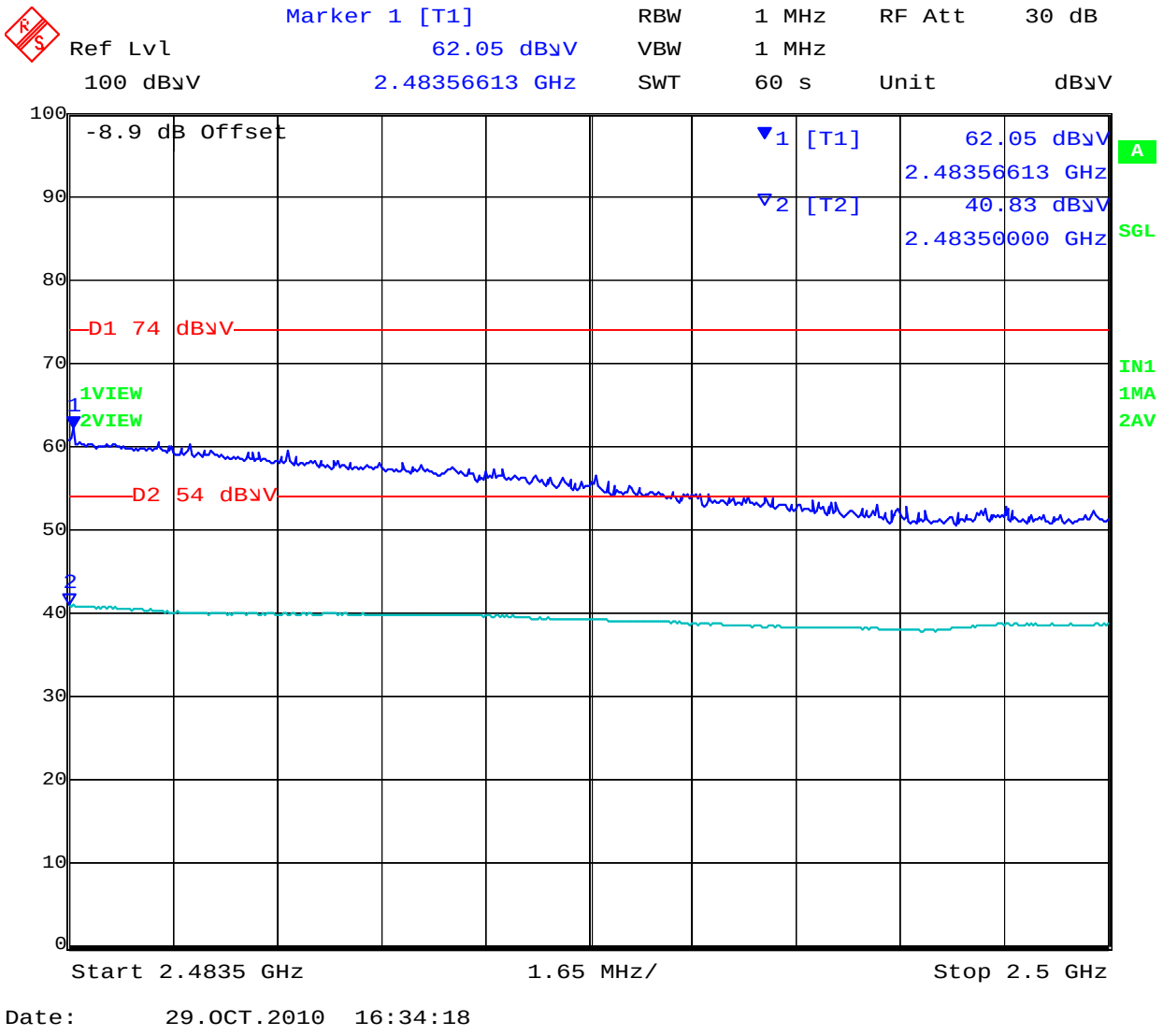
Band Edge 2483.5-2500MHz 802.11b ch11 h=100cm azt=337



Band Edge 2200-2390MHz 802.11g ch1 h=100cm azt=157

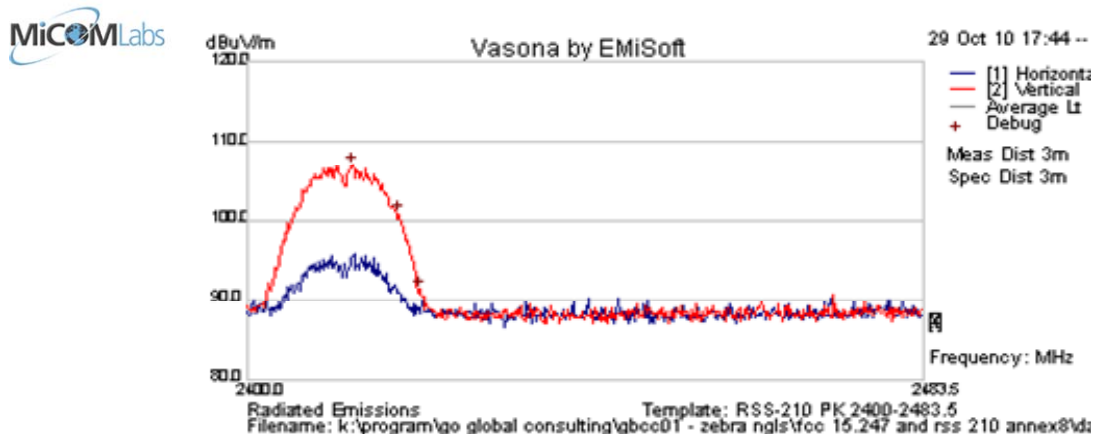


Band Edge 2483.5-2500MHz 802.11g ch11 h=100cm azt=74



7.6.7 Measurement Results AIR-ANT2506: Peak Emissions

Test Freq.	2412 MHz	**Engineer**	SB
Variant	802.11b; 1 Mbs	**Temp (°C)**	22
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

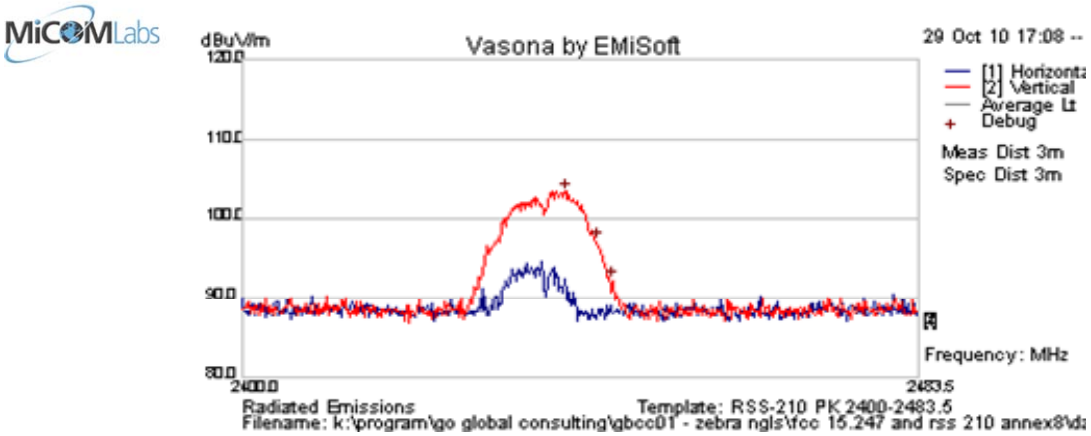


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2412.885	61.9	13.0	32.2	107.0	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

Test Freq.	2437 MHz	**Engineer**	SB
Variant	802.11b; 1 Mbs	**Temp (°C)**	22
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

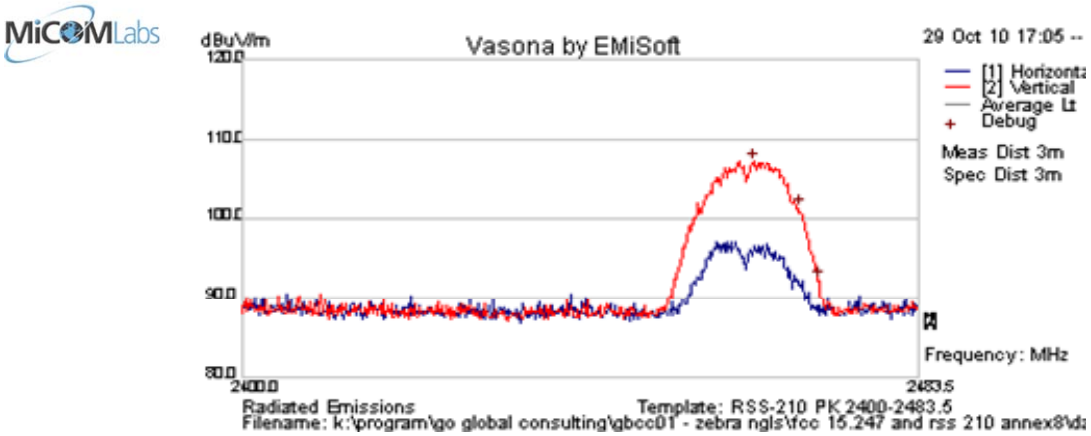


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2439.658	58.2	13.0	32.2	103.4	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

Test Freq.	2462 MHz	**Engineer**	SB
Variant	802.11b; 1 Mbs	**Temp (°C)**	22
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

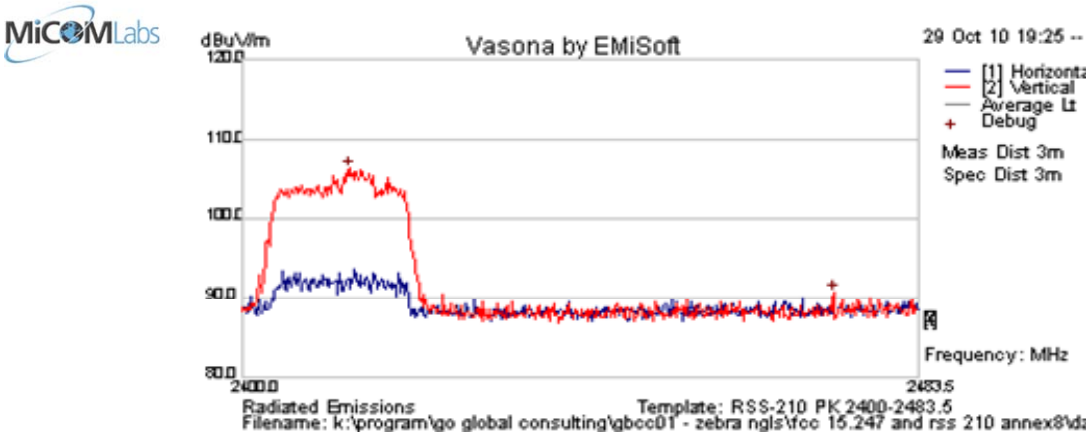


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2462.918	62.1	13.0	32.3	107.3	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (°C)**	25
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	32
Power Setting	max. power	**Press. (mBars)**	1002
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

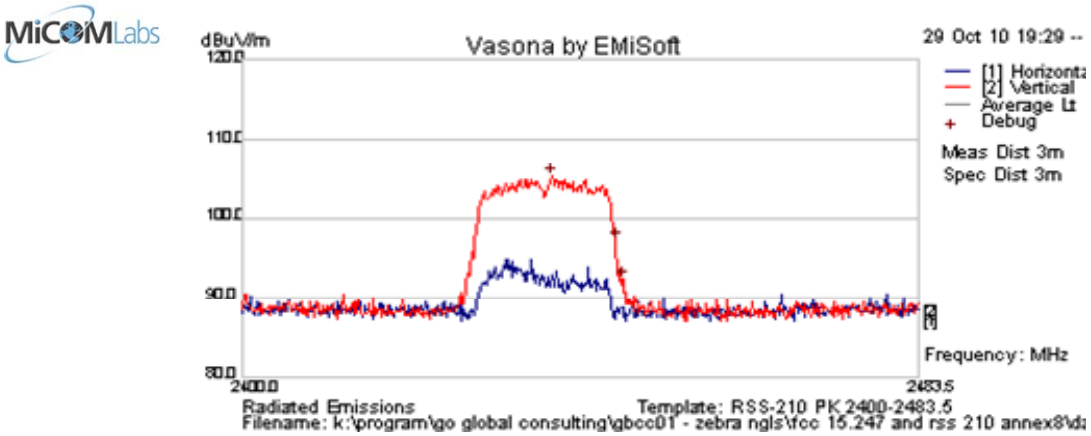


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2413.052	61.2	13.0	32.2	106.4	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (°C)**	25
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	32
Power Setting	max. power	**Press. (mBars)**	1002
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

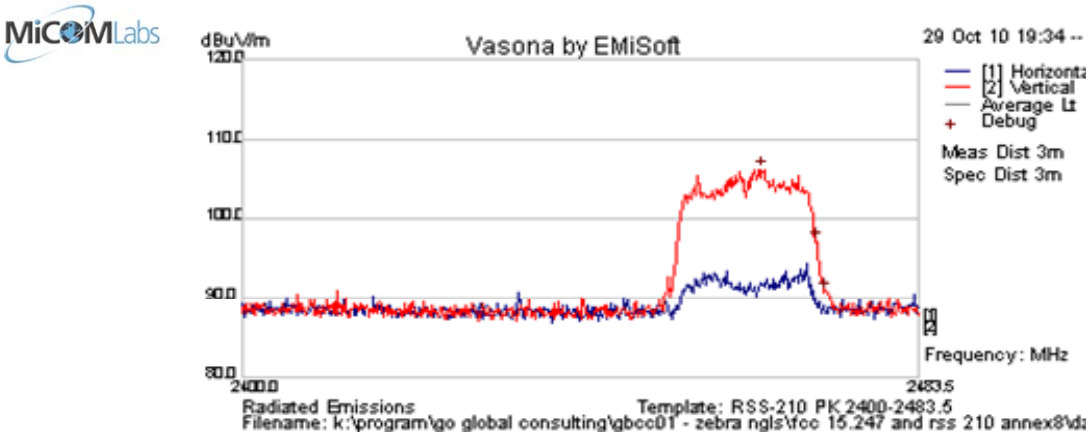


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2437.985	60.2	13.0	32.2	105.4	Peak [Scan]	V						PK

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

Test Freq.	2462 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (°C)**	25
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	32
Power Setting	max. power	**Press. (mBars)**	1002
Antenna	AIR-ANT2506	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2463.922	61.0	13.0	32.3	106.2	Peak [Scan]	V						PK

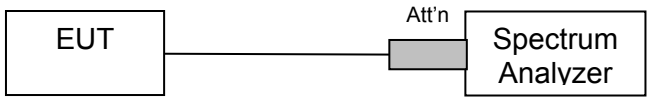
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	PK = Peak emissions of Fundamental

7.7 Receiver Conducted Spurious Emissions

Industry Canada RSS-Gen §4.10, §6

Test Procedure
Conducted emissions were measured with a spectrum analyzer connected to the antenna terminal. Measurements were made while EUT was operating in receive mode.

Test Measurement Set up



Receiver Conducted spurious emission measurement test configuration

Specification

Receiver Radiated Spurious Emissions

Industry Canada RSS-Gen §4.10,
The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tunable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

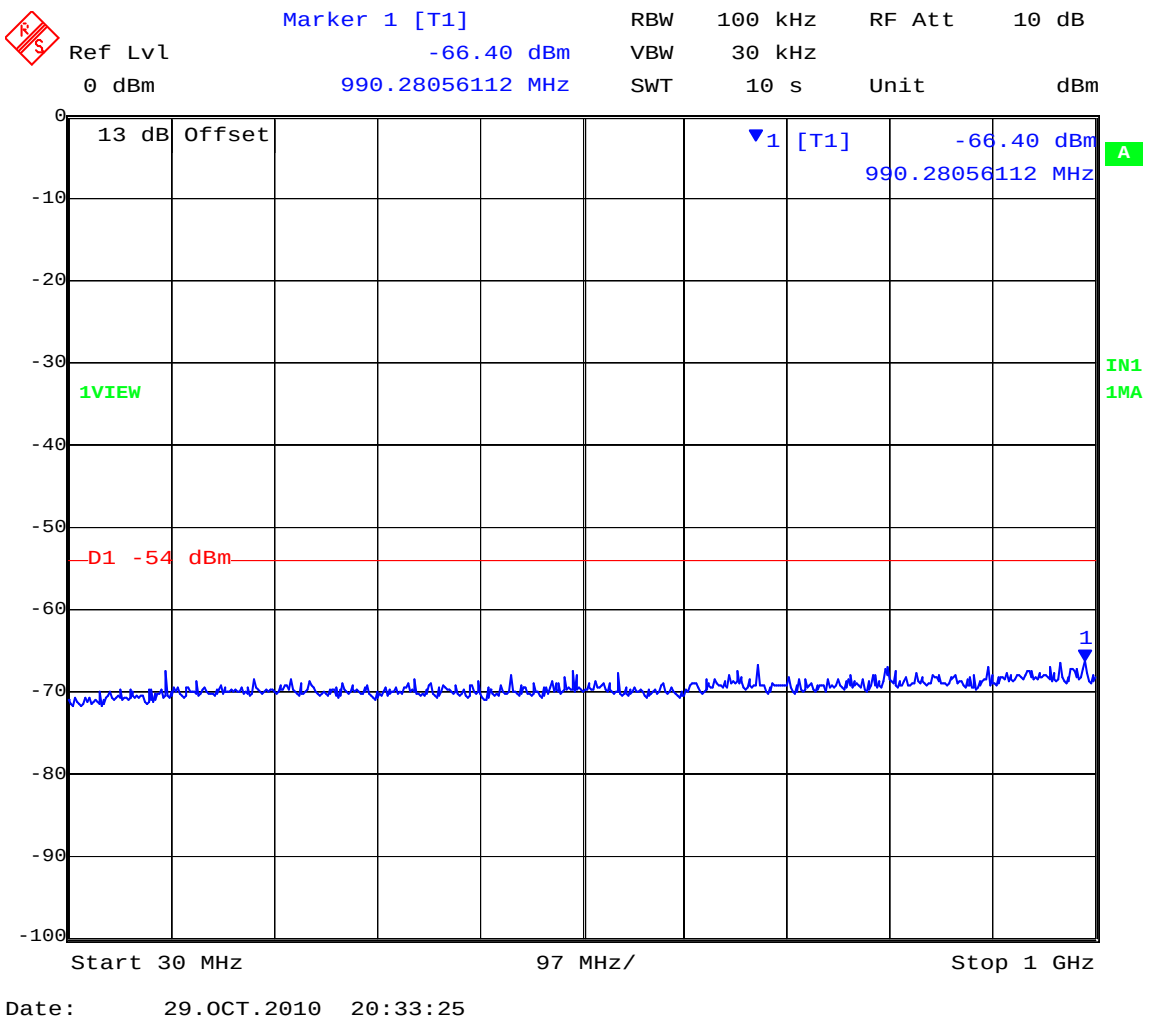
For emissions below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector with the same measurement bandwidth as that for CISPR quasi-peak measurements. Above 1 GHz, measurements shall be performed using an average detector and a resolution bandwidth of 300 kHz to 1 MHz.

RSS-Gen §6 (b)
If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

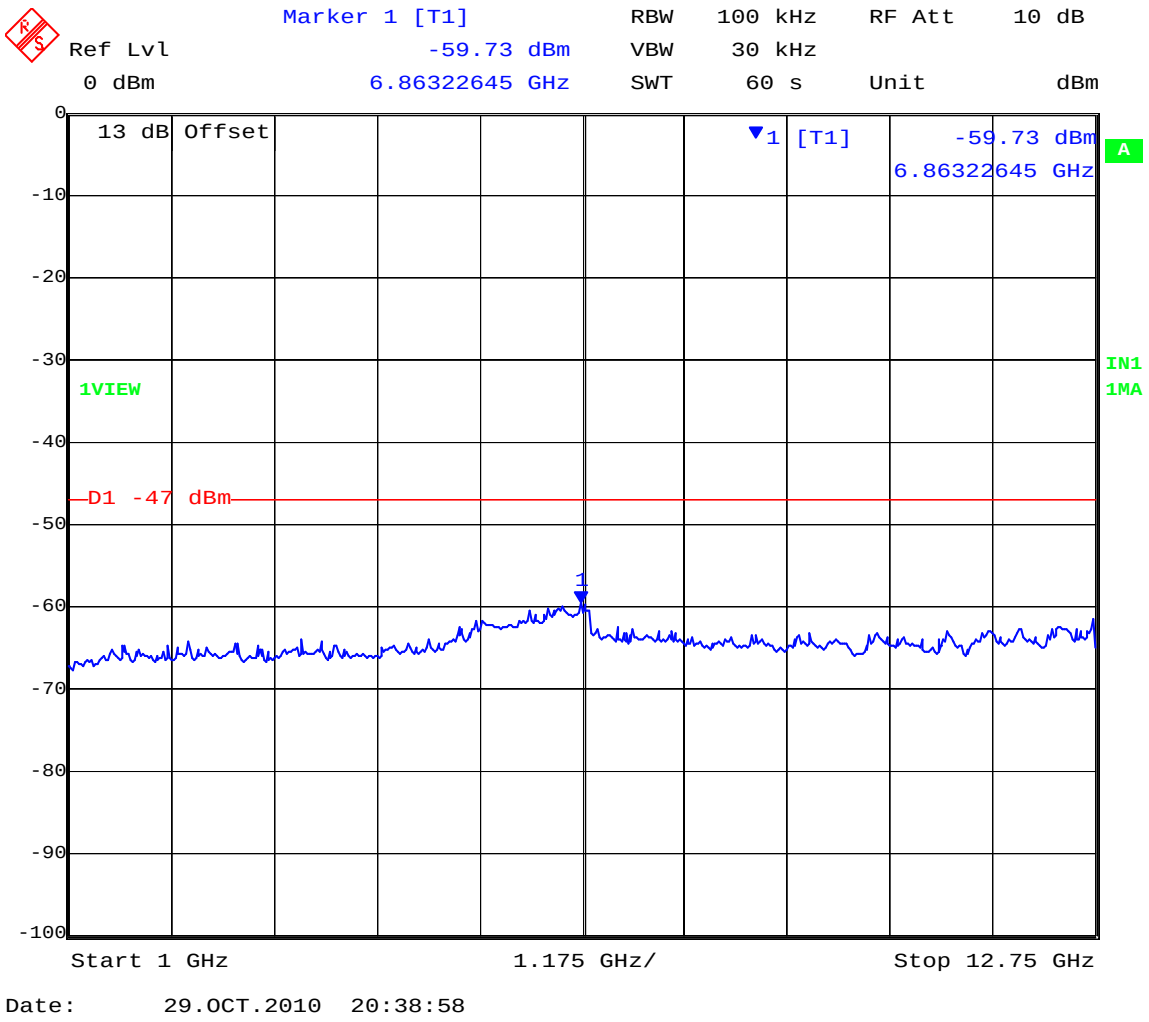
Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0287, 0158, 0252, 0223, 0116, 0117, 0287, 0363.

Receiver Conducted Emissions 30 MHz to 1GHz



Receiver Conducted Emissions 1 GHz to 12.75 GHz



7.8 Radiated Spurious Emissions – Digital Apparatus

Standard Reference

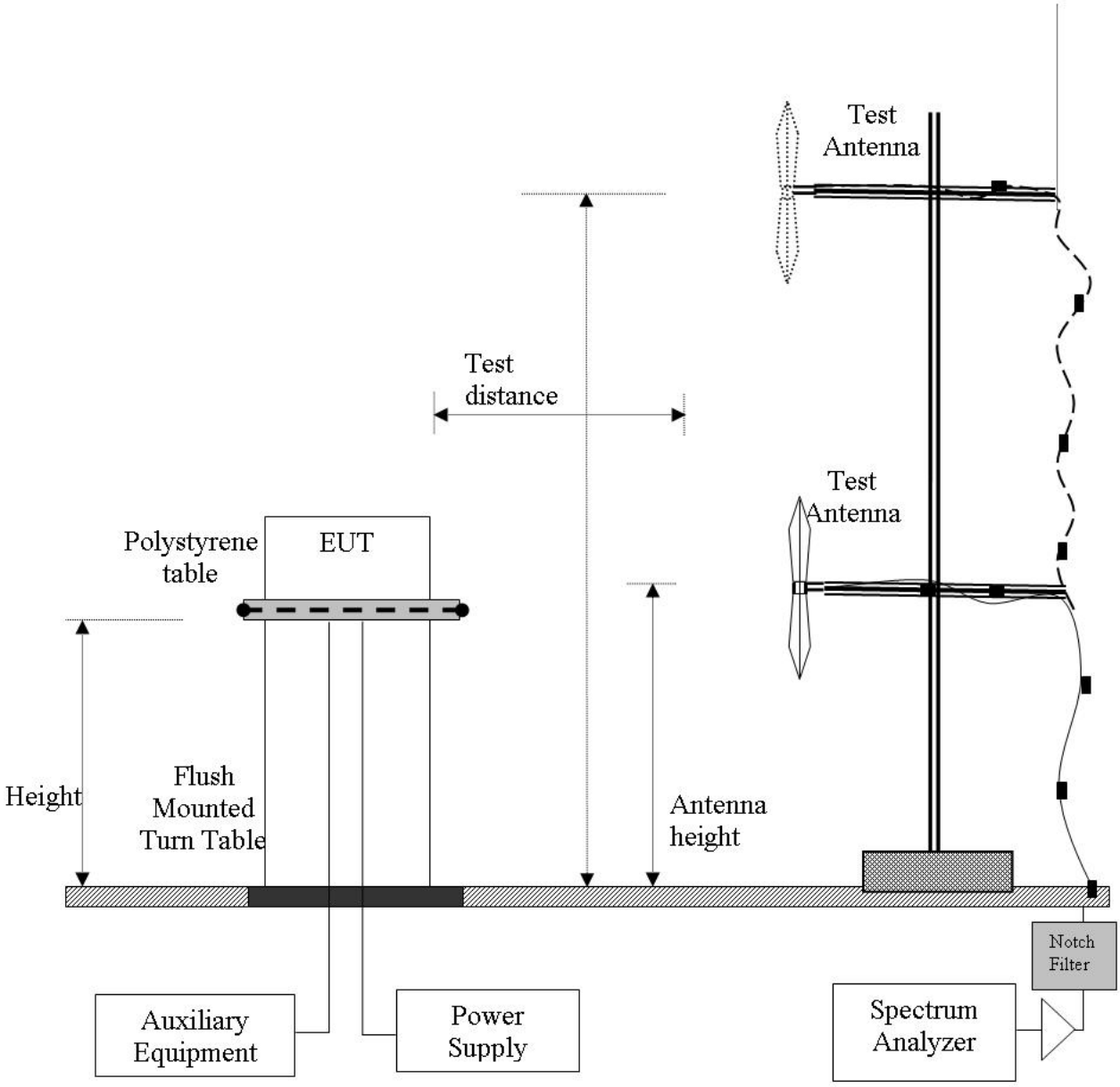
FCC, Part 15 Subpart B §15.109
Industry Canada ICES-003 §5

Test Procedure

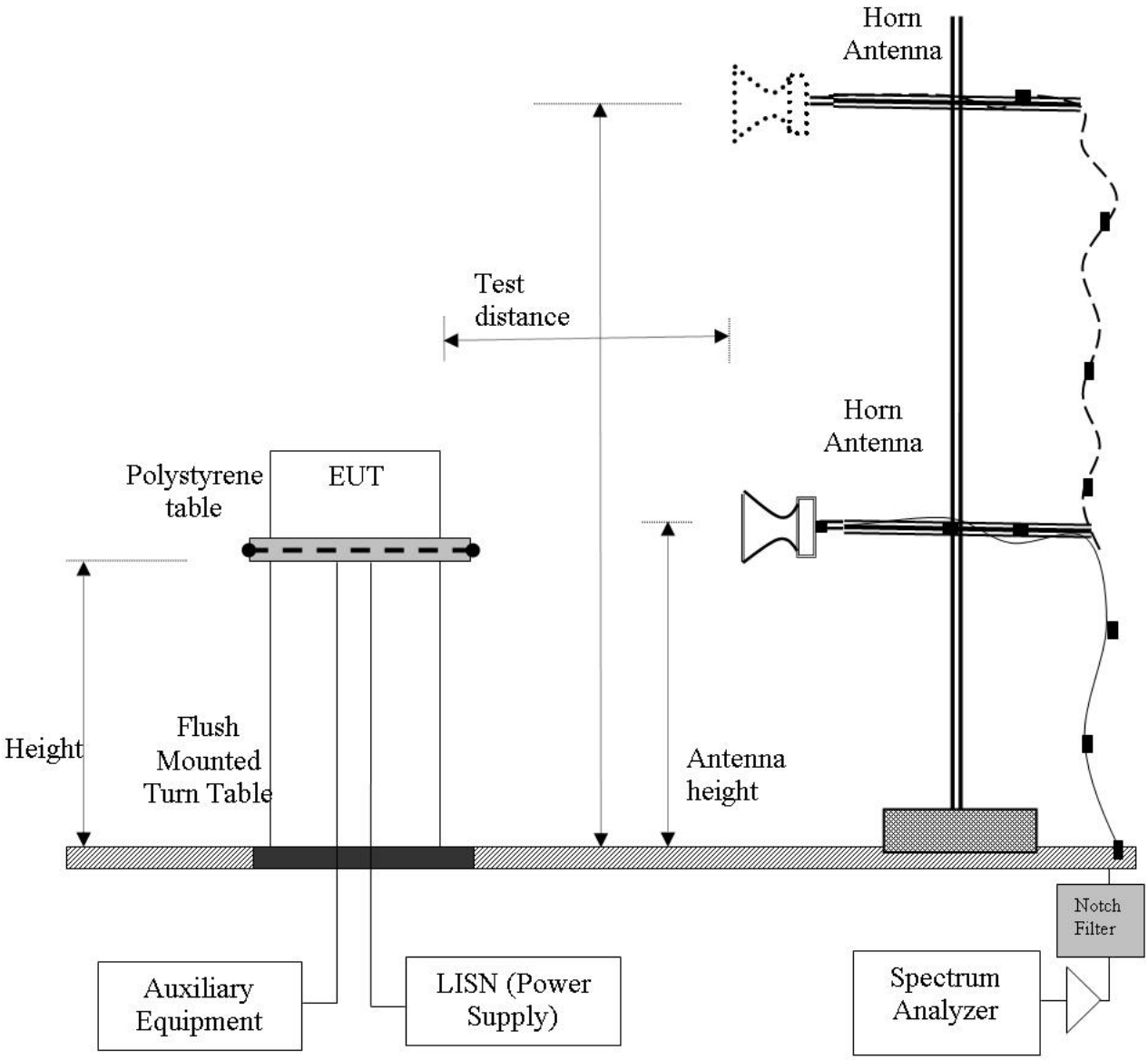
Testing was performed in a 3-meter semi-anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR Compliant receiver. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Only the highest emissions relative to the limit are listed.

Test Measurement Set up



Measurement set up for Radiated Emission Test < 1 GHz



Measurement set up for Radiated Emission Test > 1 GHz

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR – FO

FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Specification

Radiated Spurious Emissions – Digital Apparatus

FCC, Part 15 Subpart B §15.109
A representative type or model of each digital apparatus shall be tested in accordance with the measurement methods described in FCC Part 15; Subpart A - General and FCC Subpart B – Unintentional Radiators.

Industry Canada ICES-003
A representative type or model of each digital apparatus shall be tested in accordance with the measurement method described in the publication referred to in Section 7.1 [Canadian Standards Association Standard CAN/CSA-CEI/IEC CISPR 22:02, "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment."].

FCC, Part 15 Subpart B §15.109 Spurious Emissions Limits

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values.

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Field Strength of radiated emissions for a Class A digital device are as follows.

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	49.5	3
88-216	150	54.0	3
216-960	200	57.0	3
Above 960	500	60.0	3

ICES-003 §5 Spurious Emissions Limits

Class A Digital Device: The field intensity of radio noise emissions that are radiated from a Class A digital apparatus shall not exceed the limits specified in Table 5 of the publication referred to in Section 7.1, within the indicated frequency range.

Frequency range MHz	Quasi-peak limits dB(µV/m) @ 10m	Quasi-peak limits dB(µV/m) @ 3m
30 to 230	40	50.5
230 to 1 000	47	57.5
Note 1	The lower limit shall apply at the transition frequency.	
Note 2	Additional provisions may be required for cases where interference occurs	

Class B Digital Device: The field intensity of radio noise emissions that are radiated from a Class B digital apparatus shall not exceed the limits specified in Table 6 of the publication referred to in Section 7.1, within the indicated frequency range.

Frequency range MHz	Quasi-peak limits dB(µV/m) @ 10m	Quasi-peak limits dB(µV/m) @ 3m
30 to 230	30	40.5
230 to 1 000	37	47.5
Note 1	The lower limit shall apply at the transition frequency.	
Note 2	Additional provisions may be required for cases where interference occurs	

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement Uncertainty	+5.6/ -4.5 dB

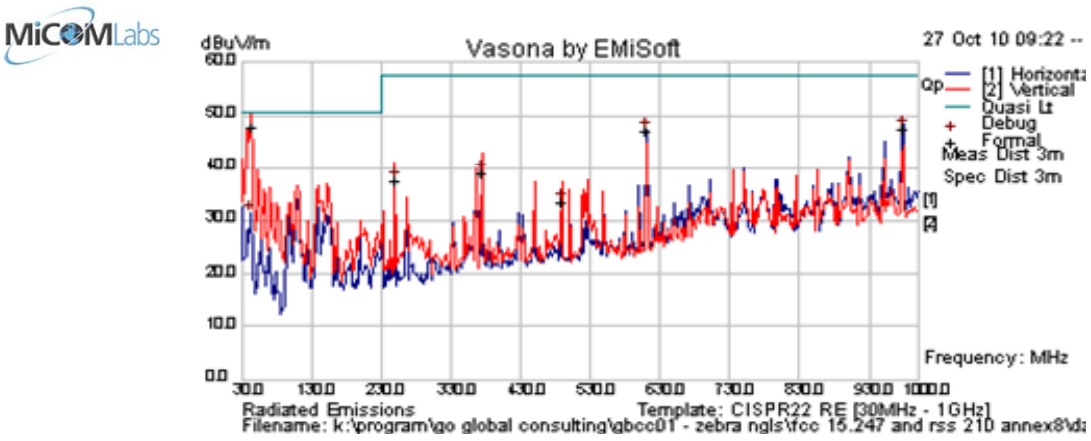
Traceability

Method	Test Equipment Used
Work instruction WI-03	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

7.8.1 Measurement Results for Radiated Spurious Emissions – Digital Apparatus

Please note: Radio emissions were investigated during digital emissions testing. No radio emissions were witnessed in the range 30 - 1000 MHz during testing.

Test Freq.	2441.75 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (°C)**	22
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	34
Power Setting	18 dBm Max	**Press. (mBars)**	1005
Antenna	AK-210-10 "Bull Horn" Omni all weather		
Test Notes 1	POE Adapter no ferrite(s)		
Test Notes 2	S/N# PW182RB4800F01		

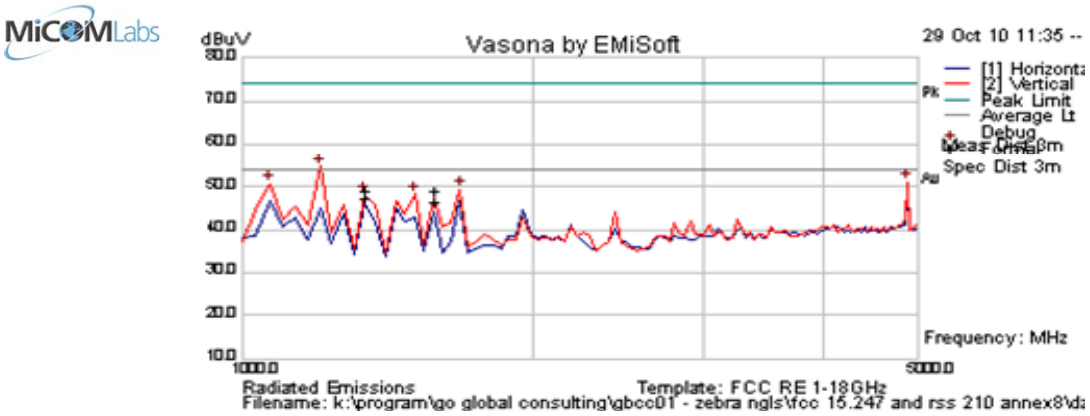


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
43.797	63.9	3.6	-19.6	48.0	Quasi Max	V	119	30	50.5	-2.6	Pass	
611.219	51.9	6.4	-11.1	47.2	Peak [Scan]	H	98	343	57.5	-10.3	Pass	
249.924	51.3	5.0	-18.8	37.5	Peak [Scan]	V	98	343	57.5	-20.0	Pass	
374.069	48.5	5.6	-15.2	38.9	Peak [Scan]	V	98	343	57.5	-18.6	Pass	
978.757	46.2	7.6	-6.3	47.5	Peak [Scan]	H	98	343	57.5	-10.0	Pass	
489.181	39.9	6.0	-12.5	33.4	Peak [Scan]	V	98	343	57.5	-24.2	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Test Freq.	2412 MHz	**Engineer**	SB
Variant	802.11b/g; 1/6 Mbs	**Temp (°C)**	22
Freq. Range	1000 MHz - 5000 MHz	**Rel. Hum.(%)**	34
Power Setting	max power	**Press. (mBars)**	1005
Antenna	N/A - No Radio Emissions	**Duty Cycle (%)**	100
Test Notes 1	Ref Scan 1 to 5 GHz		
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1220.879	67.1	2.2	-14.5	54.8	Peak	V	152	74	74.0	-19.2	Pass	
4883.517	57.4	4.5	-9.3	52.6	Peak	V	151	237	74.0	-21.4	Pass	
1375.130	52.8	2.3	-13.9	41.2	Peak	V	98	274	74	-32.8	Pass	
1709.233	63.1	2.5	-13.4	52.3	Peak	V	98	337	74	-21.8	Pass	
1098.808	63.0	2.1	-16.3	48.8	Peak	V	152	33	74	-25.2	Pass	
1587.126	61.1	2.4	-14.5	49.0	Peak	V	98	206	74.0	-25.0	Pass	
1342.972	61.1	2.3	-14.1	49.2	Peak	V	202	223	74.0	-24.8	Pass	
1220.879	65.9	2.2	-14.5	53.5	Average	V	152	74	54	-0.5	Pass	
4883.517	54.4	4.5	-9.3	49.6	Average	V	151	237	54	-4.4	Pass	
1375.130	45.6	2.3	-13.9	34.0	Average	V	98	274	54	-20.0	Pass	
1709.233	61.0	2.5	-13.4	50.1	Average	V	98	337	54	-3.9	Pass	
1098.808	60.9	2.1	-16.3	46.6	Average	V	152	33	54	-7.4	Pass	
1587.126	58.6	2.4	-14.5	46.6	Average	V	98	206	54	-7.4	Pass	
1342.972	59.1	2.3	-14.1	47.2	Average	V	202	223	54	-6.8	Pass	
1272.545	62.7	2.2	-14.0	50.9	Peak [Scan]	V	200	0	54	-3.1	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

7.9 Conducted Disturbance at Mains Terminal (150 kHz – 30 MHz)

Standard Reference

FCC, Part 15 Subpart C §15.107
Industry Canada ICES-003 §5.3

Test not applicable - EUT Tested in host device Zebra Enterprise Solutions Corp. WhereLAN III LOCATION SENSOR

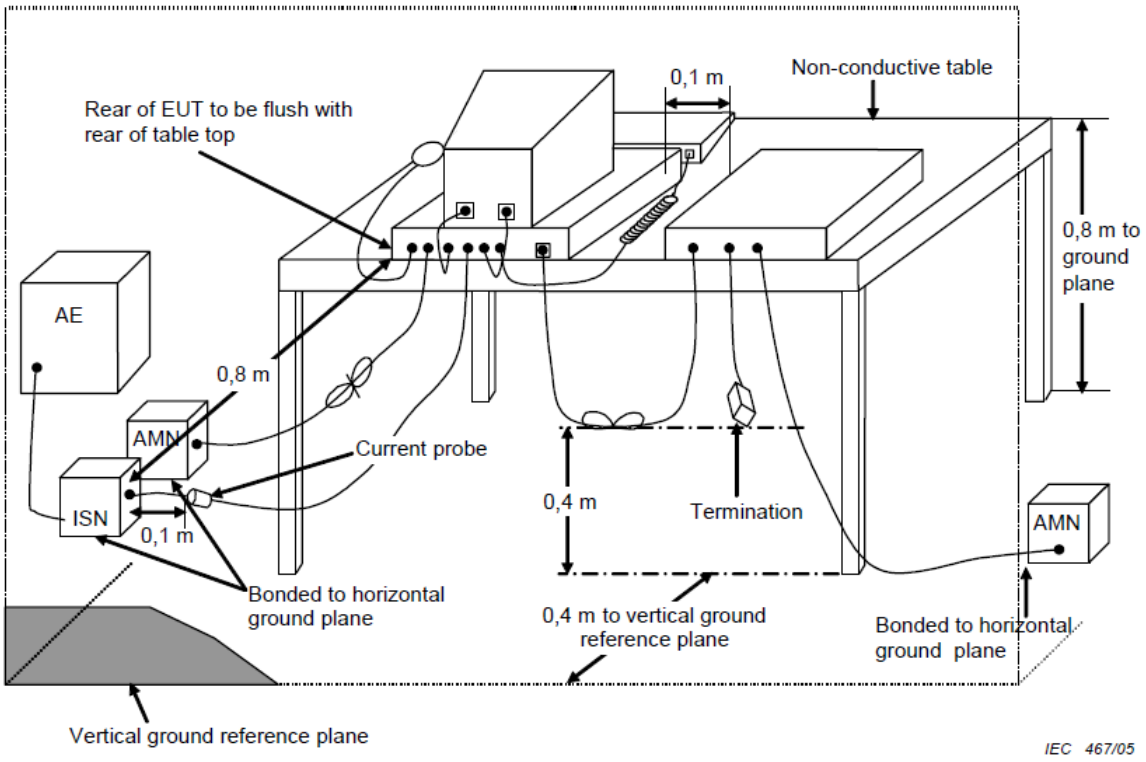
Test Procedure

The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

Test Measurement Set up



Measurement set up for Conducted Disturbance at Mains Terminals

Specification

Conducted Disturbance at Mains Terminal – Digital Apparatus

FCC, Part 15 Subpart B §15.107
(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

(b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Industry Canada ICES-003
The voltage of radio noise emissions that are conducted along the power supply lines of a Class A digital apparatus shall not exceed the limits specified in Table 1 of the publication referred to in Section 7.1 [Canadian Standards Association Standard CAN/CSA-CEI/IEC CISPR 22:02, "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment."], within the indicated frequency range.

The voltage of radio noise emissions that are conducted along the power supply lines of a Class B digital apparatus shall not exceed the limits specified in Table 2 of the publication referred to in Section 7.1 [Canadian Standards Association Standard CAN/CSA-CEI/IEC CISPR 22:02, "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment."], within the indicated frequency range.

FCC, Part 15 Subpart B §15.107 & Industry Canada ICES-003 Limits

Limits for conducted disturbance at the mains ports of class B ITE

Frequency of emission (MHz)	Quasi-peak dBuV	Average dBuV
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50
Note 1	* Decreases with the logarithm of the frequency	
Note 2	* The lower limit applies at the boundary between frequency ranges	

Limits for conducted disturbance at the mains ports of class A ITE

Frequency of emission (MHz)	Quasi-peak dBuV	Average dBuV
0.15–0.5	79	66
0.5–30	73	60
Note 1	* The lower limit shall apply at the transition frequency.	

Laboratory Measurement Uncertainty for Conducted Emissions

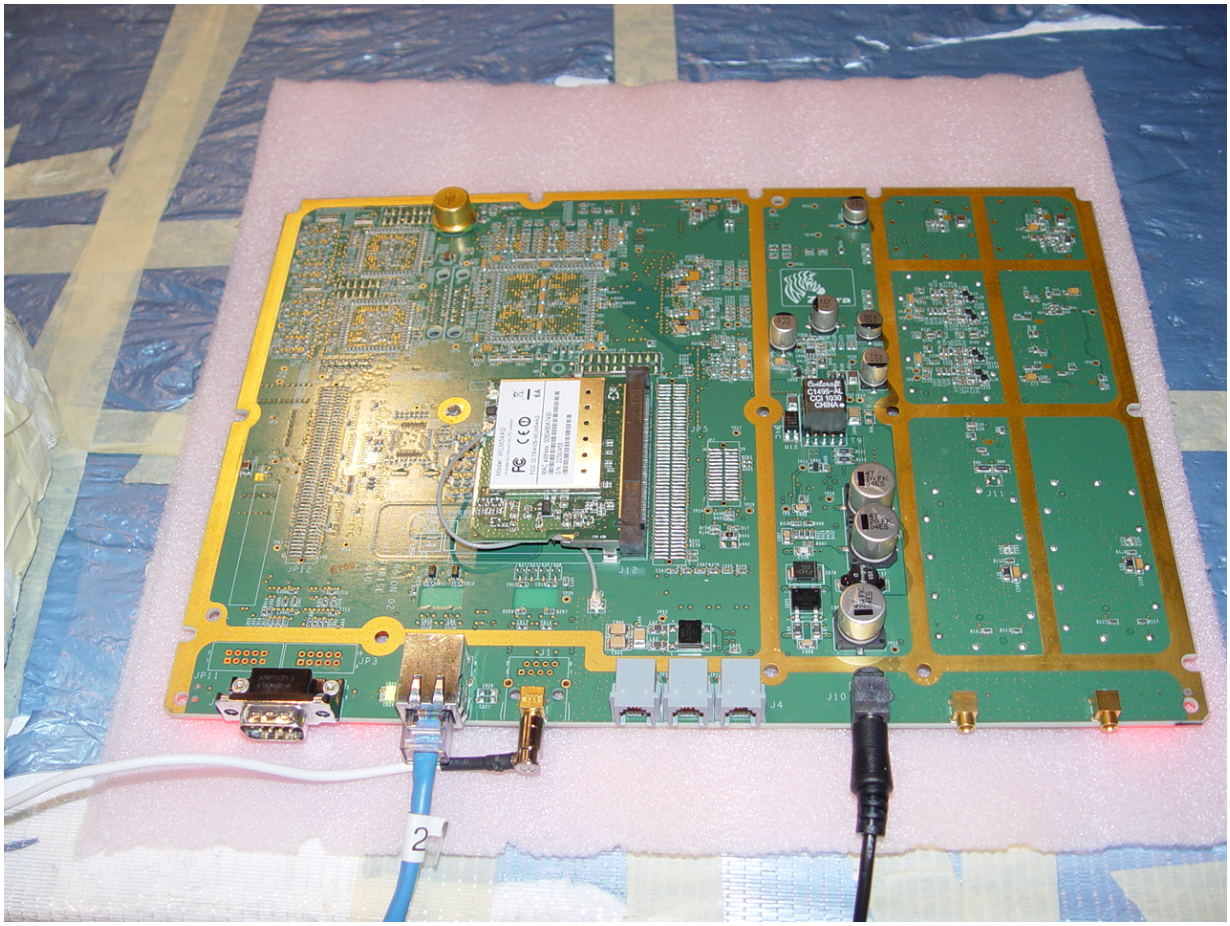
Measurement uncertainty	±2.64 dB

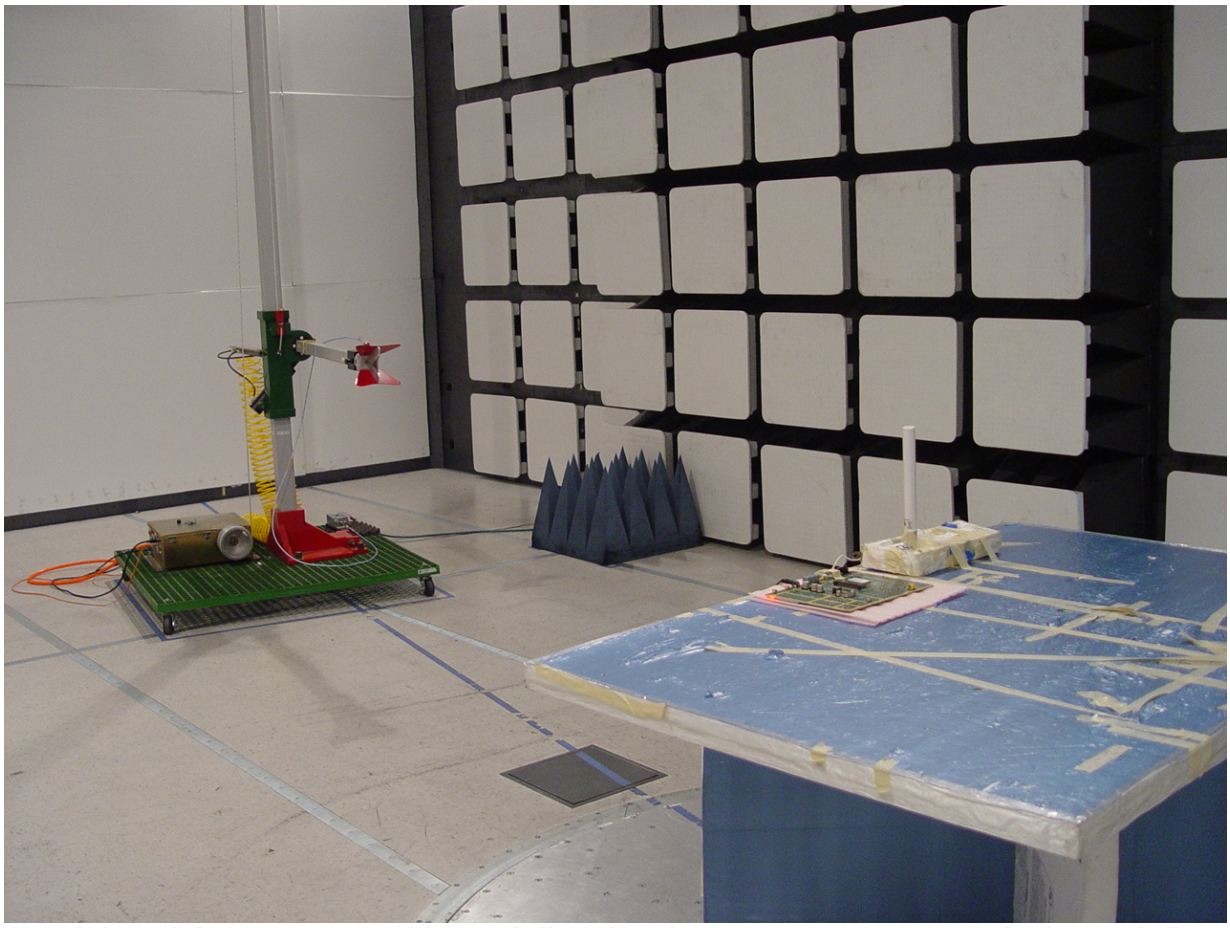
Traceability

Method	Test Equipment Used
Work instruction WI-EMC-01	0158, 0184, 0193, 0190, 0293, 0307

8 PHOTOGRAPHS

8.1 Test Setup Photos





WiFi Module WLM54AG with omni directional antenna AIR-ANT2506 (gain 5.2 dBi)

WiFi Module WLM54AG with yagi directional antenna AIR-ANT1949 (gain 13.5 dBi)

9 TEST EQUPIMENT DETAILS

Asset #	Instrument	Manufacturer	Model #	Serial #
0072	Signal Generator	Hewlett Packard	HP 83640A	2927A00105
0075	Environmental Chamber	Thermatron	SE-300-2-2	27946
0338	Antenna (30M-3GHz)	Sunol Sciences	JB3	A052907
0083	Coupler	Hewlett Packard	HP 87301D	3116A00389
0287	EMI Receiver	Rhode & Schwartz	ESIB 40	100201
0335	Horn Antenna	The Electro-Mechanics Company	3117	00066580
0116	Power Sensor	Hewlett Packard	8485A	3318A19694
0117	Power Sensor	Hewlett Packard	8487D	3318A00371
0134	Amplifier	ComPower	PA-122	181910
0158	Barometer /Thermometer	Control Co.	4196	E2844
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007
0223	Power Meter	Hewlett Packard	HP EPM-442A	US37480256
0252	K-Cable	Megaphase	Sucoflex 104	Unknown
0253	K-Cable	Megaphase	Sucoflex 104	Unknown
0256	K-Cable	Megaphase	Sucoflex 104	Unknown
0251	K-Cable	Megaphase	Sucoflex 104	Unknown
0305	20M-2GHz Amplifier	ML	ML001	001
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001
0313	Coupler	Hewlett Packard	86205A	3140A01285
0314	30 dB N-Type Attenuator	ARRA	N944-30	1623
Dipole	20MHz-1GHz Dipole Antennas	EMCO	3121C	9009-505

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