Test of Polycom Spectralink 8440 Wi-Fi handset with Bluetooth

To: FCC 47 CFR Part 15, SubPart C 15.247 & RSS-210 Annex 8

Test Report Serial No.: POLY06-U7a Rev A

MiCOM Labs

opening wireless markets

TEST REPORT

From

Test of: Polycom Spectralink 8440 Wi-Fi handset with Bluetooth

To: FCC 47 CFR Part 15, SubPart C 15.247 & RSS-210 Annex 8

Test Report Serial No.: POLY06-U7a Rev A

Reference Test Report: POLY06-U18, POLY06-U7b

This report supersedes: None

Applicant: Polycom
4750 Willow Road
Pleasanton, CA 94588-2708
USA

Product Function: Wi-Fi handset with Bluetooth

Copy No: pdf **Issue Date:** 21st January 2011

This Test Report is Issued Under the Authority of;

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ACCREDITED

TESTING CERTIFICATE #2381.01

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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 The American Association for Laboratory Accreditation

World Class 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*).

AMERICAN 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
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

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Product Certification Body

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Pleasanton, CA

for technical competence as a

Product Certification Body

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC Guide 65:1996 *General requirements for bodies operating product certification systems*. This accreditation demonstrates technical competence for a defined scope and the operation of a quality management system for a Telecommunications Certification Body (TCB) meeting FCC (U.S.), and IC (Canada) requirements.

Presented this 24th day of June 2010.

President & CEO
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2011

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

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	21st January 2011	Initial Release

3 TEST RESULT CERTIFICATE

Applicant:	Polycom 4750 Willow Road Pleasanton California , 94588-2708, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
Product:	Spectralink 8400 series Wi-Fi handsets with Bluetooth	Telephone:	+1 925 462 0304
Model No.:	Spectralink 8440	Fax:	+1 925 462 0306
S/No's:	600826511 (radiated) 600826501 (conducted)		
Date(s) Tested:	Nov 19th - Dec 10th, 2010	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15, SubPart C 15.247 & RSS-210 Annex 8	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.	FCC 47 CFR Part 15, SubPart C 15.247	2010	Title 47: Telecommunication PART 15—RADIO FREQUENCY DEVICES Subpart C—Intentional Radiators
ii.	RSS-210 Annex 8	2010	Radio Standards Specification 210, Issue 8, Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment,
iii.	RSS-GEN	2010	Radio Standards Specification-Gen, Issue 3, General Requirements and Information for the Certification of Radiocommunication Equipment,
iv.	47 CFR Part 15, SubPart B	2010	47 CFR Part 15, SubPart B; Unintentional Radiators
v.	ICES-003	2004	Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard Digital Apparatus; Issue 4
vi.	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
vii.	CISPR 22/ EN 55022	2008 2006+A1:2007	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
viii.	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
ix.	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
x.	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
xi.	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.

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5 TEST SUMMARY

List of Measurements: The following table represents the list of measurements required under FCC 47 CFR Part 15, SubPart C 15.247 & industry Canada RSS-210 Annex 8.

Standard Section(s)	Test Description	Condition	Result	Notes	Test Report Section
15.247 (a)(2)	6 dB Occupied Bandwidth	Conducted	PASS	Note 1,2,3,5	7.1
15.247 (i)	Maximum Permissable Exposure	Calculation	PASS	Note 1,2,3,5	7.2
15.247 (b)(3), 15.247 (b)(4)	Peak Output Power	Conducted	PASS	Note 1,2,3,5	7.3
15.247 (e)	Peak Power Spectral Density	Conducted	PASS	Note 1,2,3,5	7.4
15.247 (d)	Spurious Emissions	Conducted	PASS	Note 1,2,3,5	7.5
15.247 (d), 15.205, 15.209	Transmitter Radiated Spurious Emissions	Radiated	PASS	Note 1,2,3	7.6.1
15.247 (d), 15.205, 15.209	Radiated Band-Edge	Radiated	PASS	Note 1,2,3	7.6.2
RSS-GEN	Radiated Peak Emissions	Radiated	PASS	Note 1,2,3	7.6.3
RSS-GEN	Radiated Receiver Emissions	Radiated	PASS	Note 1,2,3	7.6.4
15.207	AC Wireline Emissions 0.15 – 30 MHz	Conducted	PASS	Note 1,2,3,4	7.7
15.109	Radiated (Digital) Emissions	Radiated	PASS	Note 1,2,3,4	N/A

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 6.11 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix

Note 4: Test results are presented in MiCOM Labs test report POLY06-U18.

Note 5: Radio's included within the Spectralink 8400 Series wireless handsets are declared identical by the manufacturer. EUT's were tested for RF output power. Unit and model (Model: 8450 S/N: 600826501) with highest output power was utilized for testing.

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6 PRODUCT DETAILS AND TEST CONFIGURATIONS

6.1 Test Program Scope

The scope of the test program was to test the WiFi transmitter (802.11a/b/g/n) utilized in the Polycom Spectralink 8440 Wi-Fi handset with Bluetooth for compliance against FCC 47 CFR Part 15, SubPart C 15.247 & RSS-210 Annex 8.

APPLICANT: Polycom **PRODUCT:** Spectralink 8440 Wi-Fi handset Front

APPLICANT: Polycom **PRODUCT:** Spectralink 8440 Wi-Fi handset Back

APPLICANT: Polycom **PRODUCT:** AC-DC Adapter/ Charger Model SA106B-05 for Spectralink 8400 series handsets

6.2 EUT Details

Detail	Description
Purpose:	Test of the Polycom Spectralink 8440 Wi-Fi handset with Bluetooth for compliance against FCC 47 CFR Part 15, SubPart C 15.247 & RSS-210 Annex 8
Applicant:	Polycom 4750 Willow Road Pleasanton, CA 94588-2708 USA
Manufacturer:	Same as Applicant
Test Laboratory:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	POLY06-U7a
Date EUT received:	11/11/2010
Dates of test (from - to):	11/19/2010 - 12/09/2010
No of Units Tested:	S/N: 600826511 (radiated) S/N: 600826501 (conducted)
Product Name:	Spectralink 8400 series Wi-Fi handset
Manufacturers Trade Name:	Polycom Spectralink 8400 series Wi-Fi handsets
Model No.:	Spectralink 8440 handset with Bluetooth
Equipment Primary Function:	Wi-Fi handset with Bluetooth
Equipment Secondary Function(s):	N/A
Type of Technology:	802.11a/b/g/n with Bluetooth
Installation type:	Portable
Construction/Location for Use:	Indoor/Outdoor
Software/Firmware Release:	fcc-1.8 (test software)
Test Software Release:	fcc-1.8 (test software)
Rated Input Voltage and Current DC:	Nominal:3.8V; Battery: 3.5V - 4.2V, Charger (USB or Base) supply: 5V +/- 10%
Operating Temperature Range ºC:	Min: 0 °C Max: 40 °C
Equipment Dimensions:	5.75” x 2.125” x 0.9”
Weight:	8 oz
Long Term Frequency Stability:	20 p.p.m.
Transmit/Receive Operation:	Full Duplex
Output Power Type	Fixed

6.3 External A.C. / D.C. Power Adaptor

Model	Description
SA106B-05	GCI Technologies switching adaptor: Input: 100 - 240V AC; 50-60 Hz; 0.25 Amp Output: 5V DC; 1 Amp

6.4 Operational Power Range

Fundamental Frequency (MHz)	Utility Setting Used During Tests	Measured Output Power (dBm)	TX SPR: Utility Setting Used During Test	Band Edge: Utility Setting Used During Test	Compliant Test Utility Setting	Compliant Output Power (dBm)
802.11b	Conducted RF Emissions		Radiated RF Emissions		Final Results	
2412	24	16.72	24	24	24	16.72
2437	24	17.70	24		24	17.70
2462	24	17.50	24	24	24	17.50
802.11g	Conducted RF Emissions		Radiated RF Emissions		Final Results	
2412	24	16.22	24	24	24	16.22
2437	24	17.34	24		24	17.34
2462	24	17.20	24	15	15	16.00
802.11n HT-20	Conducted RF Emissions		Radiated RF Emissions		Final Results	
2412	24	16.21	24	24	24	16.21
2437	24	17.16	24		24	17.16
2462	24	17.00	24	16	16	16.70
5745	24	19.11	24	24	24	19.11
5785	24	19.00	24		24	19.00
5825	24	18.68	24		24	18.68
802.11a	Conducted RF Emissions		Radiated RF Emissions		Final Results	
5745	24	19.11	24	24	24	19.11
5785	24	19.16	24		24	19.16
5825	24	18.84	24		24	18.84

6.5 Types of Modulation Supported

Modulation / Mode	BW 1
802.11b	DSSS/CCK
802.11g	DSSS
802.11n HT-20 (2.4GHz)	OFDM
802.11a	OFDM
802.11n HT-20 (5.8GHz)	OFDM

6.6 Antenna Details

The following is a description of the EUT antennas.

Antenna Type	Manufacturer	Model	Gain	Frequency Range
Plated antenna on PCB	Polycom	N/A	2.5 dBi	2400 - 2483.5 MHz 5150 - 5850 MHz

6.7 Cabling and I/O Ports

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

Type of I/O Ports	Description	Screened (Y/N)	Length	Qty	Tested (Y/N)
Battery terminal	Battery connections for removable battery	N	N/A	1	N
1/8th" Stereo connector	Connection to hands free headset	Y	< 3 meters	1	Y
AC-DC Adapter/ Charger	Power connector - mini USB for charging using AC-DC Adapter/ Charger (model: SA106B-05)	Y	< 3 meters	1	Y
Charging terminals	Charging terminal for charging EUT with docking options	N	N/A	1	Y

6.8 EUT Configurations

Frequency Bands:

Test Mode	Start Freq. (MHz)	Stop Freq. (MHz)	Rated Output Power (Watts)	Frequency Tolerence (p.p.m.)	20dB BW (KHz)	Emission Designator	Microprocessor
802.11b	2412	2462	0.059	20	13900	13M9G1D	
802.11g	2412	2462	0.054	20	16500	16M5D1D	
802.11n HT-20	2412	2462	0.052	20	17600	17M6D1D	
802.11a	5725	5850	0.082	20	16600	16M6D1D	
802.11n HT-20	5725	5850	0.081	20	17700	17M7D1D	

Channel plan and spacing

Band (GHz)	Mode	Freq Band (MHz)	Freq Range (MHz)	Low Ch	Mid Ch	High Ch	# Ch	Ch Spacing (MHz)
2.4	802.11b	2400 - 2483.5	2412 - 2462	2412	2437	2462	11	5
2.4	802.11g	2400 - 2483.5	2412 - 2462	2412	2437	2462	11	5
2.4	802.11n HT-20	2400 - 2483.5	2412 - 2462	2412	2437	2462	11	5
5.8	802.11a	5725 - 5850	5745 - 5825	5745	5785	5825	5	20
5.8	802.11n HT-20	5725 - 5850	5745 - 5825	5745	5785	5825	5	20

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6.9 Equipment Details

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

Equipment	Equipment Description	Manufacturer	Model No.	Serial No (s).	Tested
Battery	Alpha SAMPLE	Polycom	ESB-RS657+002	AC10103200B7	N
Battery	Alpha SAMPLE	Polycom	ESB-RS657+002	AC1010320232	N
Battery	Alpha SAMPLE	Polycom	ESB-RS657+002	AC101032008E	Y
Battery	Alpha SAMPLE	Polycom	ESB-RS658+002	AD101032019C	N
Charging Dock	Alpha SAMPLE	Polycom	ESB-DCA39+001	AlphaB391741033	N
AC-DC Adapter	I.T.E. Power Supply	HON-KWANG	HK-U-120A050-CP	N/A	N
AC-DC Adapter/ Charger	Switching Adapter	GCi technologies	SA106B-05	N/A	Y
Speaker Dock	10uF @ U8 Pin4 to Ground Dock PCB Revision X4	Polycom	N/A	N/A	N
AC-DC Adapter	I.T.E. Power Supply	HON-KWANG	HK-AX-120A200-CP	N/A	N
Headset	Encore Headset	Plantronics	P/N: 29951-12	0E0723 K7	N

6.10 Test Configurations

Operational Mode(s)	Data Rate Tested	Duty Cycle
b	1 MBit/s	10 %
g	6 MBit/s	10 %
a	6 MBit/s	10 %
n HT-20	6.5 MCS	10 %

6.11 Equipment Modifications

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

1. NONE

6.12 Deviations from the Test Standard

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

1. NONE

7 TEST RESULTS

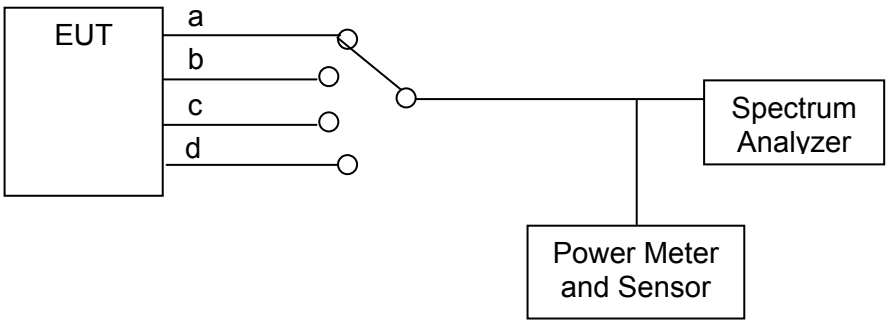
7.1 6 dB and 99% Bandwidth

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 setup for 6 dB & 99% Bandwidth

Specification for 6dB Bandwidth Limits

FCC §15.247 (a)(2)

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

Industry Canada RSS-210 §A8.2 (a)

These include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to all three bands:

(a) The minimum -6 dB bandwidth shall be at least 500 kHz.

Traceability

Method	Test Equipment Used
WI-03	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 (%):**	10	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	2.5	dBi
Applied Voltage:	4.20	Vdc			
Notes 1:					
Notes 2:					

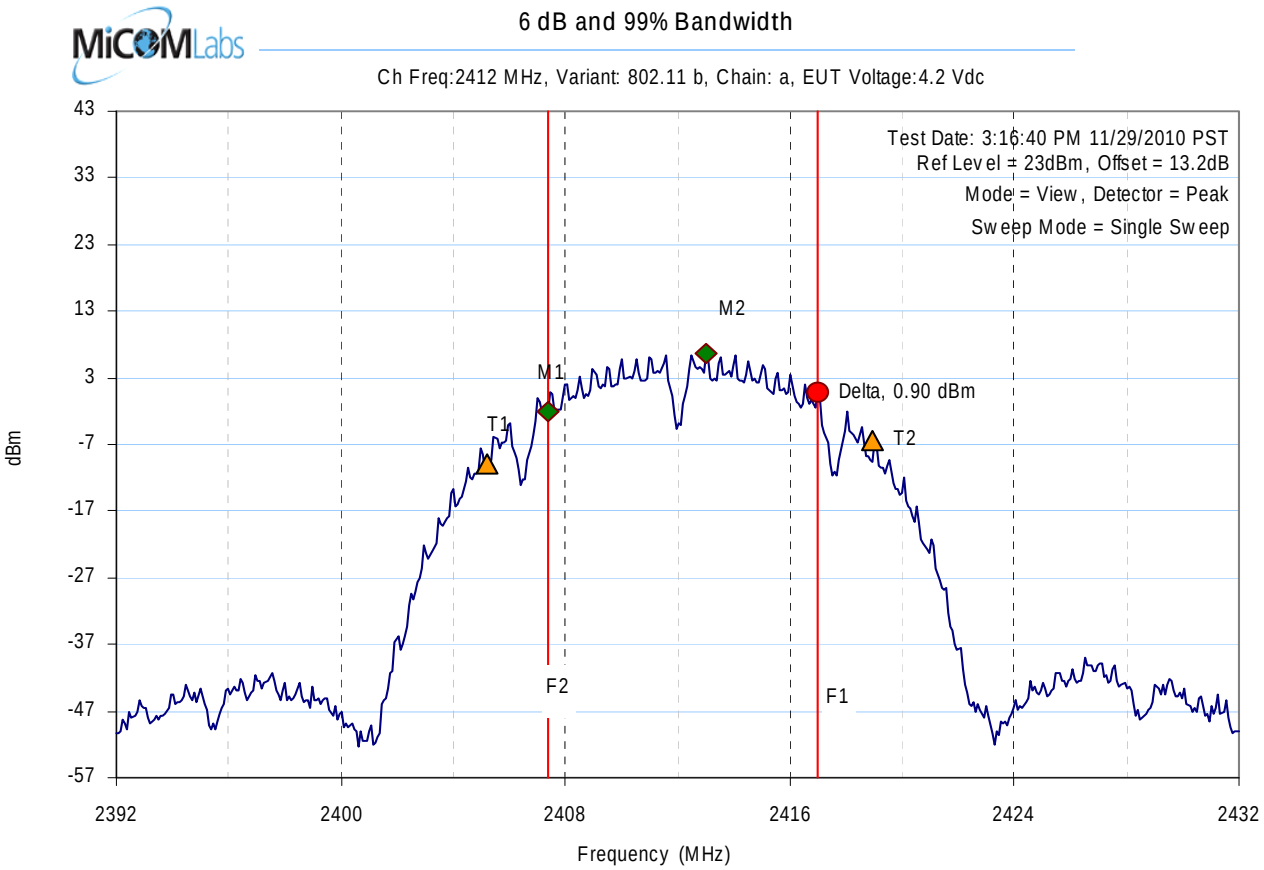
6 dB Bandwidth

Test Frequency	6 dB Bandwidth MHz				Minimum 6dB Bandwidth Limit		Margin
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
2412.000	9.619000	--	--	--	500	0.5	-9.119000
2437.000	9.138000	--	--	--			-8.638000
2462.000	9.138000	--	--	--			-8.638000

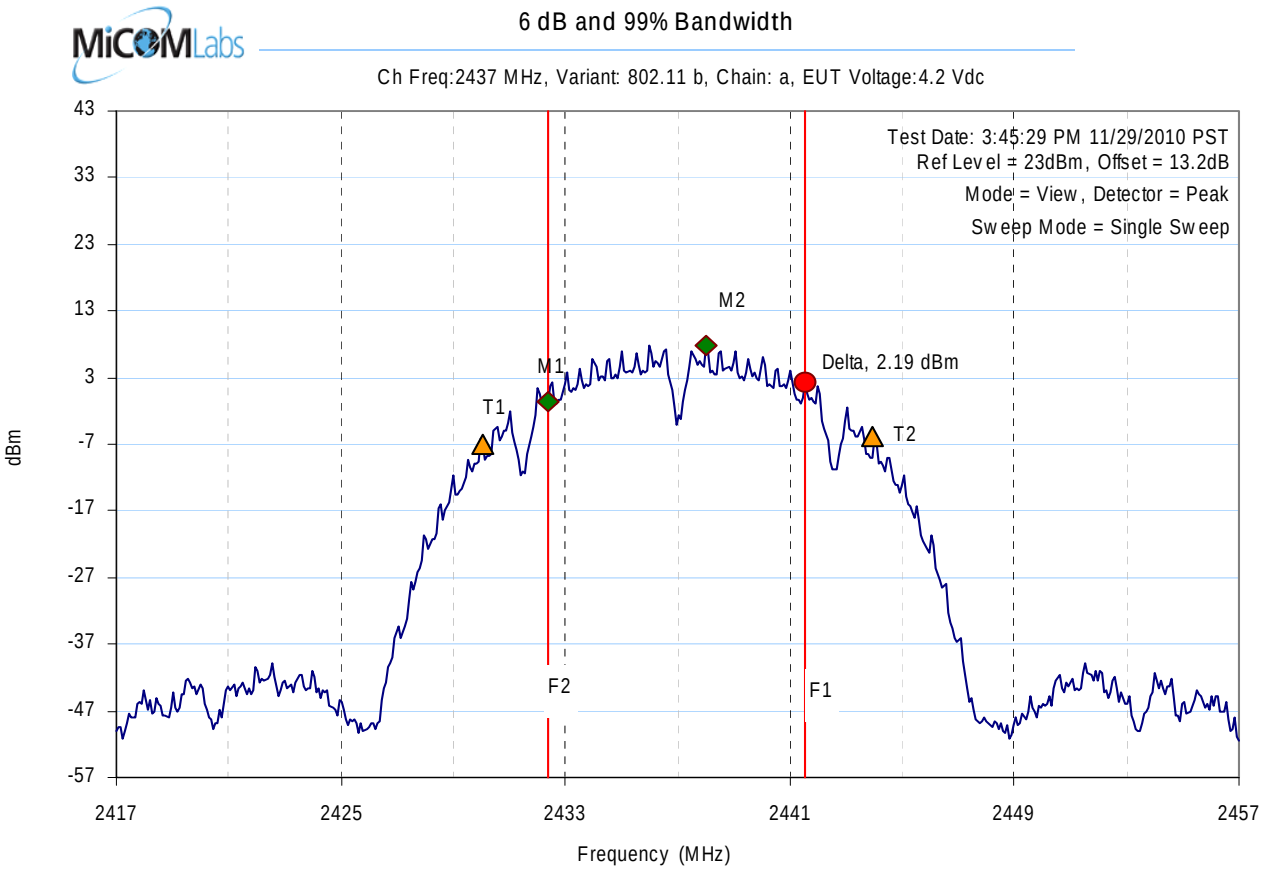
99% Bandwidth

Test Frequency	99 % Bandwidth MHz						
MHz	**a**	**b**	**c**	**d**			
2412.000	13.788000	--	--	--			--
2437.000	13.948000	--	--	--			
2462.000	13.948000	--	--	--			

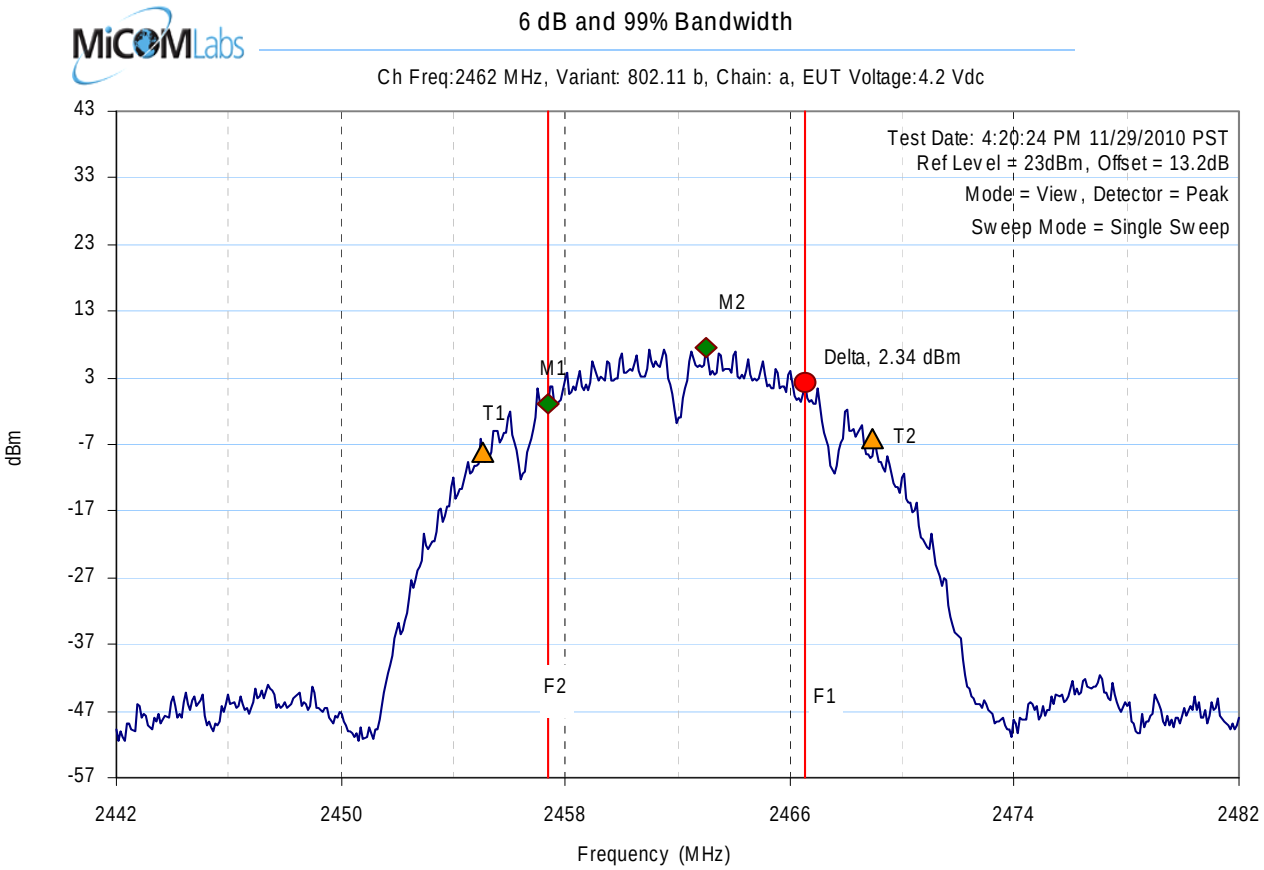
Measurement uncertainty:	±2.81 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2407.390782MHz : -1.948dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 2413.002004MHz : 6.657dBm	6dB BW(Delta-M1) = 9.619238MHz
Sweep time(s) = 20	Delta : 2417.010020MHz : .895dBm	99% OBW(T2-T1) = 13.787575MHz
RF Atten (dB) = 10	T1 : 2405.226453MHz : -9.949dBm	
Span = 40.00MHz	T2 : 2418.933868MHz : -6.471dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2432.390782MHz : -.730dBm	Center frequency = 2437MHz
VBW = 300.00KHz	M2 : 2438.002004MHz : 7.777dBm	6dB BW(Delta-M1) = 9.138277MHz
Sweep time(s) = 20	Delta : 2441.529058MHz : 2.187dBm	99% OBW(T2-T1) = 13.947896MHz
RF Atten (dB) = 10	T1 : 2430.066132MHz : -6.914dBm	
Span = 40.00MHz	T2 : 2443.933868MHz : -5.771dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2457.390782MHz : -.876dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 2463.002004MHz : 7.521dBm	6dB BW(Delta-M1) = 9.138277MHz
Sweep time(s) = 20	Delta : 2466.529058MHz : 2.335dBm	99% OBW(T2-T1) = 13.947896MHz
RF Atten (dB) = 10	T1 : 2455.066132MHz : -8.259dBm	
Span = 40.00MHz	T2 : 2468.933868MHz : -6.052dBm	

7.1.2 6 dB and 99% Bandwidth Results: 802.11g

Test Conditions:	15.247 (a)(2)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11g		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	10	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	2.5 dBi	
Applied Voltage:	4.20	Vdc			
Notes 1:					
Notes 2:					

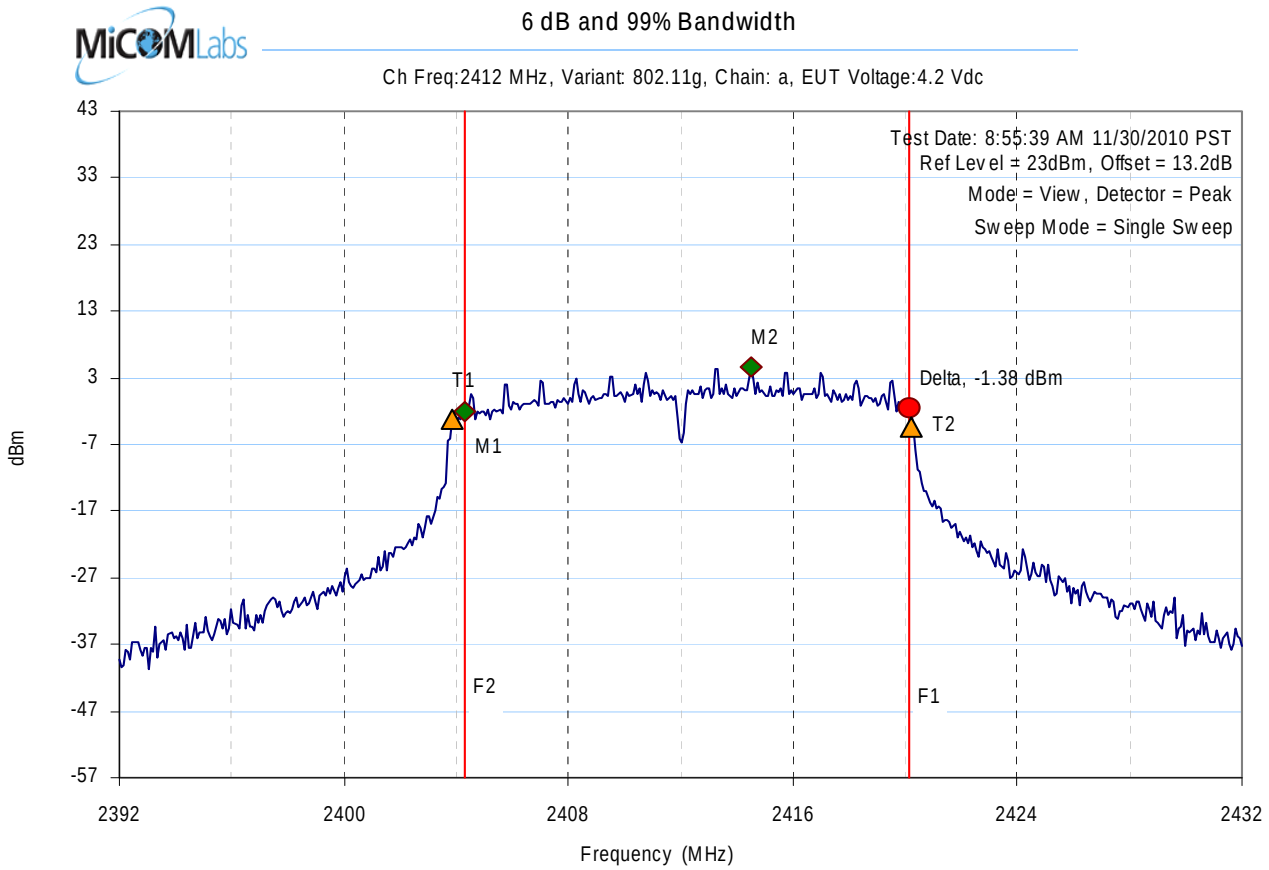
6 dB Bandwidth

Test Frequency	6 dB Bandwidth MHz				Minimum 6dB Bandwidth Limit		Margin
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
2412.000	15.792000	--	--	--	500	0.5	-15.292000
2437.000	15.551000	--	--	--			-15.051000
2462.000	15.711000	--	--	--			-15.211000

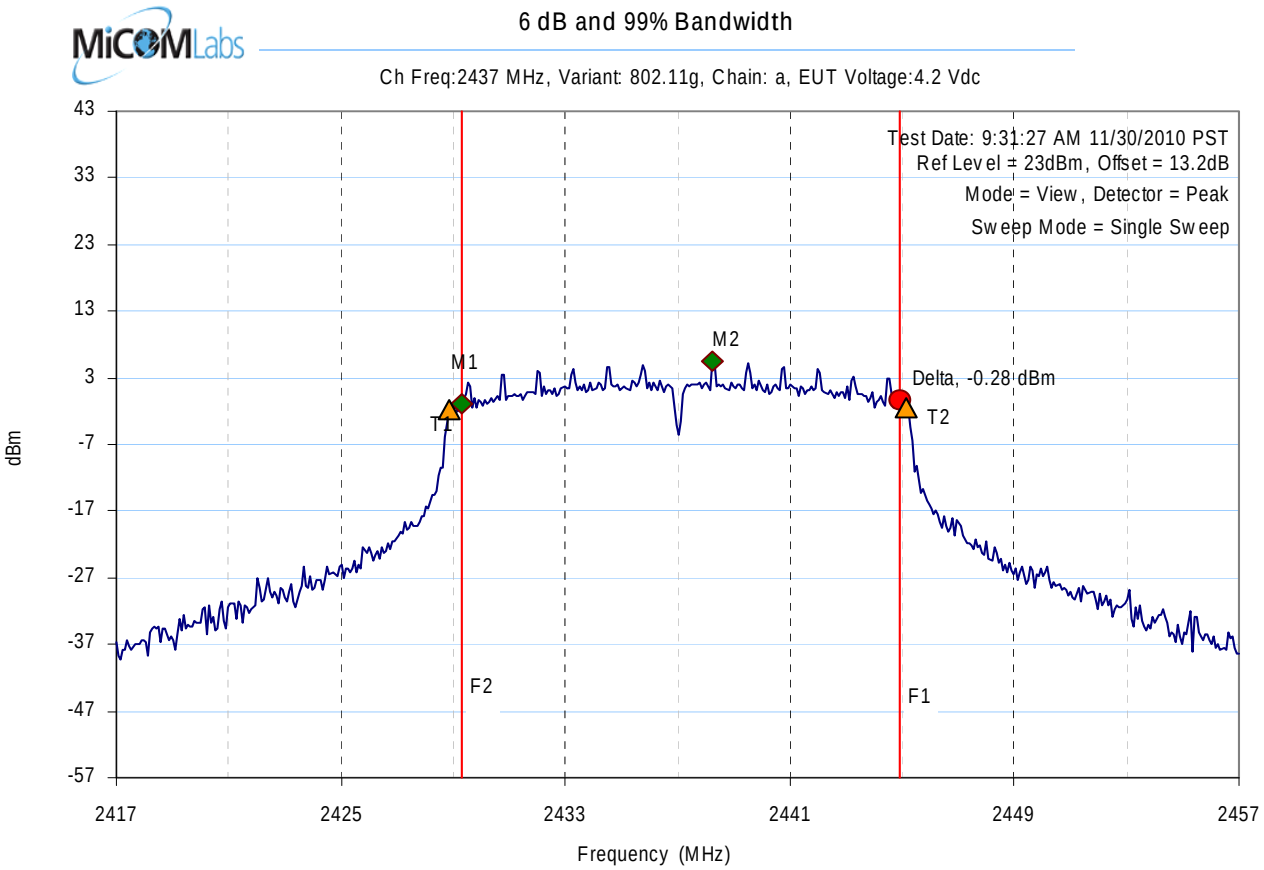
99% Bandwidth

Test Frequency	99 % Bandwidth MHz						
MHz	**a**	**b**	**c**	**d**			
2412.000	16.433000	--	--	--			
2437.000	16.353000	--	--	--			
2462.000	16.513000	--	--	--			

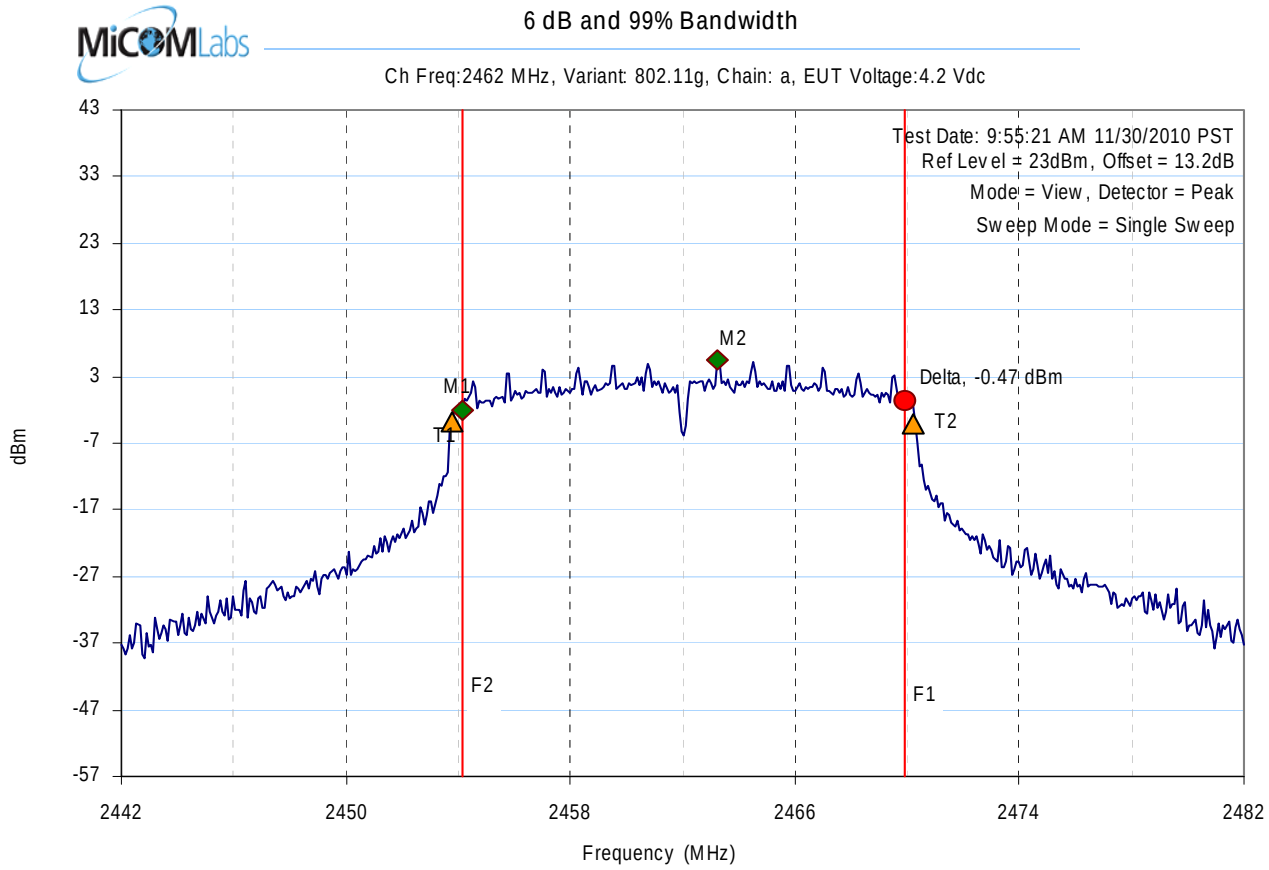
Measurement uncertainty:	±2.81 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2404.344689MHz : -1.976dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 2414.525050MHz : 4.558dBm	6dB BW(Delta-M1) = 15.791583MHz
Sweep time(s) = 20	Delta : 2420.136273MHz : -1.376dBm	99% OBW(T2-T1) = 16.432866MHz
RF Atten (dB) = 10	T1 : 2403.863727MHz : -3.335dBm	
Span = 40.00MHz	T2 : 2420.216433MHz : -4.279dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2429.344689MHz : -1.031dBm	Center frequency = 2437MHz
VBW = 300.00KHz	M2 : 2438.242485MHz : 5.374dBm	6dB BW(Delta-M1) = 15.551102MHz
Sweep time(s) = 20	Delta : 2444.895792MHz : -.282dBm	99% OBW(T2-T1) = 16.352705MHz
RF Atten (dB) = 10	T1 : 2428.863727MHz : -1.901dBm	
Span = 40.00MHz	T2 : 2445.136273MHz : -1.56dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2454.184369MHz : -1.954dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 2463.242485MHz : 5.367dBm	6dB BW(Delta-M1) = 15.711423MHz
Sweep time(s) = 20	Delta : 2469.895792MHz : -.465dBm	99% OBW(T2-T1) = 16.513026MHz
RF Atten (dB) = 10	T1 : 2453.783567MHz : -3.868dBm	
Span = 40.00MHz	T2 : 2470.216433MHz : -3.967dBm	

7.1.3 6 dB and 99% Bandwidth Results: 802.11n HT-20

Test Conditions:	15.247 (a)(2)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11n HT-20	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	10
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	2.5 dBi
Applied Voltage:	4.20 Vdc		
Notes 1:			
Notes 2:			

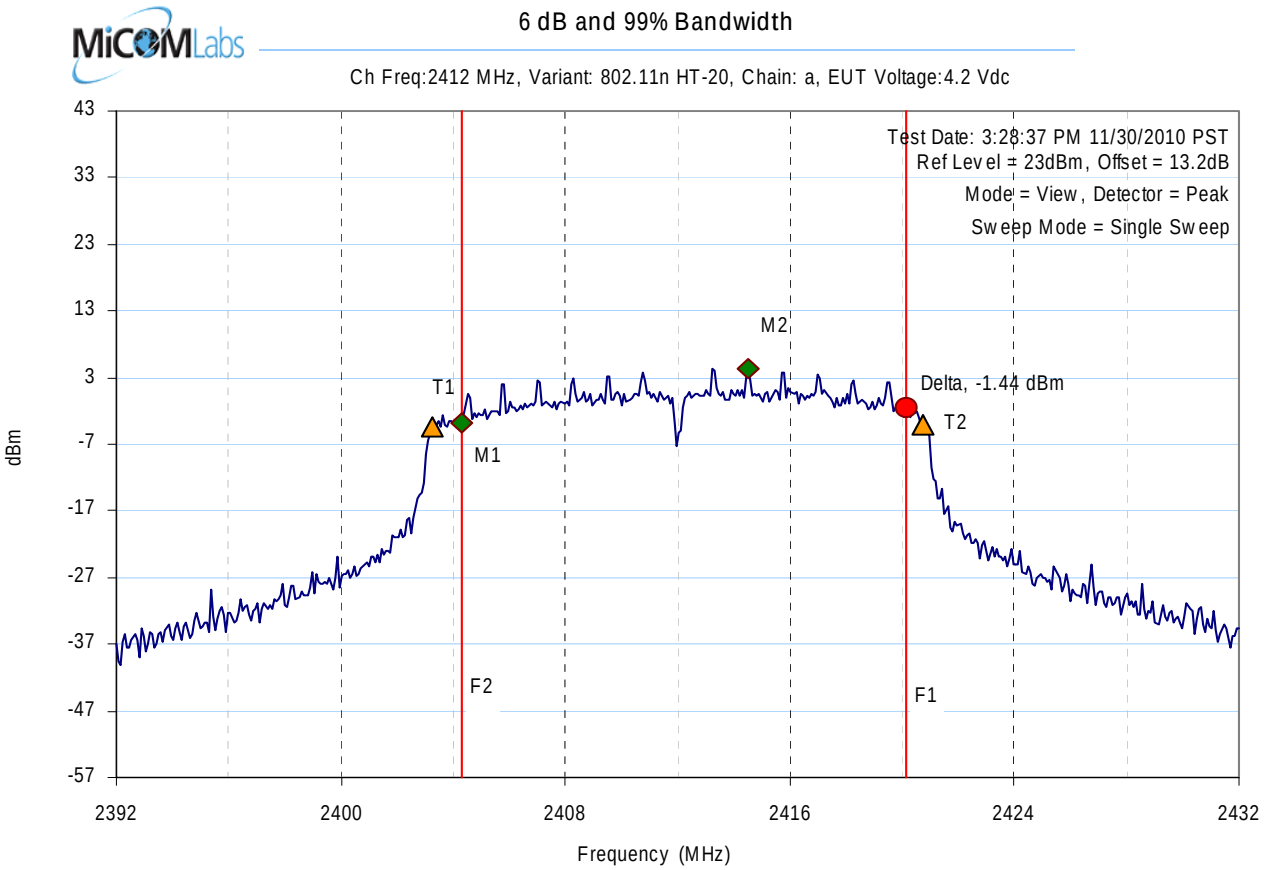
6 dB Bandwidth

Test Frequency	6 dB Bandwidth MHz				Minimum 6dB Bandwidth Limit		Margin
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
2412.000	15.792000	--	--	--	500	0.5	-15.292000
2437.000	15.551000	--	--	--			-15.051000
2462.000	15.391000	--	--	--			-14.891000

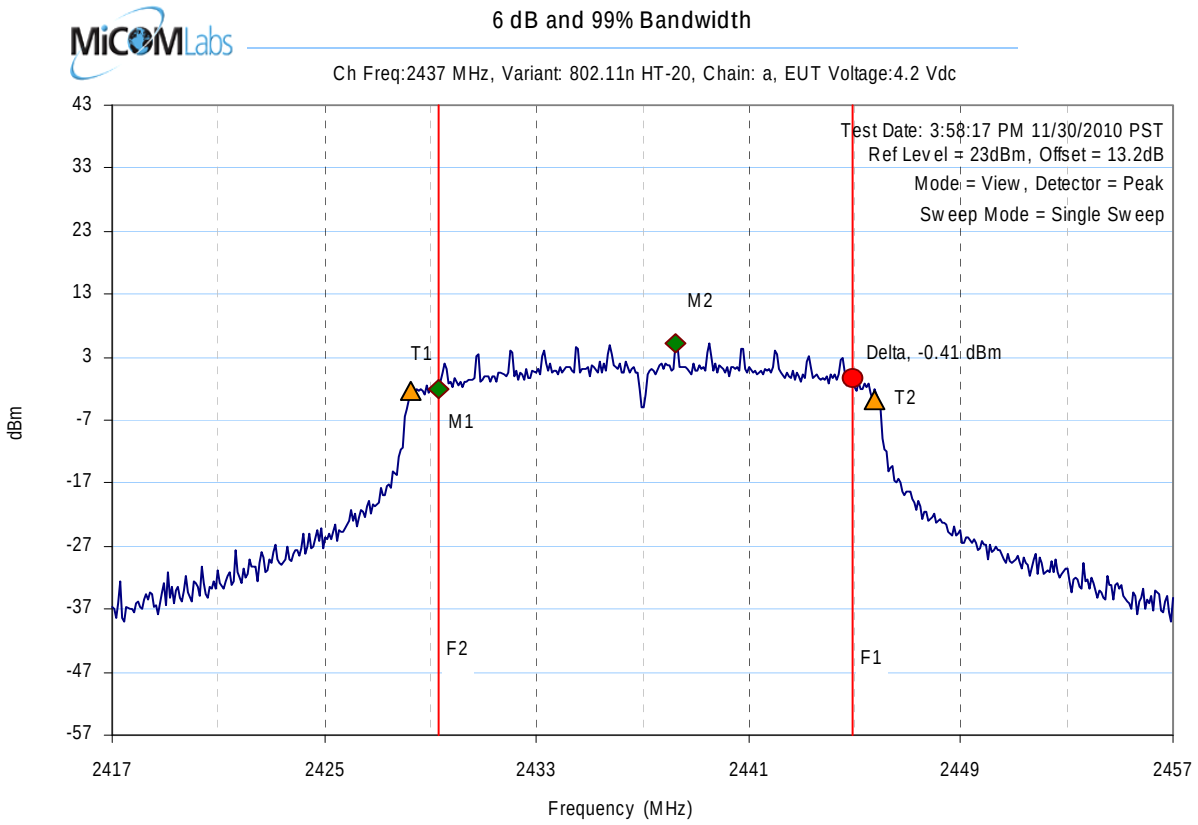
99% Bandwidth

Test Frequency	99 % Bandwidth MHz						
MHz	**a**	**b**	**c**	**d**			
2412.000	17.635000	--	--	--			
2437.000	17.635000	--	--	--			
2462.000	17.635000	--	--	--			

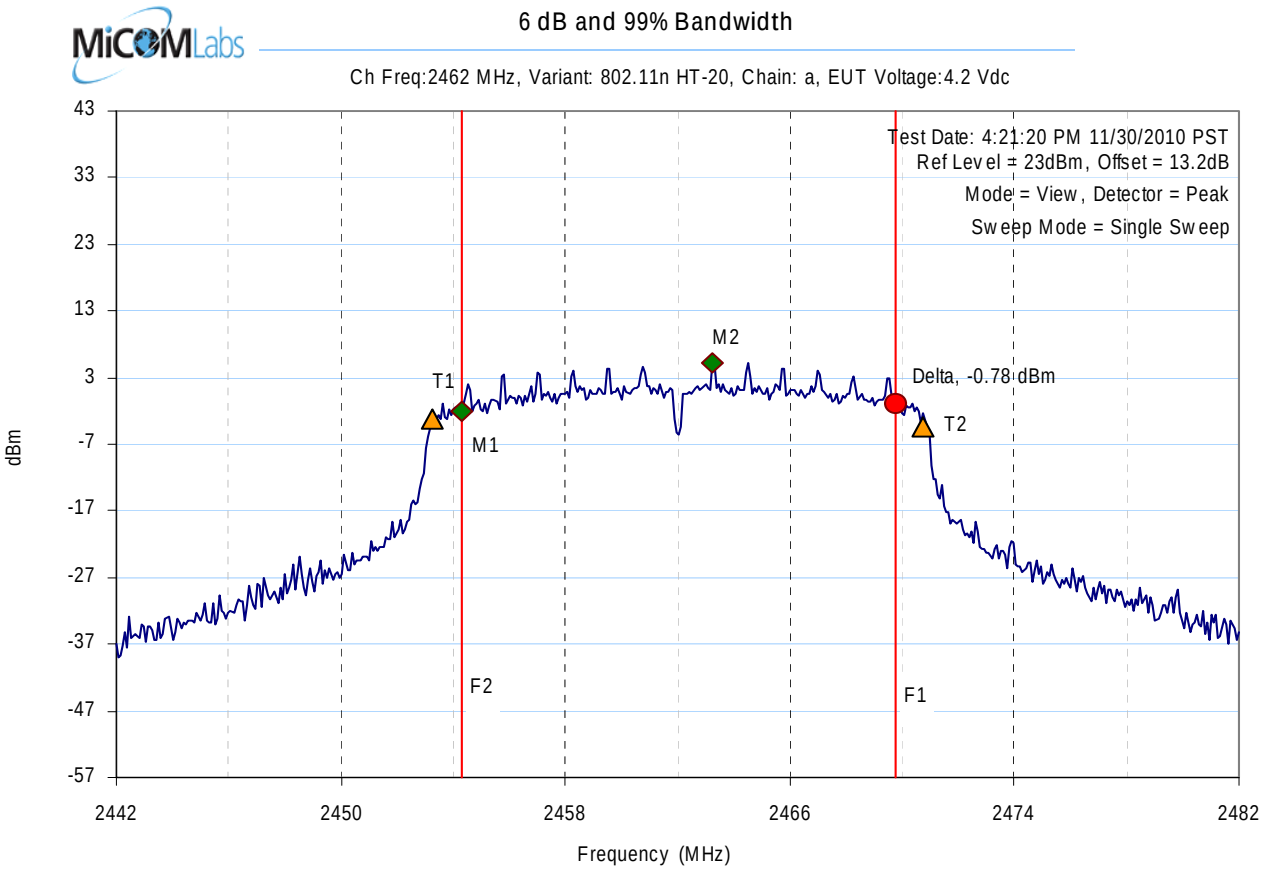
Measurement uncertainty:	±2.81 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2404.344689MHz : -3.744dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 2414.525050MHz : 4.405dBm	6dB BW(Delta-M1) = 15.791583MHz
Sweep time(s) = 20	Delta : 2420.136273MHz : -1.442dBm	99% OBW(T2-T1) = 17.635271MHz
RF Atten (dB) = 10	T1 : 2403.222445MHz : -4.490dBm	
Span = 40.00MHz	T2 : 2420.777555MHz : -4.13dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2429.344689MHz : -2.009dBm	Center frequency = 2437MHz
VBW = 300.00KHz	M2 : 2438.242485MHz : 5.188dBm	6dB BW(Delta-M1) = 15.551102MHz
Sweep time(s) = 20	Delta : 2444.895792MHz : -.415dBm	99% OBW(T2-T1) = 17.635271MHz
RF Atten (dB) = 10	T1 : 2428.222445MHz : -2.456dBm	
Span = 40.00MHz	T2 : 2445.777555MHz : -3.833dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2454.344689MHz : -2.164dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 2463.242485MHz : 5.156dBm	6dB BW(Delta-M1) = 15.390782MHz
Sweep time(s) = 20	Delta : 2469.735471MHz : -.777dBm	99% OBW(T2-T1) = 17.635271MHz
RF Atten (dB) = 10	T1 : 2453.222445MHz : -3.136dBm	
Span = 40.00MHz	T2 : 2470.777555MHz : -4.364dBm	

7.1.4 6 dB and 99% Bandwidth Results: 802.11a

Test Conditions:	15.247 (a)(2)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11a	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	10
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	2.5 dBi
Applied Voltage:	4.20 Vdc		
Notes 1:			
Notes 2:			

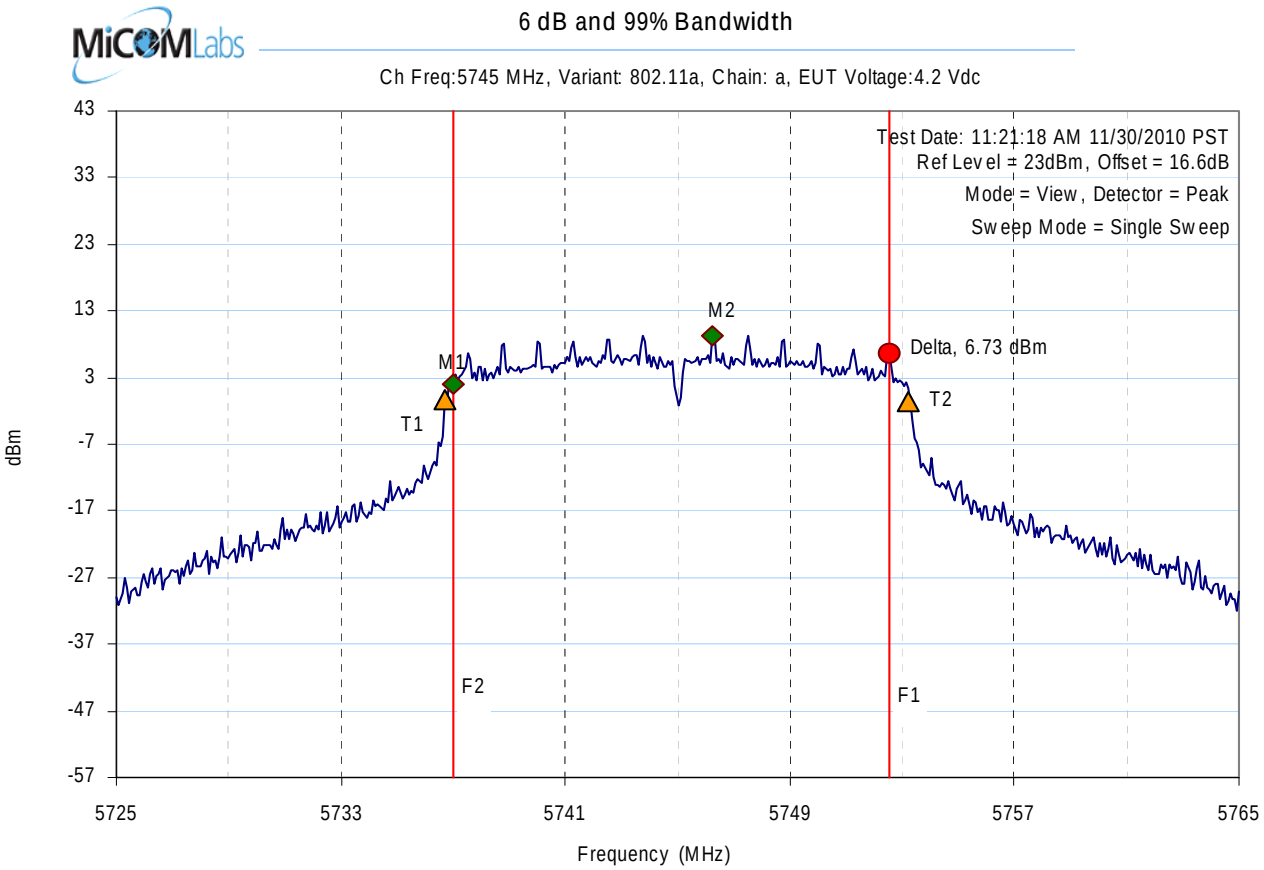
6 dB Bandwidth

Test Frequency	6 dB Bandwidth MHz				Minimum 6dB Bandwidth Limit		Margin
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
5745.000	15.551000	--	--	--	500	0.5	-15.051000
5785.000	15.551000	--	--	--			-15.051000
5825.000	15.230000	--	--	--			-14.730000

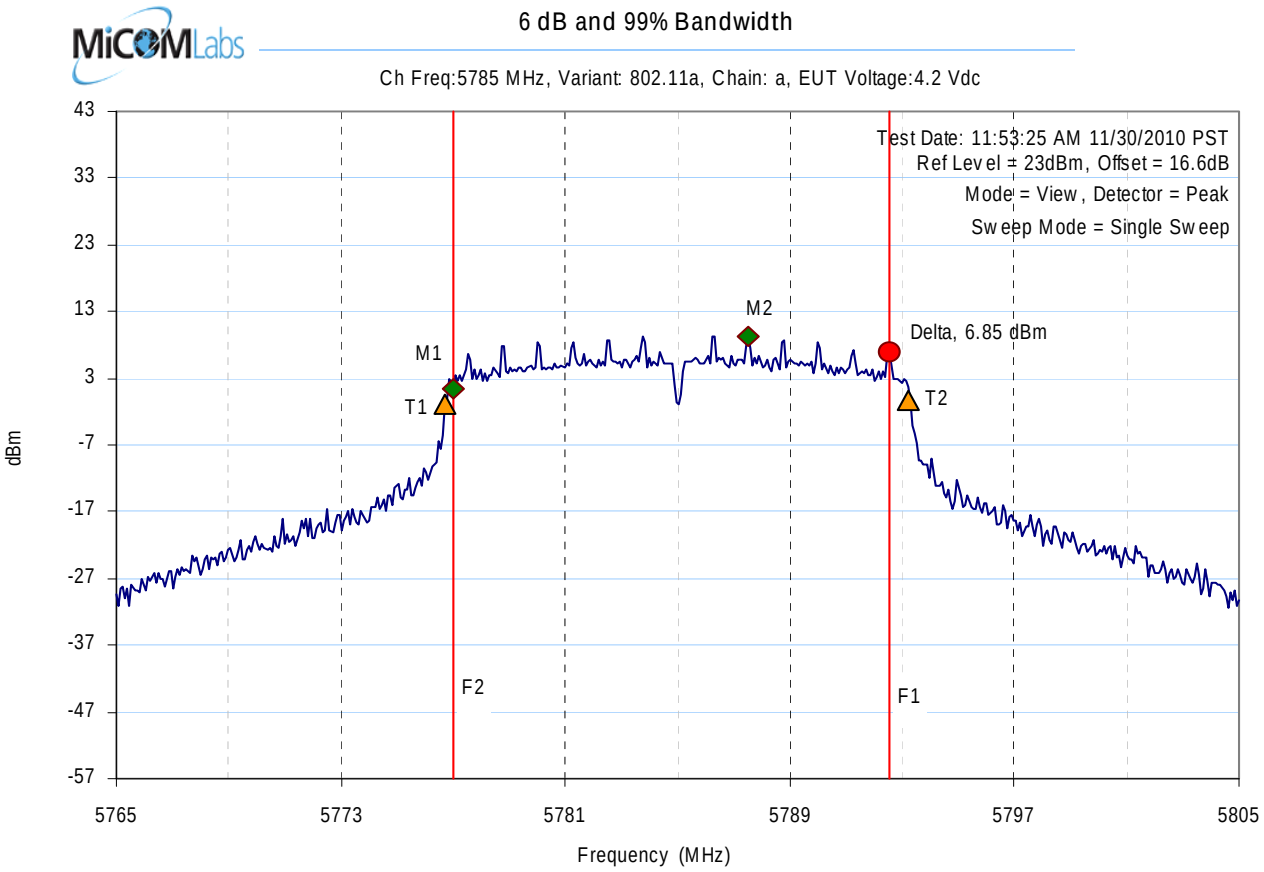
99% Bandwidth

Test Frequency	99 % Bandwidth MHz						
MHz	**a**	**b**	**c**	**d**			
5745.000	16.593000	--	--	--			
5785.000	16.593000	--	--	--			
5825.000	16.593000	--	--	--			

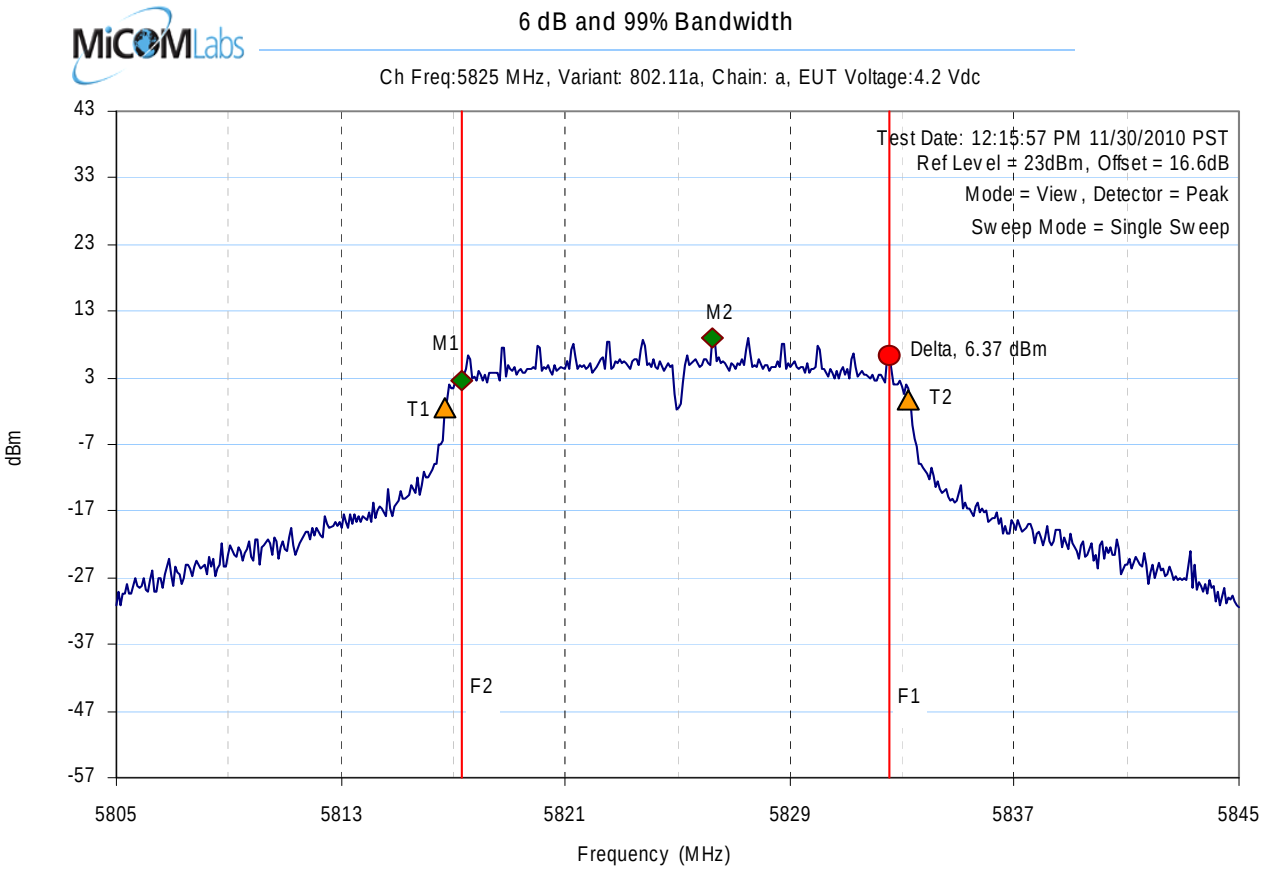
Measurement uncertainty:	±2.81 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5737.024048MHz : 1.869dBm	Center frequency = 5745MHz
VBW = 300.00KHz	M2 : 5746.242485MHz : 9.356dBm	6dB BW(Delta-M1) = 15.551102MHz
Sweep time(s) = 20	Delta : 5752.575150MHz : 6.730dBm	99% OBW(T2-T1) = 16.593186MHz
RF Atten (dB) = 10	T1 : 5736.703407MHz : -.382dBm	
Span = 40.00MHz	T2 : 5753.216433MHz : -0.608dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5777.024048MHz : 1.562dBm	Center frequency = 5785MHz
VBW = 300.00KHz	M2 : 5787.525050MHz : 9.356dBm	6dB BW(Delta-M1) = 15.551102MHz
Sweep time(s) = 20	Delta : 5792.575150MHz : 6.850dBm	99% OBW(T2-T1) = 16.593186MHz
RF Atten (dB) = 10	T1 : 5776.703407MHz : -.758dBm	
Span = 40.00MHz	T2 : 5793.216433MHz : -0.229dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5817.344689MHz : 2.632dBm	Center frequency = 5825MHz
VBW = 300.00KHz	M2 : 5826.242485MHz : 8.977dBm	6dB BW(Delta-M1) = 15.230461MHz
Sweep time(s) = 20	Delta : 5832.575150MHz : 6.368dBm	99% OBW(T2-T1) = 16.593186MHz
RF Atten (dB) = 10	T1 : 5816.703407MHz : -1.440dBm	
Span = 40.00MHz	T2 : 5833.216433MHz : -0.39dBm	

7.1.5 6 dB and 99% Bandwidth Results: 802.11n HT-20

Test Conditions:	15.247 (a)(2)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11n HT-20	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	10
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	2.5 dBi
Applied Voltage:	4.20 Vdc		
Notes 1:			
Notes 2:			

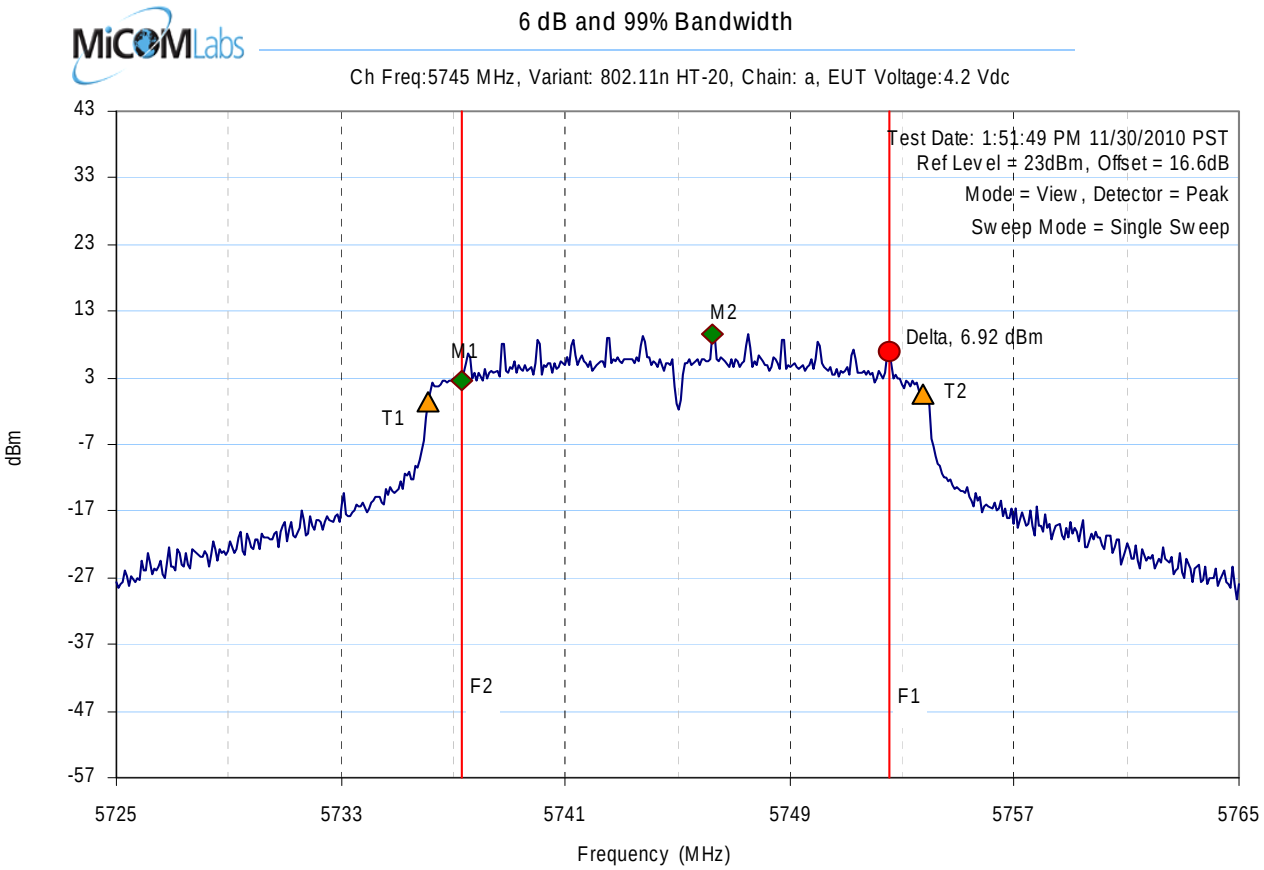
6 dB Bandwidth

Test Frequency	6 dB Bandwidth MHz				Minimum 6dB Bandwidth Limit		Margin
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
5745.000	15.230000	--	--	--	500	0.5	-14.730000
5785.000	15.230000	--	--	--			-14.730000
5825.000	16.032000	--	--	--			-15.532000

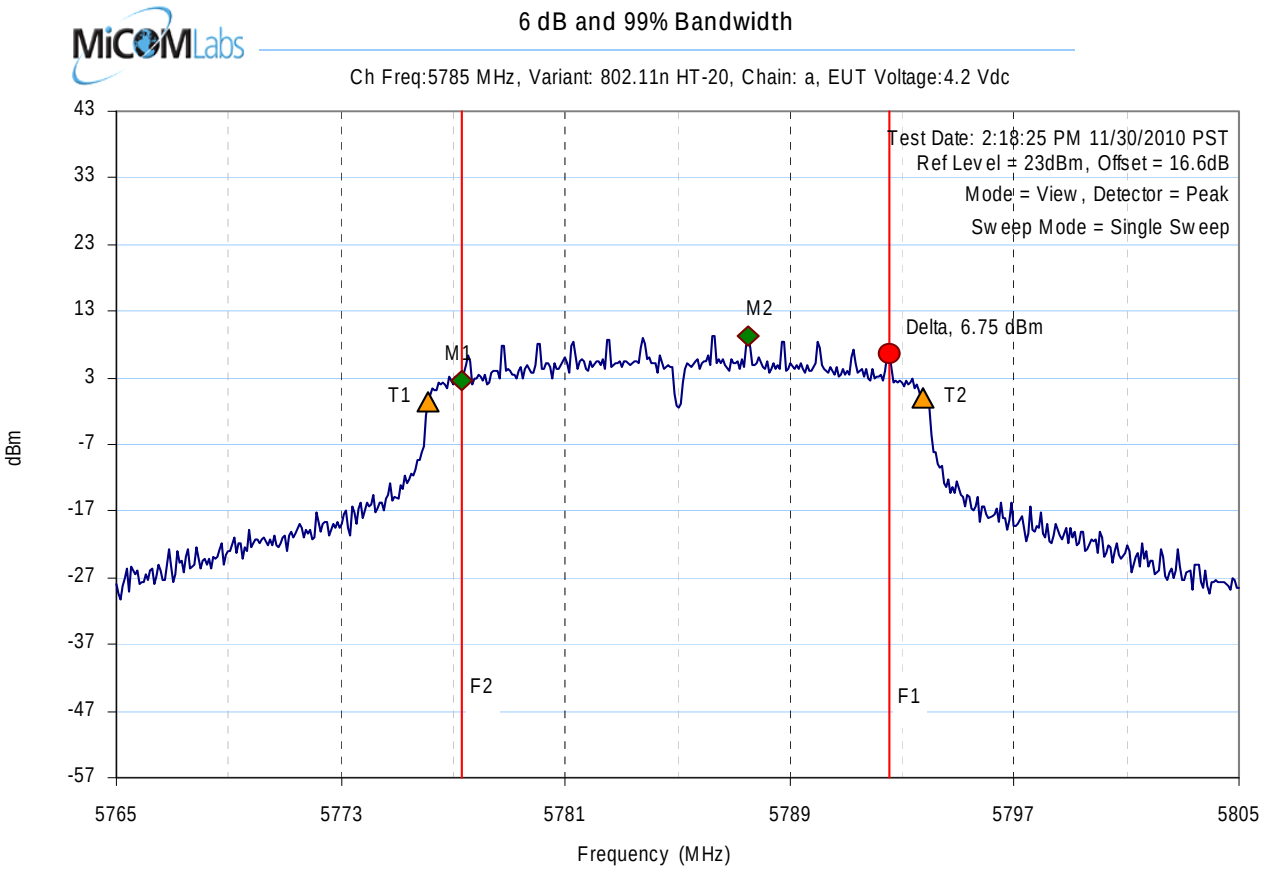
99% Bandwidth

Test Frequency	99 % Bandwidth MHz						
MHz	**a**	**b**	**c**	**d**			
5745.000	17.715000	--	--	--			
5785.000	17.715000	--	--	--			
5825.000	17.715000	--	--	--			

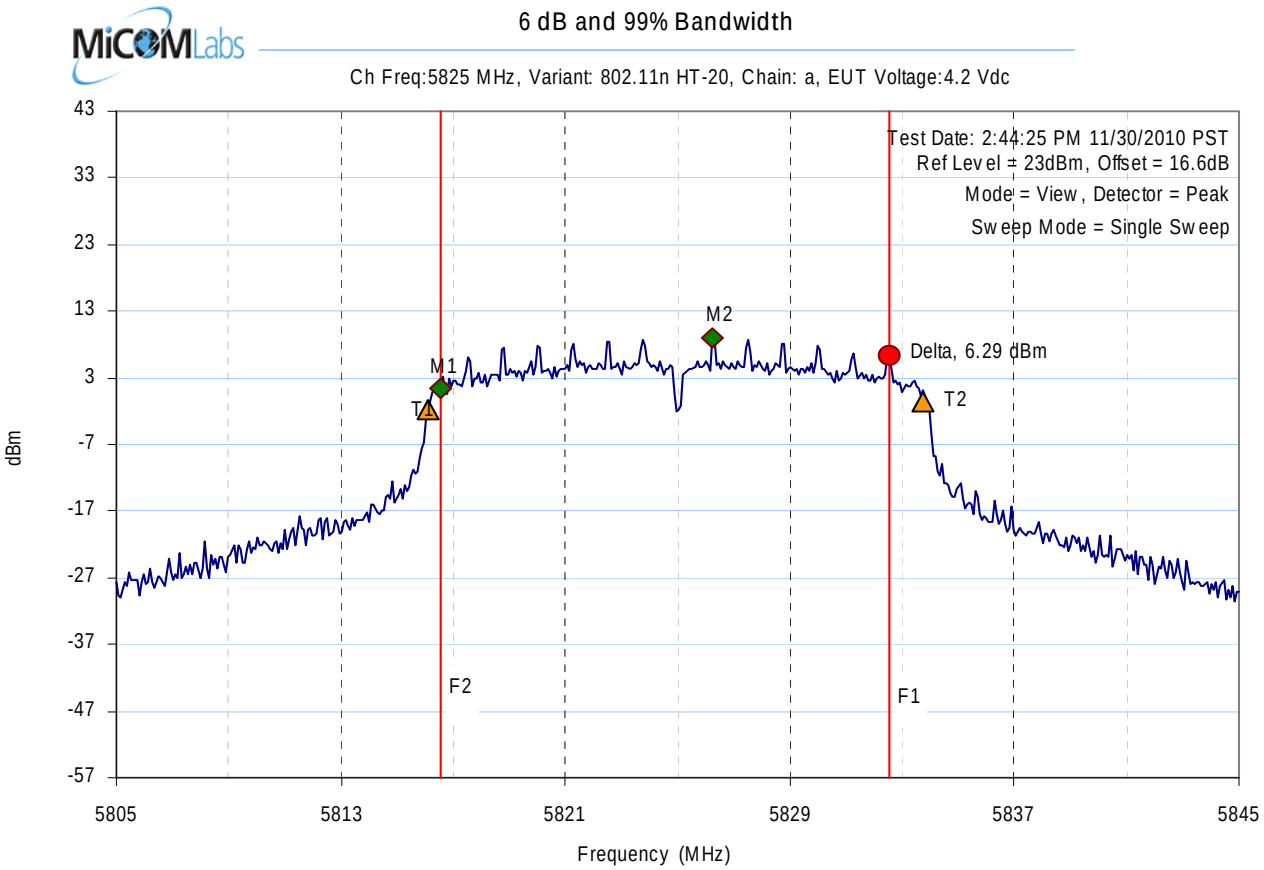
Measurement uncertainty:	±2.81 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5737.344689MHz : 2.591dBm	Center frequency = 5745MHz
VBW = 300.00KHz	M2 : 5746.242485MHz : 9.589dBm	6dB BW(Delta-M1) = 15.230461MHz
Sweep time(s) = 20	Delta : 5752.575150MHz : 6.923dBm	99% OBW(T2-T1) = 17.715431MHz
RF Atten (dB) = 10	T1 : 5736.142285MHz : -.738dBm	
Span = 40.00MHz	T2 : 5753.777555MHz : 0.617dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5777.344689MHz : 2.691dBm	Center frequency = 5785MHz
VBW = 300.00KHz	M2 : 5787.525050MHz : 9.303dBm	6dB BW(Delta-M1) = 15.230461MHz
Sweep time(s) = 20	Delta : 5792.575150MHz : 6.750dBm	99% OBW(T2-T1) = 17.715431MHz
RF Atten (dB) = 10	T1 : 5776.142285MHz : -.585dBm	
Span = 40.00MHz	T2 : 5793.777555MHz : -0.055dBm	



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5816.543086MHz : 1.304dBm	Center frequency = 5825MHz
VBW = 300.00KHz	M2 : 5826.242485MHz : 8.935dBm	6dB BW(Delta-M1) = 16.032064MHz
Sweep time(s) = 20	Delta : 5832.575150MHz : 6.287dBm	99% OBW(T2-T1) = 17.715431MHz
RF Atten (dB) = 10	T1 : 5816.142285MHz : -1.897dBm	
Span = 40.00MHz	T2 : 5833.777555MHz : -0.545dBm	

7.2 Maximum Permissible Exposure

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 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)	Peak Output Power (dBm)	Antenna Gain (numeric)	EIRP (mW)	Distance @ 1mW/cm2 Limit(cm)	Minimum Separation Distance (cm)
2.4 - 4.835	2.5	17.7	1.7782794	104.71	2.89	20
4.9 - 5.8	2.5	19.16	1.7782794	146.55	3.42	20

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

FCC §1.1310

Limit = 1mW / cm^2 from 1.310 Table 1

RSS-Gen §5.6

Exposure of Humans to RF Fields: Category I and Category II equipment shall comply with the applicable requirements of RSS-102.

Laboratory Measurement Uncertainty for Power Measurements

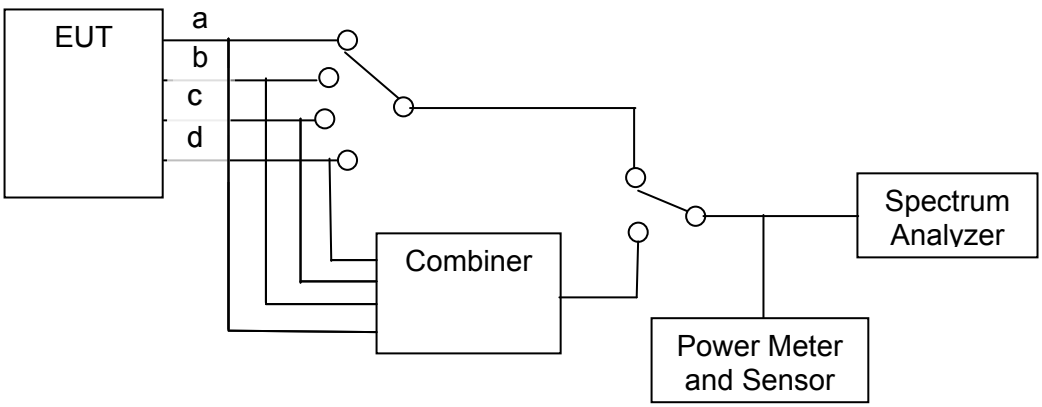
Measurement uncertainty	±1.33 dB

7.3 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 setup 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 for Peak Output Power 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.

Specification for Peak Output Power Limits (continued)

Industry Canada RSS-210 §A8.4 (4)

(4) For systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W. Except as provided in Section A8.4 (5), the e.i.r.p. shall not exceed 4 W.

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

(5) Point-to-point systems in the bands 2400-2483.5 MHz and 5725-5850 MHz are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding 4 W e.i.r.p. However, remote stations of point-to-multipoint systems shall be allowed to operate at greater than 4 W e.i.r.p. under the same conditions as for point-to-point systems.

Note: "Fixed point-to-point operation" excludes point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information.

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 802.11b

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 (%):**	10		
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	2.5	dBi	
Applied Voltage:	4.20	Vdc				
Notes 1:						
Notes 2:						

Test Frequency	**Measured Peak Power**				**Total Power (dBm)**		**Limit**	**Margin**
	RF Port (dBm)							
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
2412	16.72	--	--	--	--	16.72	30.00	-13.28
2437	17.70	--	--	--	--	17.70	30.00	-12.30
2462	17.50	--	--	--	--	17.50	30.00	-12.50

Measurement uncertainty:	±1.33 dB

7.3.2 Measurement results for 802.11g

Test Conditions:	15.247 (b)		**Rel. Humidity (%):**	35	to	42
Variant:	802.11g		**Ambient Temp. (ºC):**	19	to	22
TPC:	HIGH		**Pressure (mBars):**	998	to	1003
Modulation:	ON		**Duty Cycle (%):**	10		
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	2.5	dBi	
Applied Voltage:	4.20	Vdc				
Notes 1:						
Notes 2:						

Test Frequency	**Measured Peak Power**				**Total Power (dBm)**		**Limit**	**Margin**
	RF Port (dBm)							
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
2412	16.22	--	--	--	--	16.22	30.00	-13.78
2437	17.34	--	--	--	--	17.34	30.00	-12.66
2462	17.20	--	--	--	--	17.20	30.00	-12.80

Measurement uncertainty:	±1.33 dB

7.3.3 Measurement results for 802.11n HT-20

Test Conditions:	15.247 (b)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11n HT-20	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	10
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	2.5 dBi
Applied Voltage:	4.20 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	16.21	--	--	--	--	16.21	30.00	-13.79
2437	17.16	--	--	--	--	17.16	30.00	-12.84
2462	17.00	--	--	--	--	17.00	30.00	-13.00

Measurement uncertainty:	±1.33 dB

7.3.4 Measurement results for 802.11a

Test Conditions:	15.247 (b)		**Rel. Humidity (%):**	35	to	42
Variant:	802.11a		**Ambient Temp. (ºC):**	19	to	22
TPC:	HIGH		**Pressure (mBars):**	998	to	1003
Modulation:	ON		**Duty Cycle (%):**	10		
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	2.5	dBi	
Applied Voltage:	4.20	Vdc				
Notes 1:						
Notes 2:						

Test Frequency	**Measured Peak Power**				**Total Power (dBm)**		**Limit**	**Margin**
	RF Port (dBm)							
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
5745	19.11	--	--	--	--	19.11	30.00	-10.89
5785	19.16	--	--	--	--	19.16	30.00	-10.84
5825	18.84	--	--	--	--	18.84	30.00	-11.16

Measurement uncertainty:	±1.33 dB

7.3.5 Measurement results for 802.11n HT-20

Test Conditions:	15.247 (b)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11n HT-20	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	10
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	2.5 dBi
Applied Voltage:	4.20 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**
5745	19.11	--	--	--	--	19.11	30.00	-10.89
5785	19.00	--	--	--	--	19.00	30.00	-11.00
5825	18.68	--	--	--	--	18.68	30.00	-11.32

Measurement uncertainty:	±1.33 dB

7.4 Peak Power Spectral Density

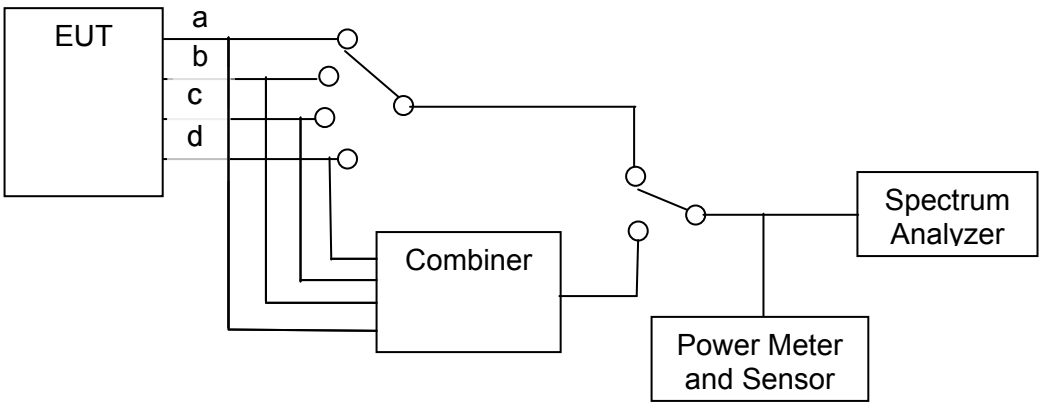
Test Procedure

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 setup for Peak Power Spectral Density

Specification for Peak Power Spectral Density Limits

FCC §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

Industry Canada RSS-210 §A8.2 (b)

These include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to all three bands:

(a) The minimum -6 dB bandwidth shall be at least 500 kHz.

(b) The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Section A8.4 (4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

Traceability

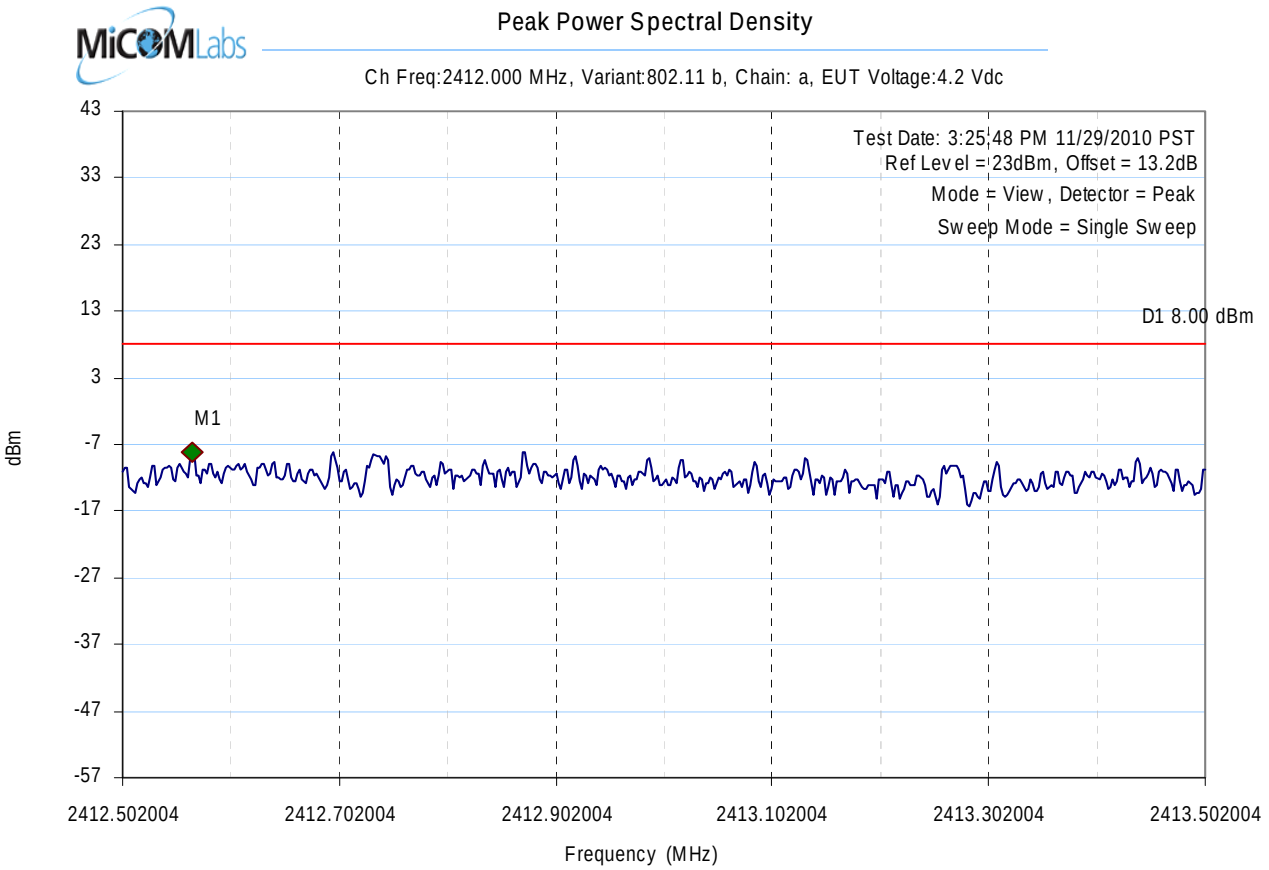
Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0252, 0313, 0314, 0223, 0116, 0117, 0287, 0363

7.4.1 Measurement results for 802.11b

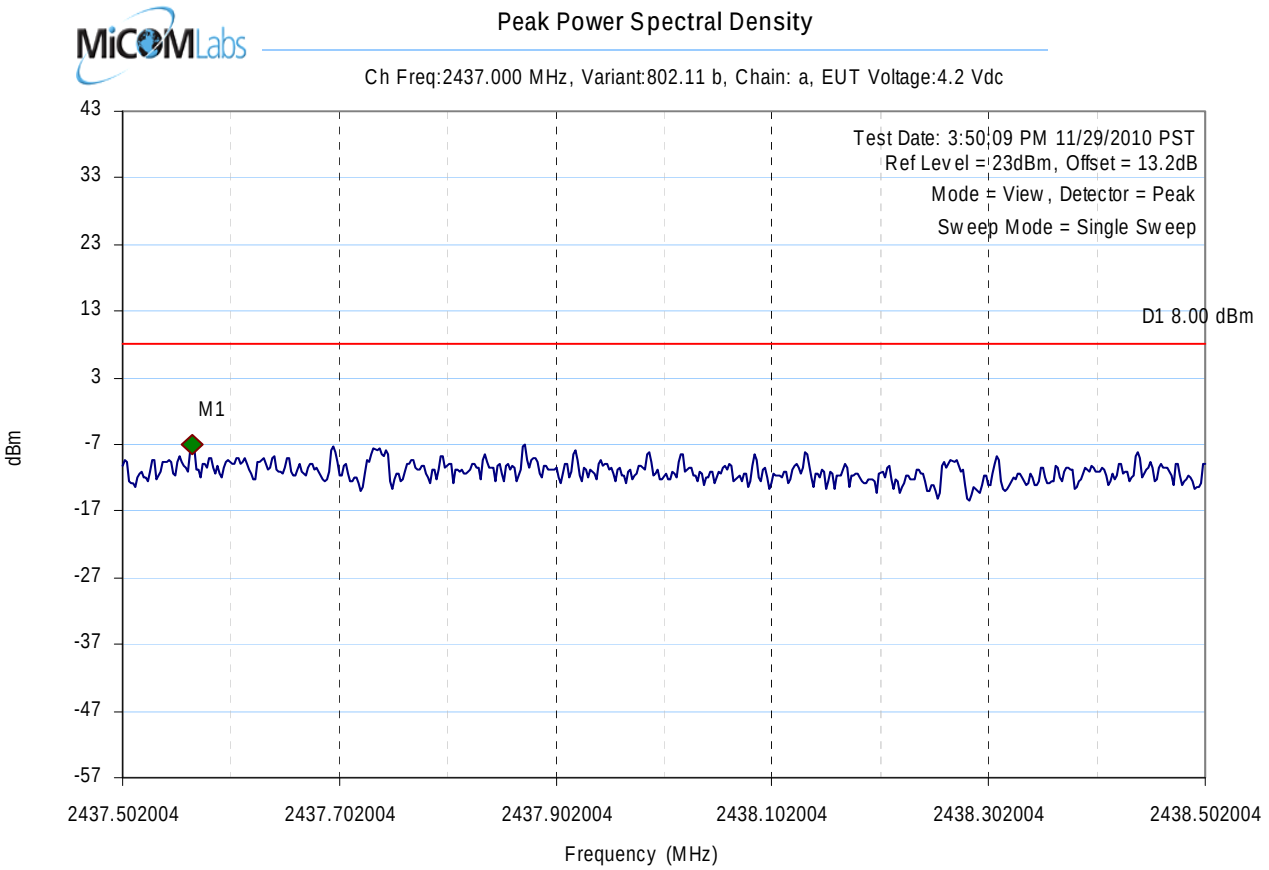
Test Conditions:	15.247 (e)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11 b	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	10
Beam Forming Gain	N/A dB	**Antenna Gain:**	2.5 dBi
Applied Voltage:	4.20 Vdc		
Notes 1:			
Notes 2:			

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	-8.06	--	--	--	--	-8.06	8.00	-16.06
2437.000	-7.08	--	--	--	--	-7.08	8.00	-15.08
2462.000	-7.25	--	--	--	--	-7.25	8.00	-15.25

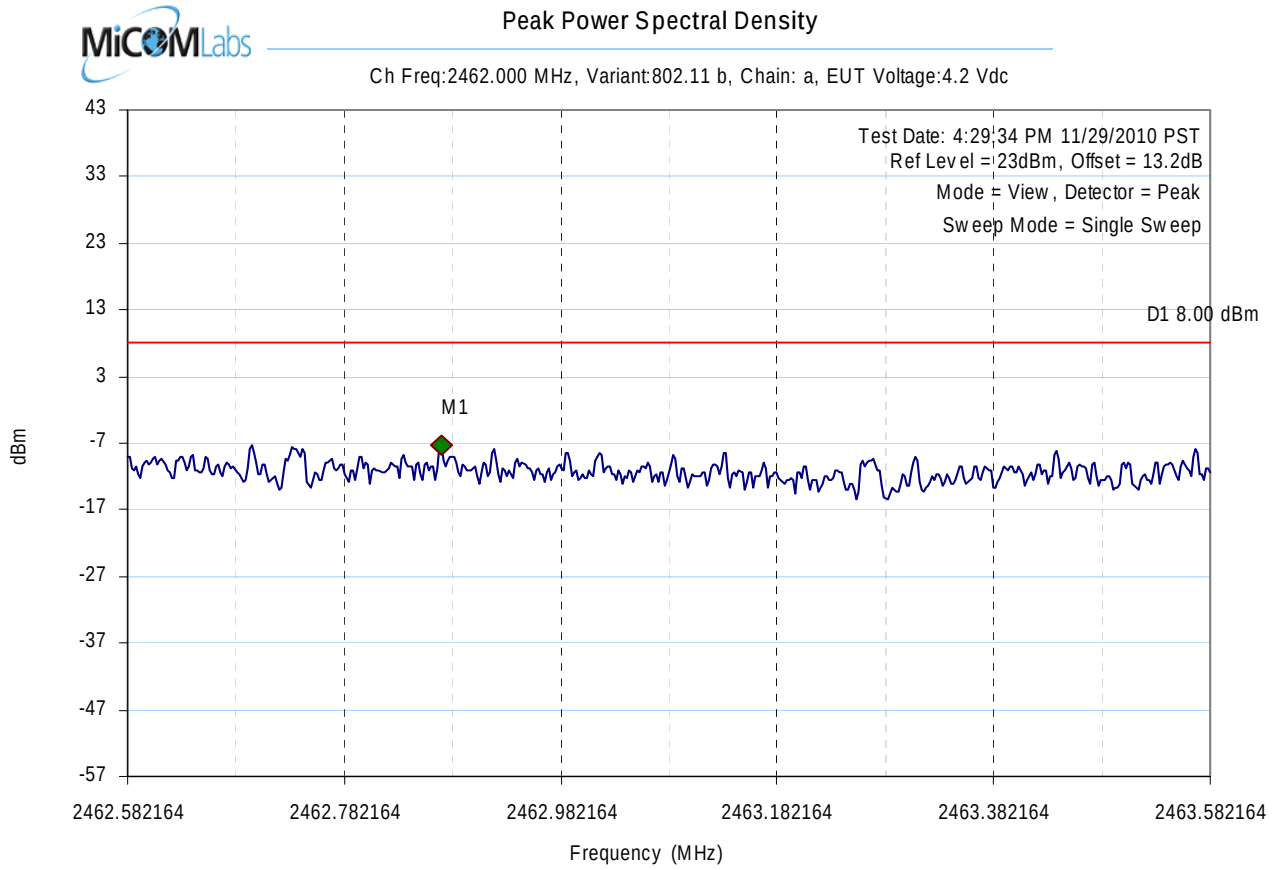
Measurement uncertainty:	± 1.33 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2412.566132MHz : -8.061dBm	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 : 2437.566132MHz : -7.079dBm	Center frequency = 2437MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		



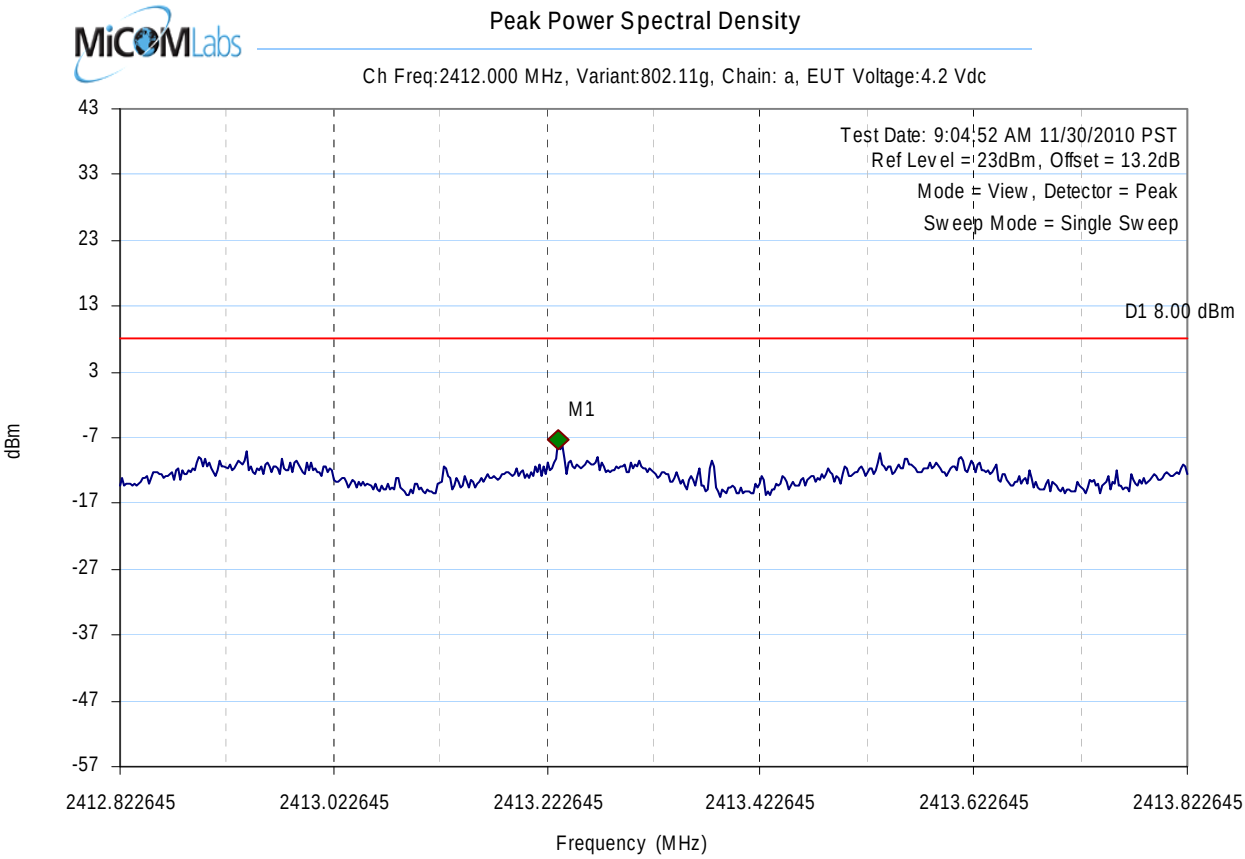
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2462.872745MHz : -7.250dBm	Center frequency = 2462MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		

7.4.2 Measurement results for 802.11g

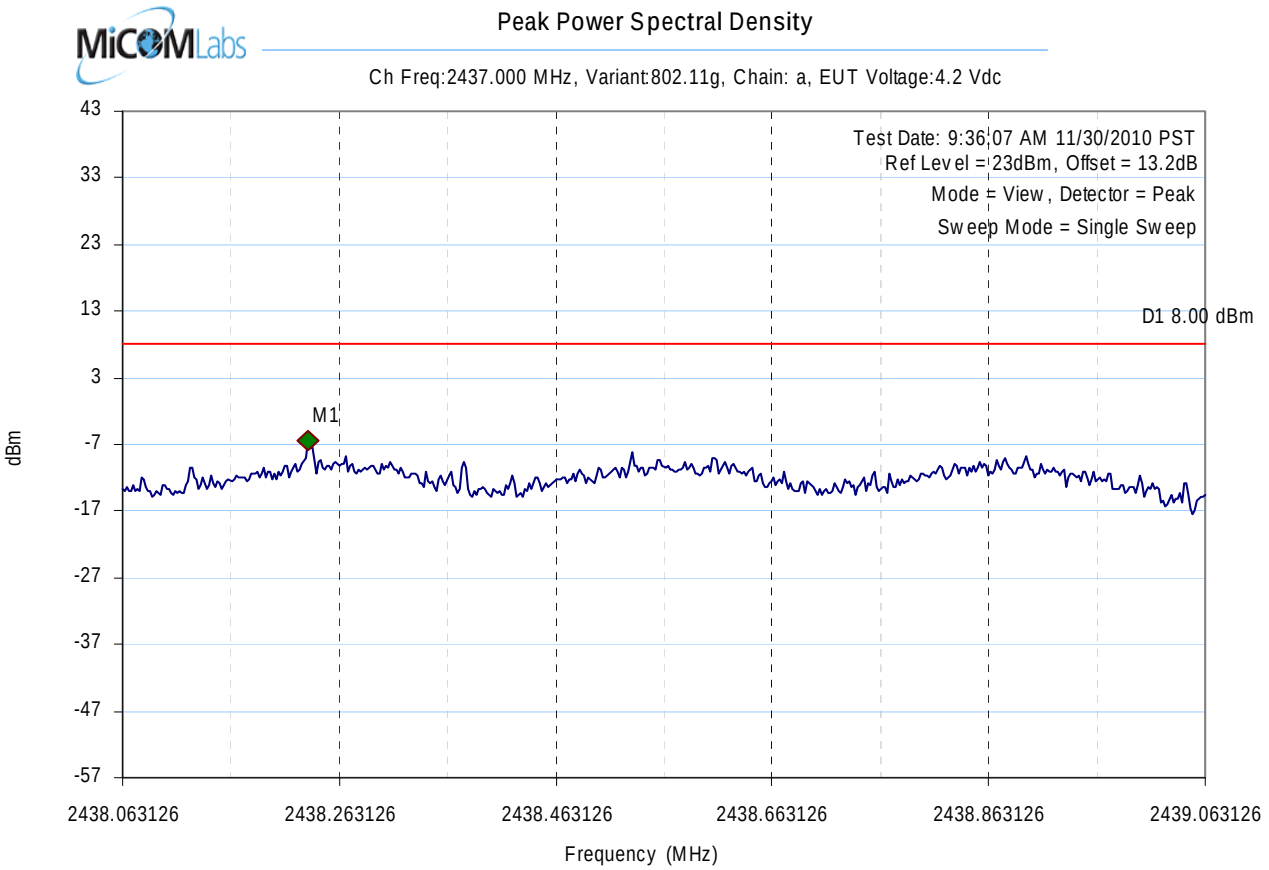
Test Conditions:	15.247 (e)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11g	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	10
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	2.5 dBi
Applied Voltage:	4.20 Vdc		
Notes 1:			
Notes 2:			

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	-7.30	--	--	--	--	-7.30	8.00	-15.30
2437.000	-6.41	--	--	--	--	-6.41	8.00	-14.41
2462.000	-8.33	--	--	--	--	-8.33	8.00	-16.33

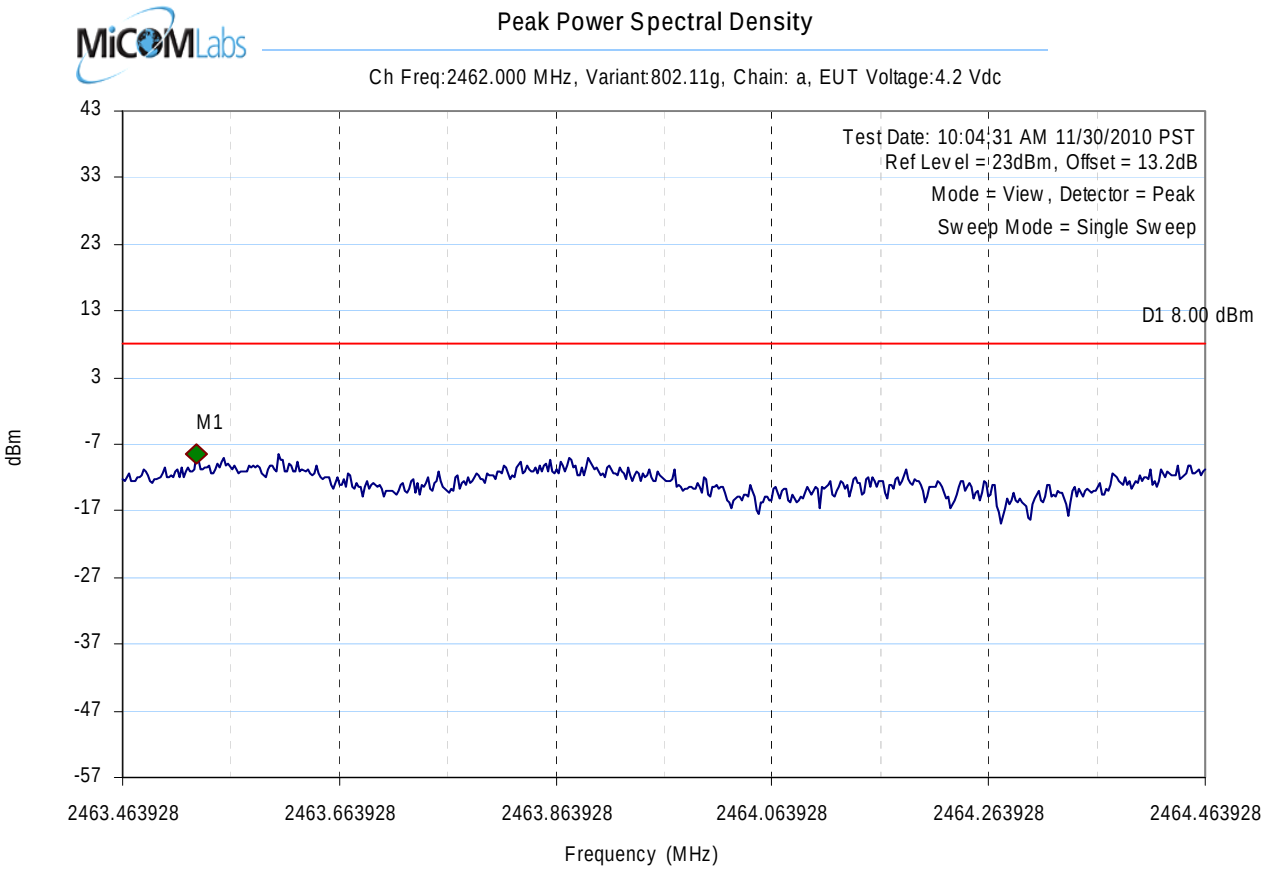
Measurement uncertainty:	± 1.33 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2413.233467MHz : -7.303dBm	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 : 2438.233467MHz : -6.412dBm	Center frequency = 2437MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		



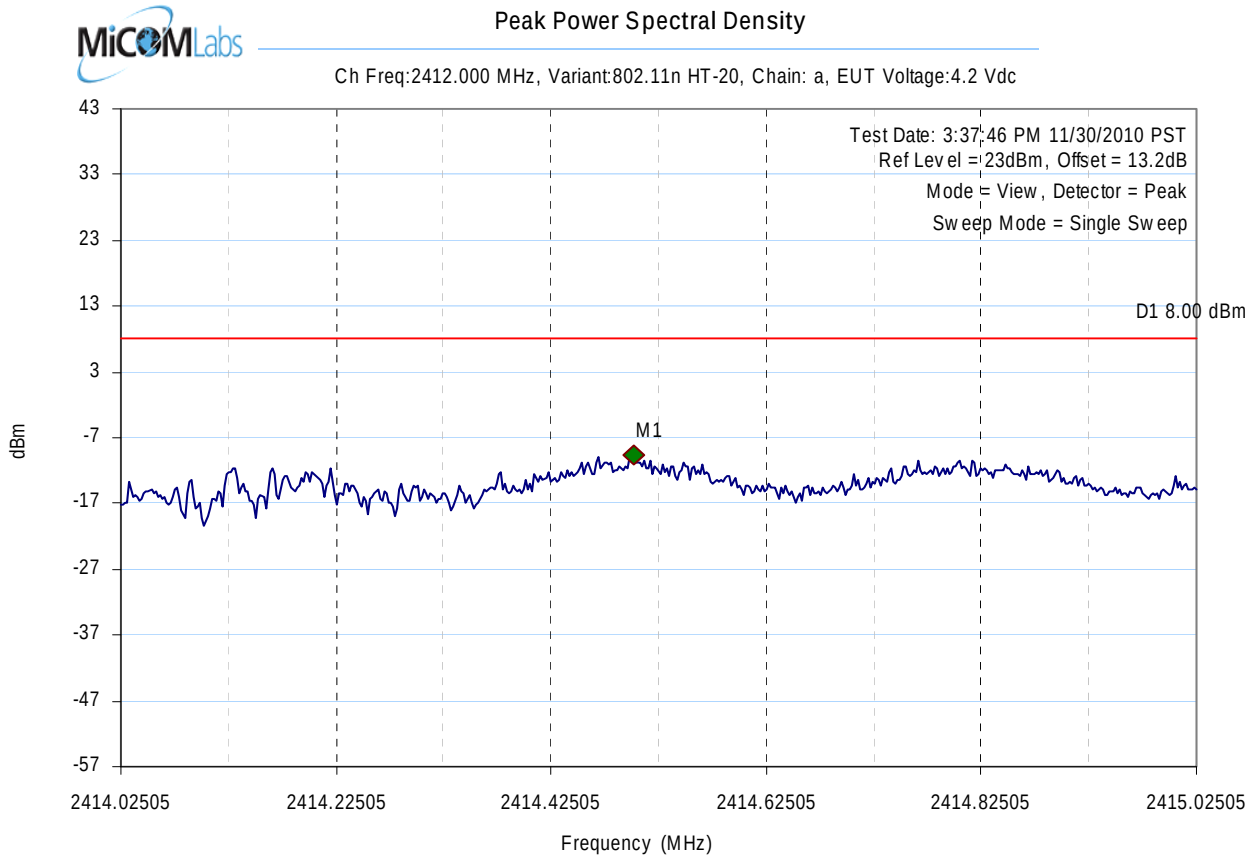
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2463.532064MHz : -8.328dBm	Center frequency = 2462MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		

7.4.3 Measurement results for802.11n HT-20

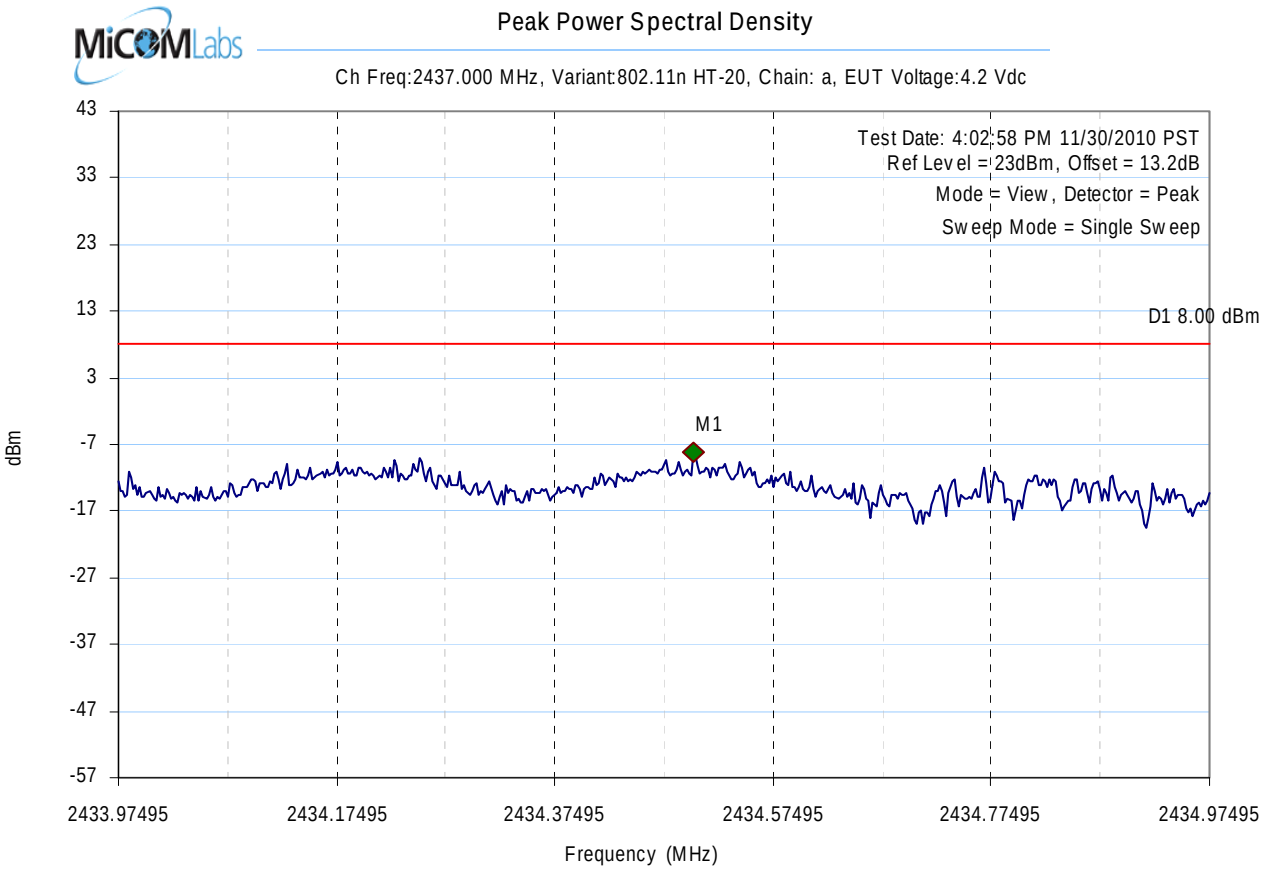
Test Conditions:	15.247 (e)		**Rel. Humidity (%):**	35	to	42
Variant:	802.11n HT-20		**Ambient Temp. (ºC):**	19	to	22
TPC:	HIGH		**Pressure (mBars):**	998	to	1003
Modulation:	ON		**Duty Cycle (%):**	10		
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	2.5	dBi	
Applied Voltage:	4.20	Vdc				
Notes 1:						
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	-9.51	--	--	--	--	-9.51	8.00	-17.51
2437.000	-8.26	--	--	--	--	-8.26	8.00	-16.26
2462.000	-8.23	--	--	--	--	-8.23	8.00	-16.23

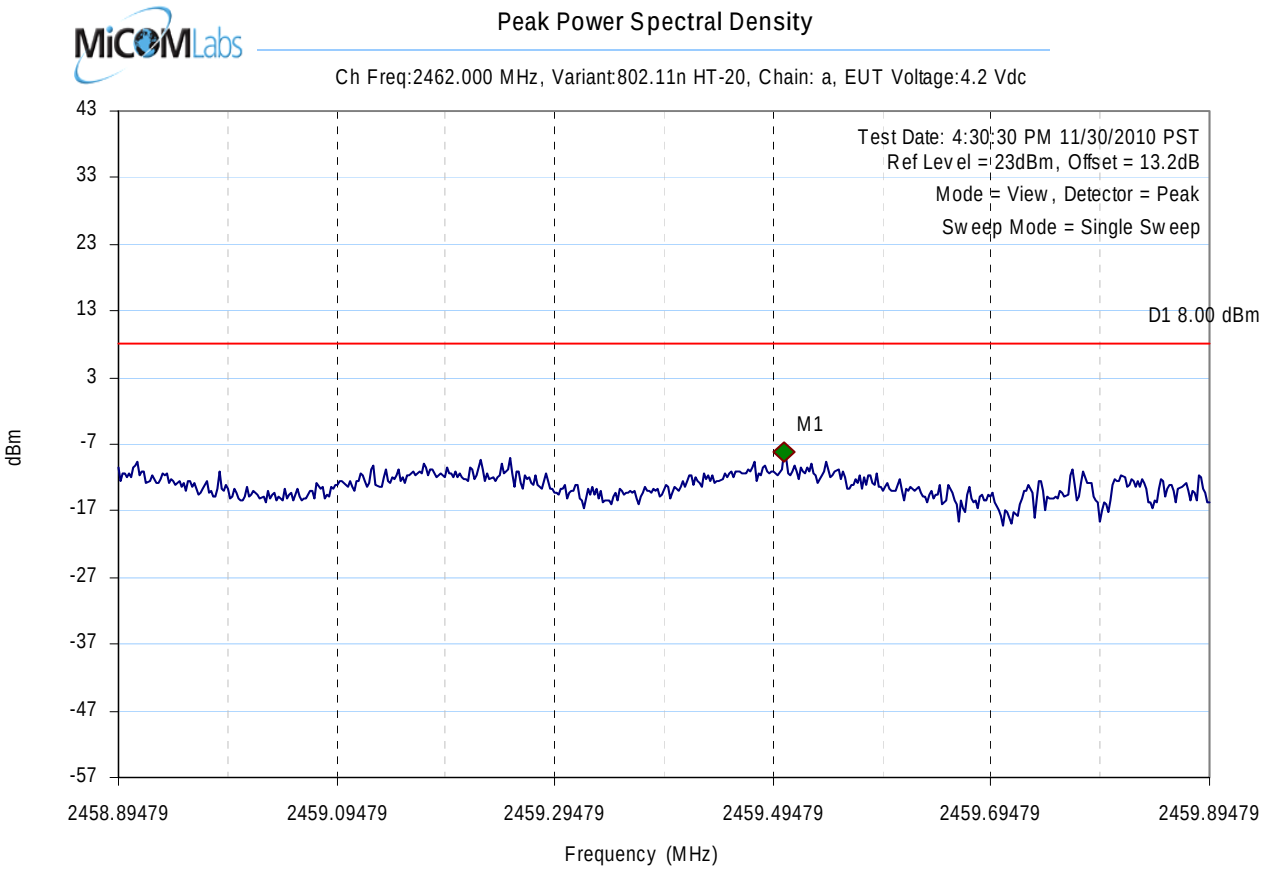
Measurement uncertainty:	± 1.33 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2414.502004MHz : -9.505dBm	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 : 2434.502004MHz : -8.257dBm	Center frequency = 2437MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		



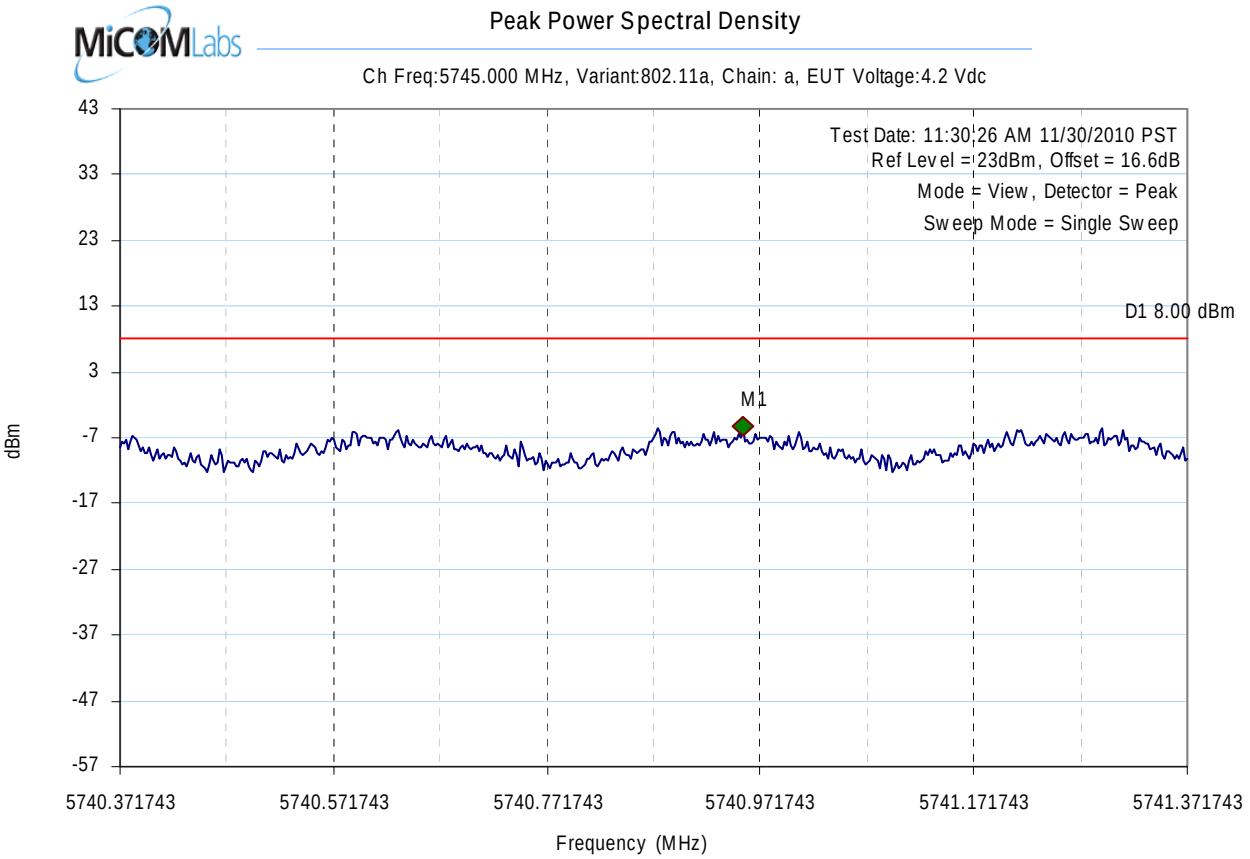
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 2459.504008MHz : -8.228dBm	Center frequency = 2462MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		

7.4.4 Measurement results for 802.11a

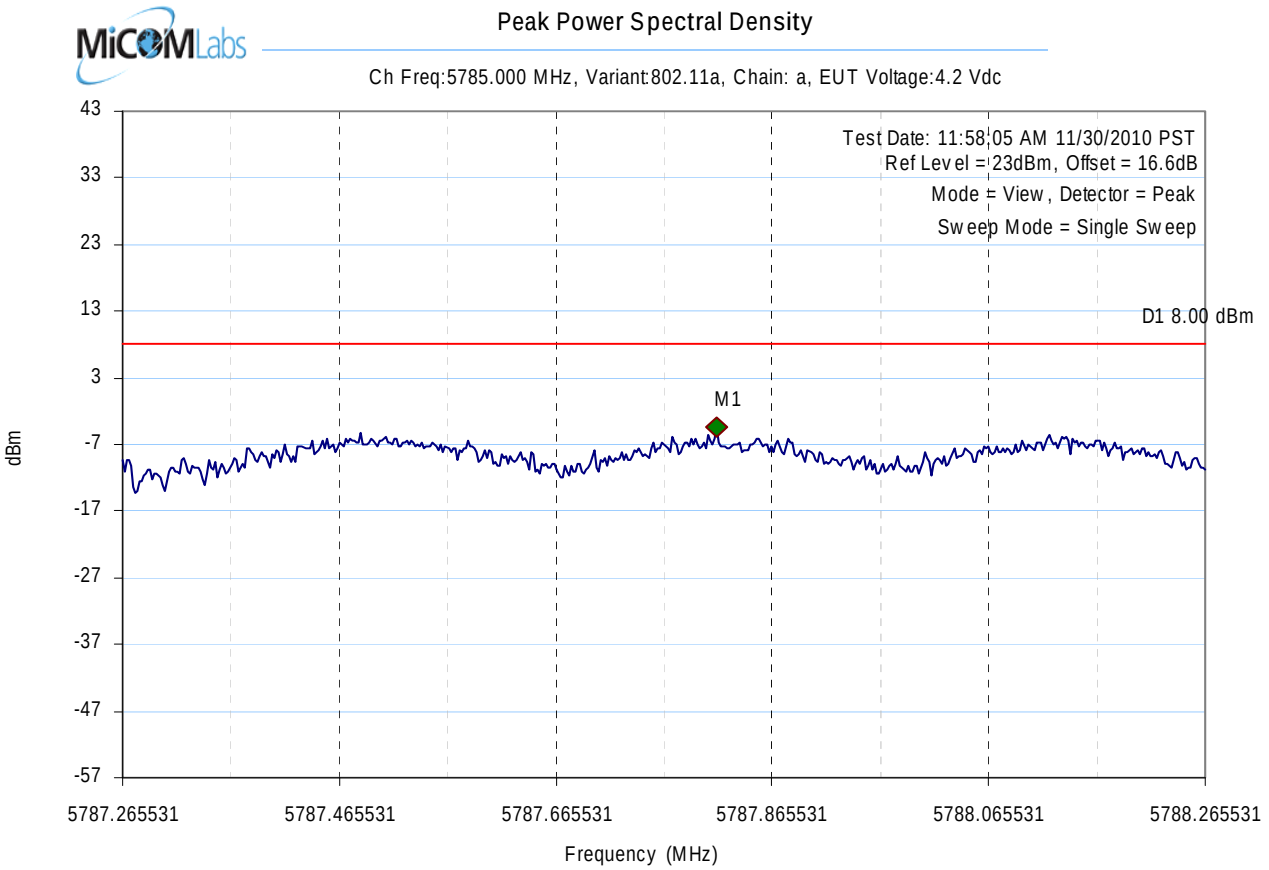
Test Conditions:	15.247 (e)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11a		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	10	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	2.5	dBi
Applied Voltage:	4.20	Vdc			
Notes 1:					
Notes 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
5745.000	-5.35	--	--	--	--	-5.35	8.00	-13.35
5785.000	-4.25	--	--	--	--	-4.25	8.00	-12.25
5825.000	-3.14	--	--	--	--	-3.14	8.00	-11.14

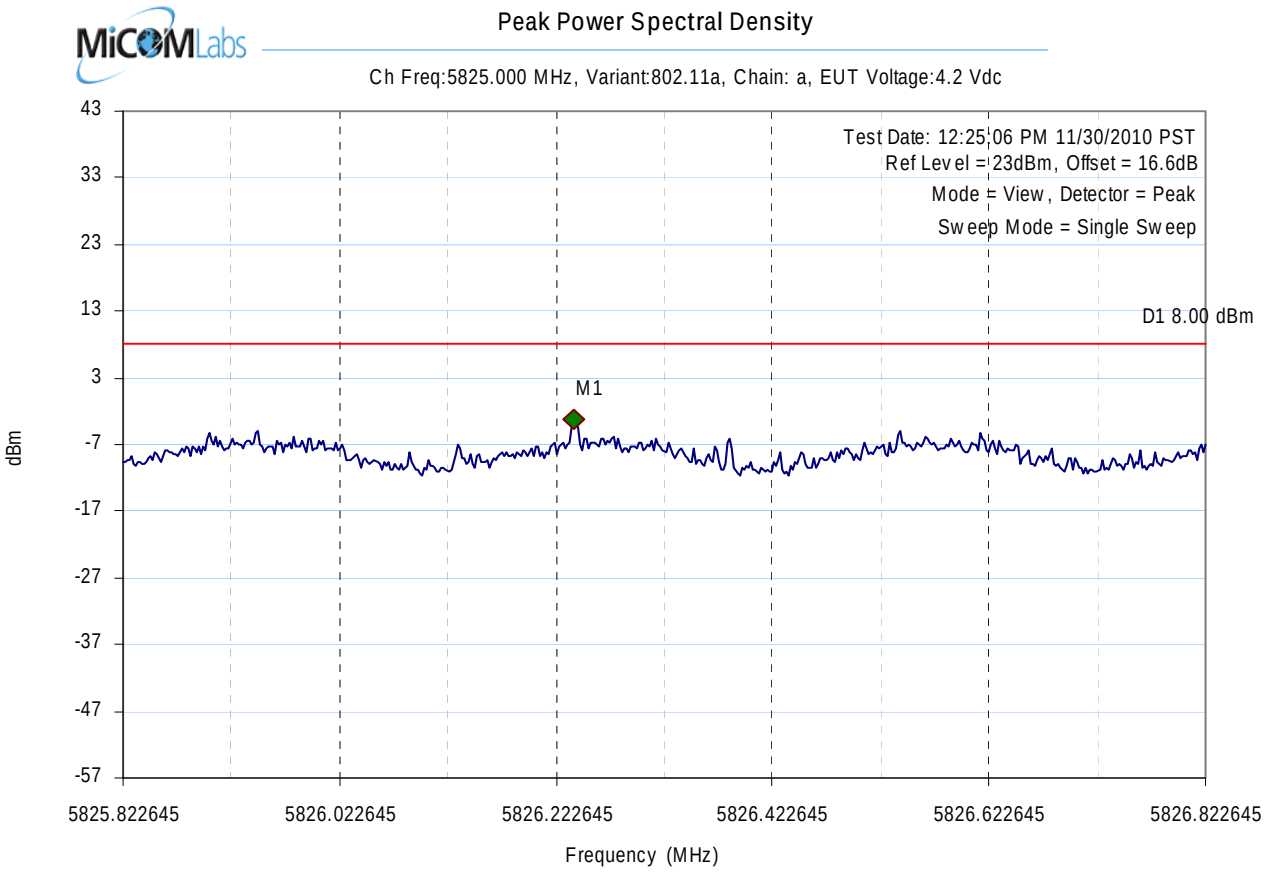
Measurement uncertainty:	± 1.33 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 5740.954910MHz : -5.352dBm	Center frequency = 5745MHz
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 : 5787.814629MHz : -4.248dBm	Center frequency = 5785MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		



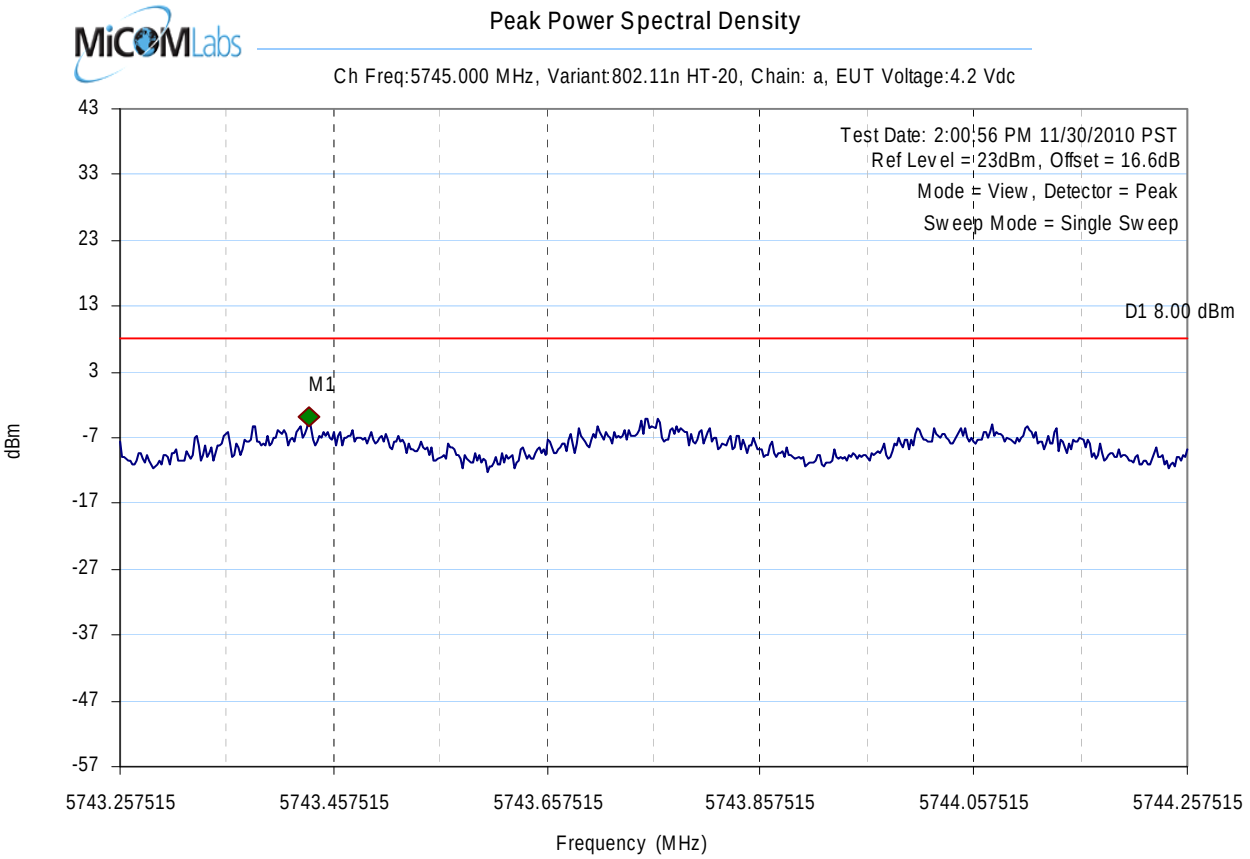
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 5826.239479MHz : -3.136dBm	Center frequency = 5825MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		

7.4.5 Measurement results for 802.11n HT-20

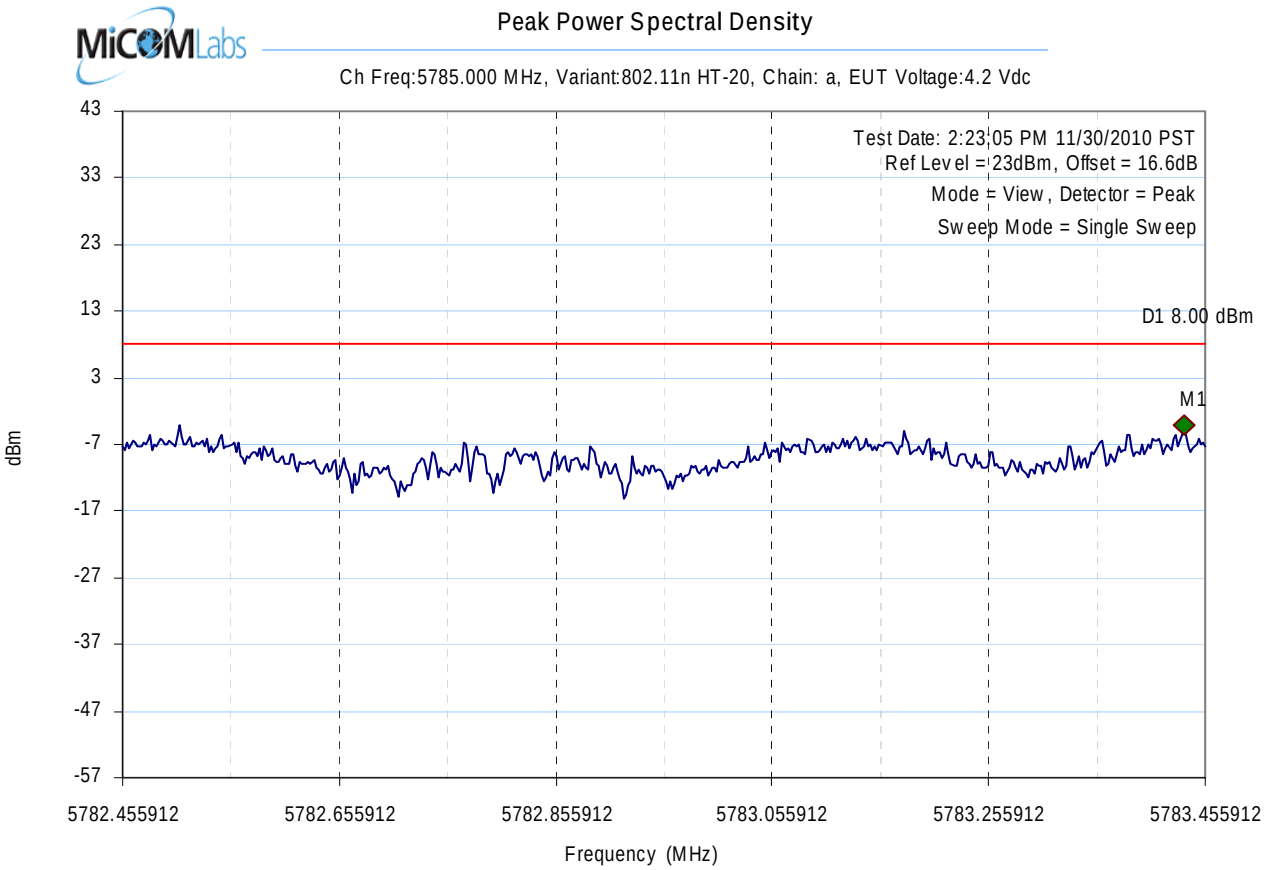
Test Conditions:	15.247 (e)	**Rel. Humidity (%):**	35	to	42
Variant:	802.11n HT-20	**Ambient Temp. (ºC):**	19	to	22
TPC:	HIGH	**Pressure (mBars):**	998	to	1003
Modulation:	ON	**Duty Cycle (%):**	10		
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	2.5	dBi	
Applied Voltage:	4.20 Vdc				
Notes 1:					
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
5745.000	-3.94	--	--	--	--	-3.94	8.00	-11.94
5785.000	-4.07	--	--	--	--	-4.07	8.00	-12.07
5825.000	-4.02	--	--	--	--	-4.02	8.00	-12.02

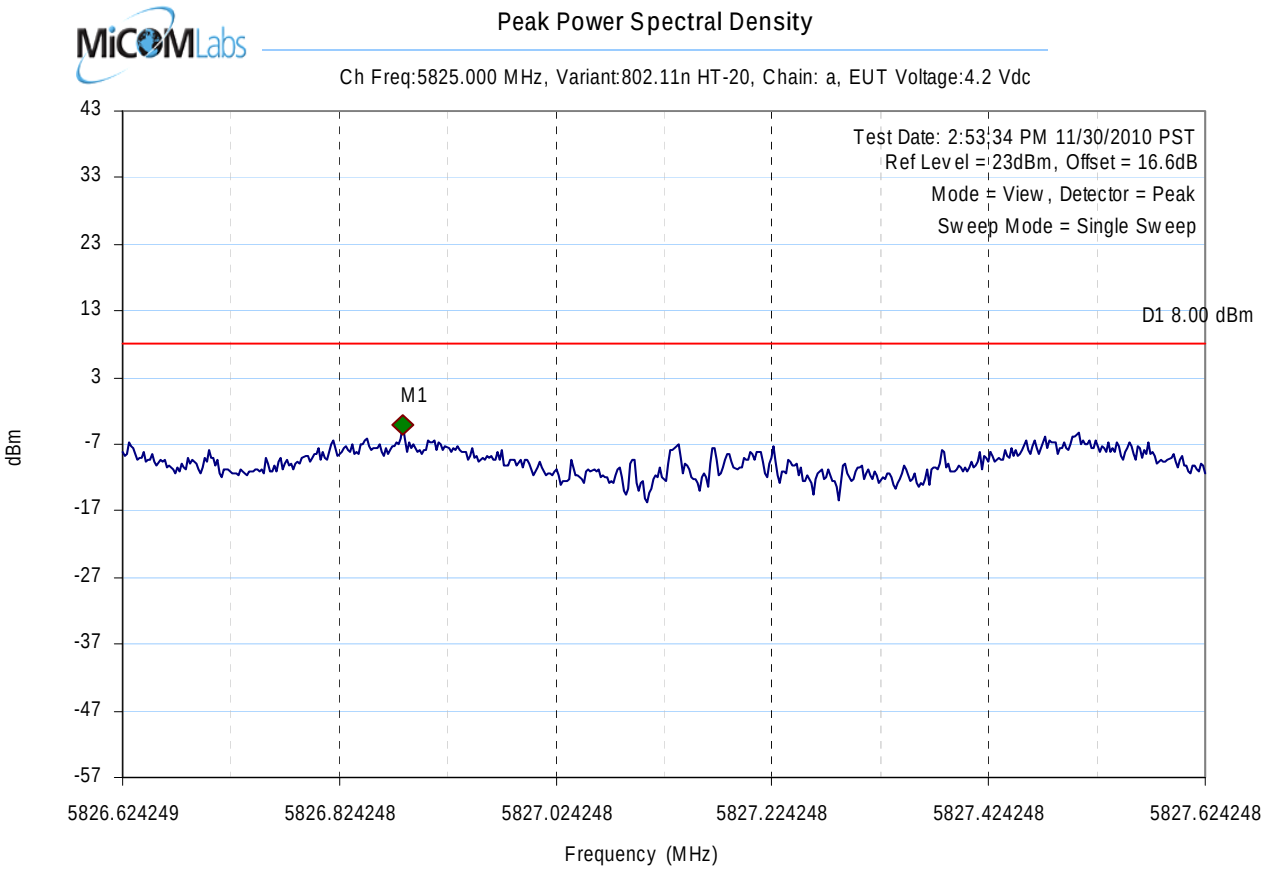
Measurement uncertainty:	± 1.33 dB



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 3.00KHz	M1 : 5743.433868MHz : -3.937dBm	Center frequency = 5745MHz
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 : 5783.435872MHz : -4.065dBm	Center frequency = 5785MHz
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 : 5826.882766MHz : -4.016dBm	Center frequency = 5825MHz
VBW = 10.00KHz		
Sweep time(s) = 350		
RF Atten (dB) = 20		
Span = 1.00MHz		

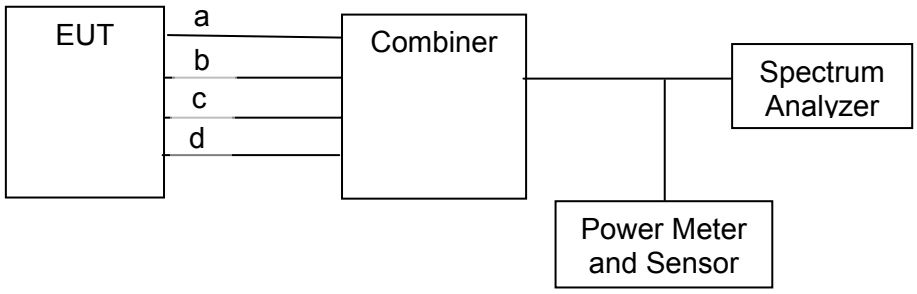
7.5 Conducted Spurious Emissions

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 Configuration



Measurement setup for Conducted Spurious Emission

Specification for Band Edge Limits

FCC §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.

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)).

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	

Industry Canada RSS-210 §A8.5

Out-of-band Emissions: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RSS-GEN 6.2

If the receiver has a detachable antenna of known impedance, antenna conducted spurious emissions measurement is permitted as an alternative to radiated measurement. However, the radiated method of Section 6.1 is recommended:

The antenna conducted test shall be performed with the antenna disconnected and the receiver antenna terminals connected to a measuring instrument having equal impedance to that specified for the antenna

The receiver spurious emissions measured at the antenna terminals by the antenna conducted method shall then comply with the following limits:

Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts in the band 30-1000 MHz, and 5 nanowatts above 1000 MHz.

Traceability

Method	Test Equipment Used
WI-05	0158, 0252, 0313, 0314, 0223, 0116, 0117, 0287, 0363.

7.5.1 Measurement Results for 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 (%):**	10
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	N/A dBi
Applied Voltage:	4.20 Vdc		
Notes 1:			
Notes 2:			

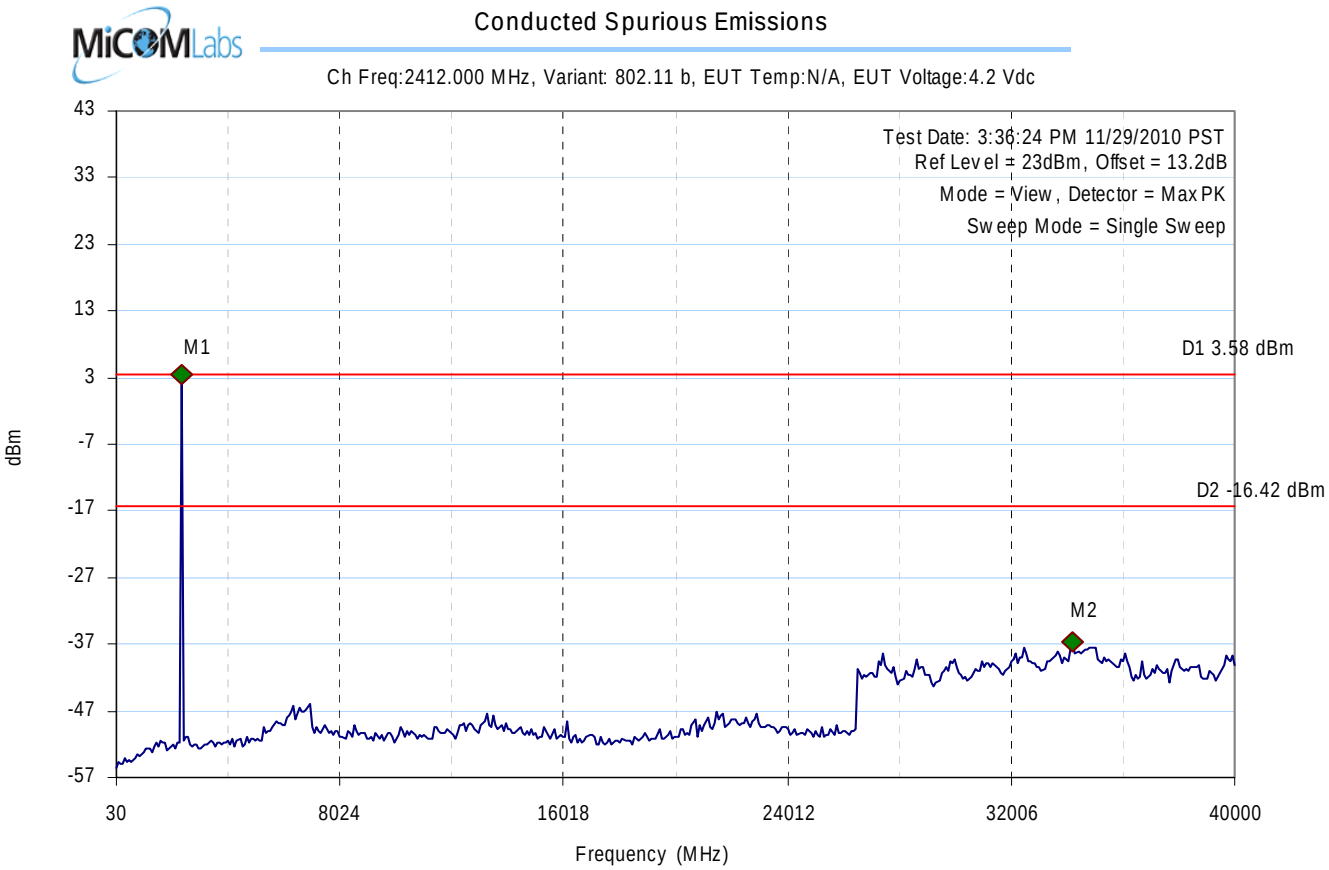
Conducted Spurious Measurement

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	40000.00	-36.74	-16.42
2437.000	30.00	40000.00	-37.36	-22.94
2462.000	30.00	40000.00	-37.50	-25.02

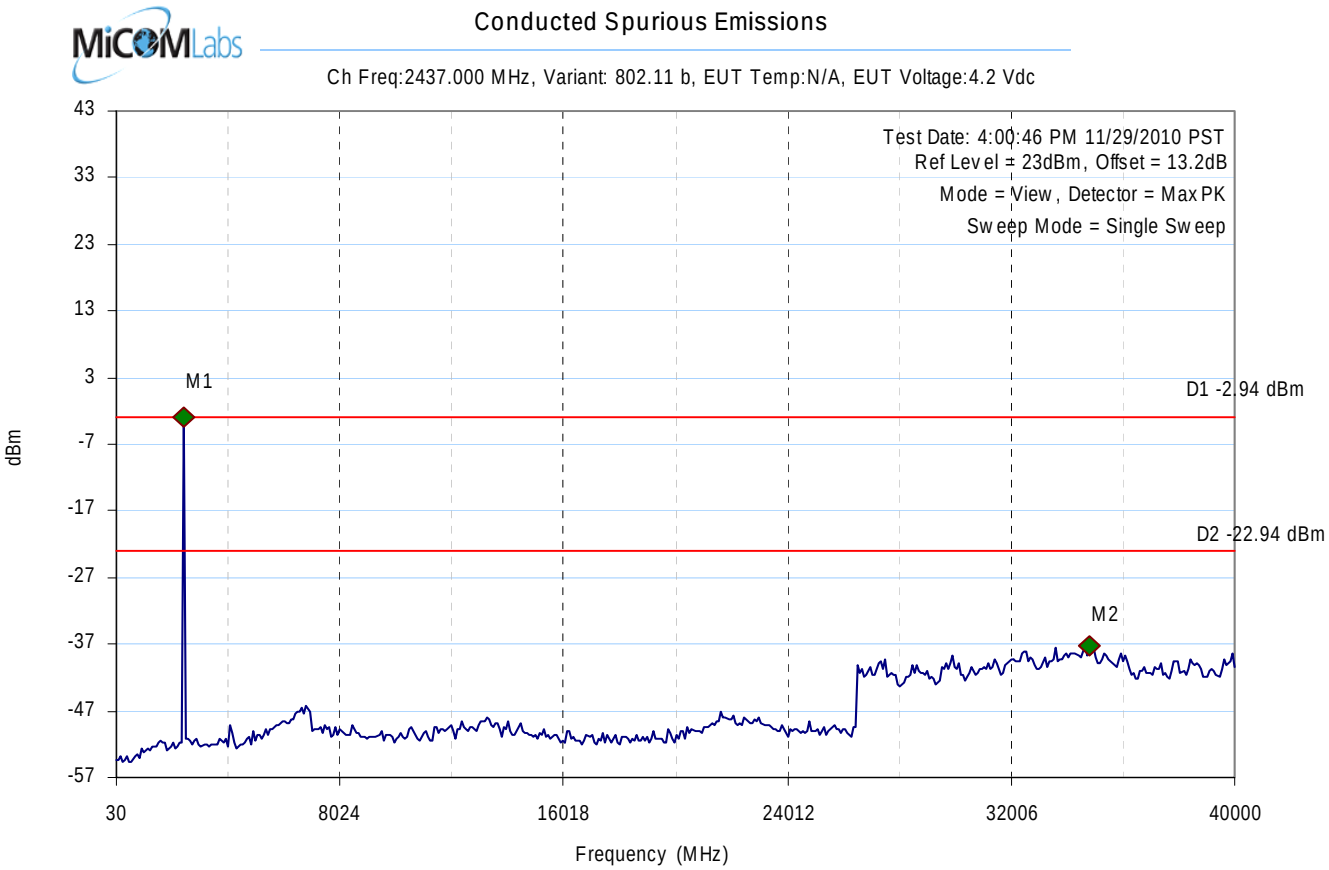
Band-edge Measurement

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	-45.96	-13.97	-31.99
2462.000	2483.50	-50.71	-12.33	-38.37

Measurement uncertainty:	±2.81 dB

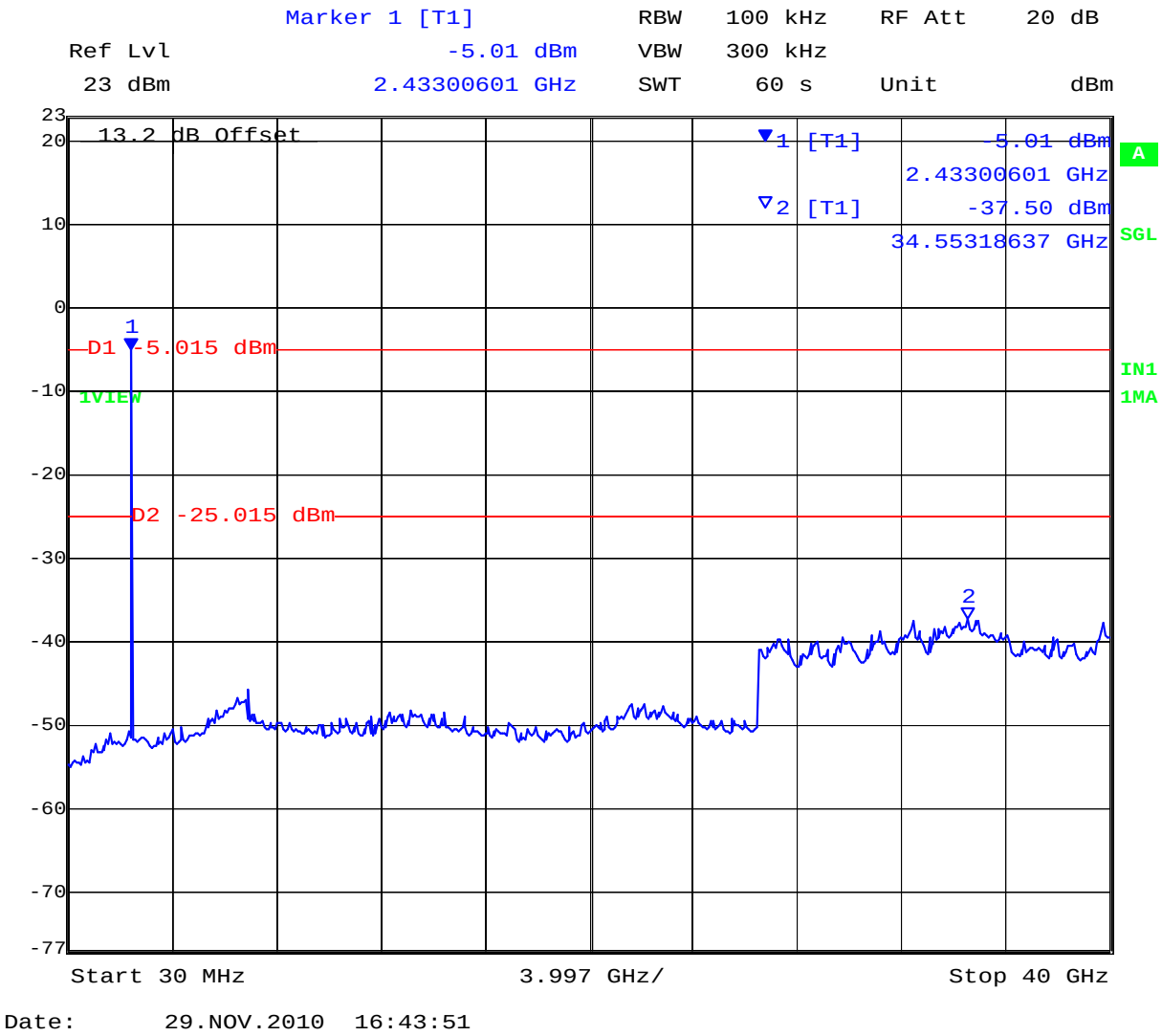


Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2352.905812MHz : 3.576dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 34232.785571MHz : -36.741dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		

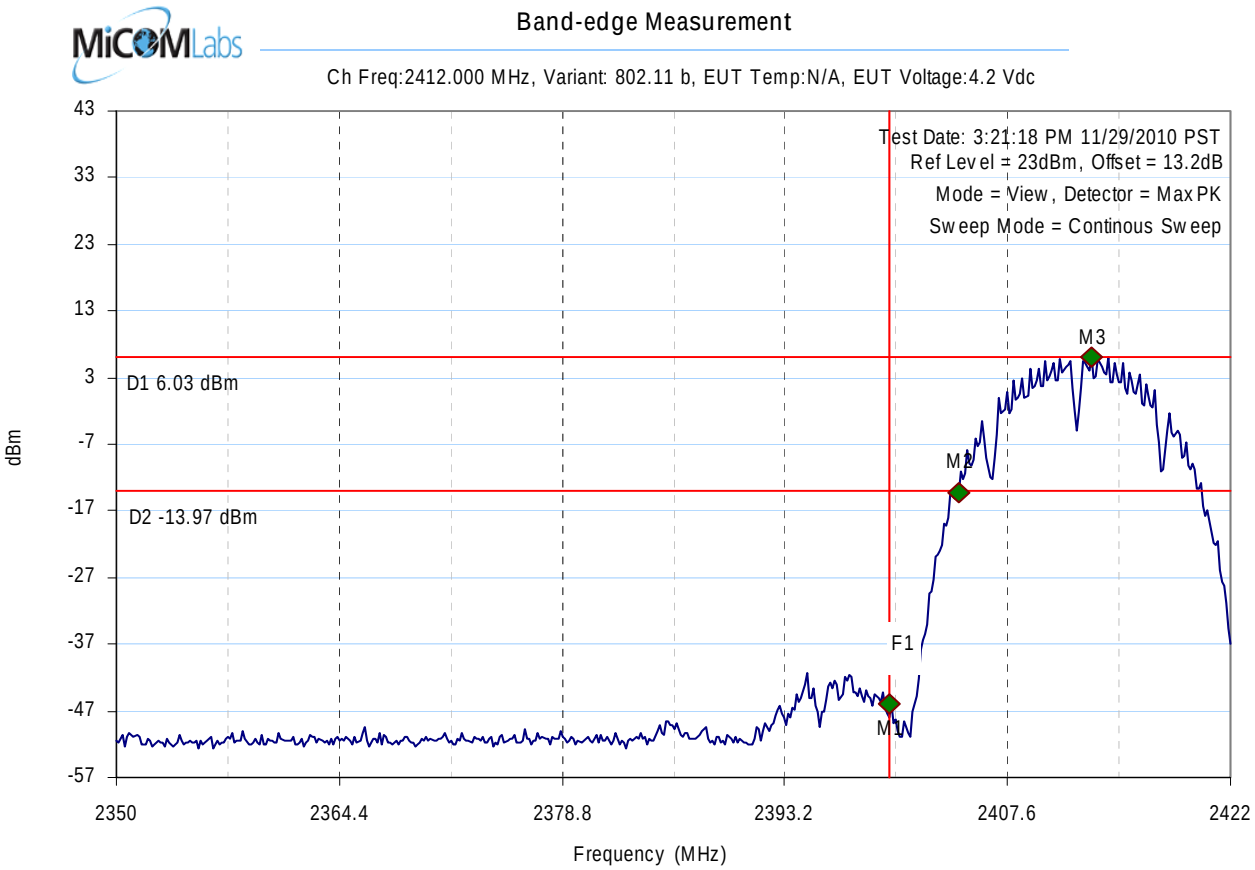


Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2433.006012MHz : -2.944dBm	Center frequency = 2437MHz
VBW = 300.00KHz	M2 : 34793.486973MHz : -37.355dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		

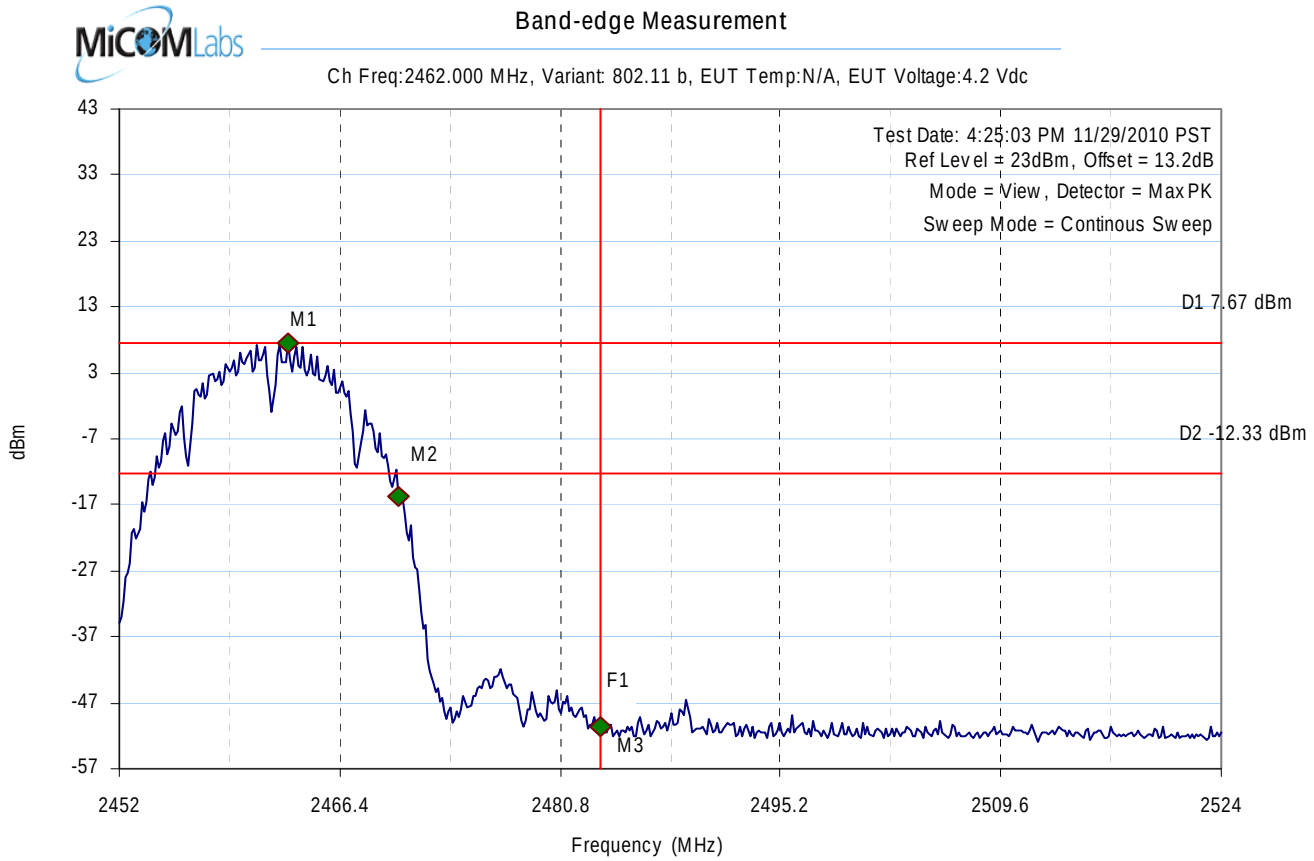
802.11b TX SPR Ambient 2462MHz 4.20V 0.03-40GHz



Date: 29.NOV.2010 16:43:51



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2400.000000MHz : -45.956dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 2404.396794MHz : -14.364dBm	
Sweep time(s) = 20	M3 : 2413.054108MHz : 6.032dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2462.965932MHz : 7.666dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 2470.180361MHz : -15.639dBm	
Sweep time(s) = 20	M3 : 2483.500000MHz : -50.705dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		

7.5.2 Measurement Results for 802.11g

Test Conditions:	15.247 (a)(2)		**Rel. Humidity (%):**	35	to	42
Variant:	802.11g		**Ambient Temp. (ºC):**	19	to	22
TPC:	HIGH		**Pressure (mBars):**	998	to	1003
Modulation:	ON		**Duty Cycle (%):**	10		
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	N/A	dBi	
Applied Voltage:	4.20	Vdc				
Notes 1:						
Notes 2:						

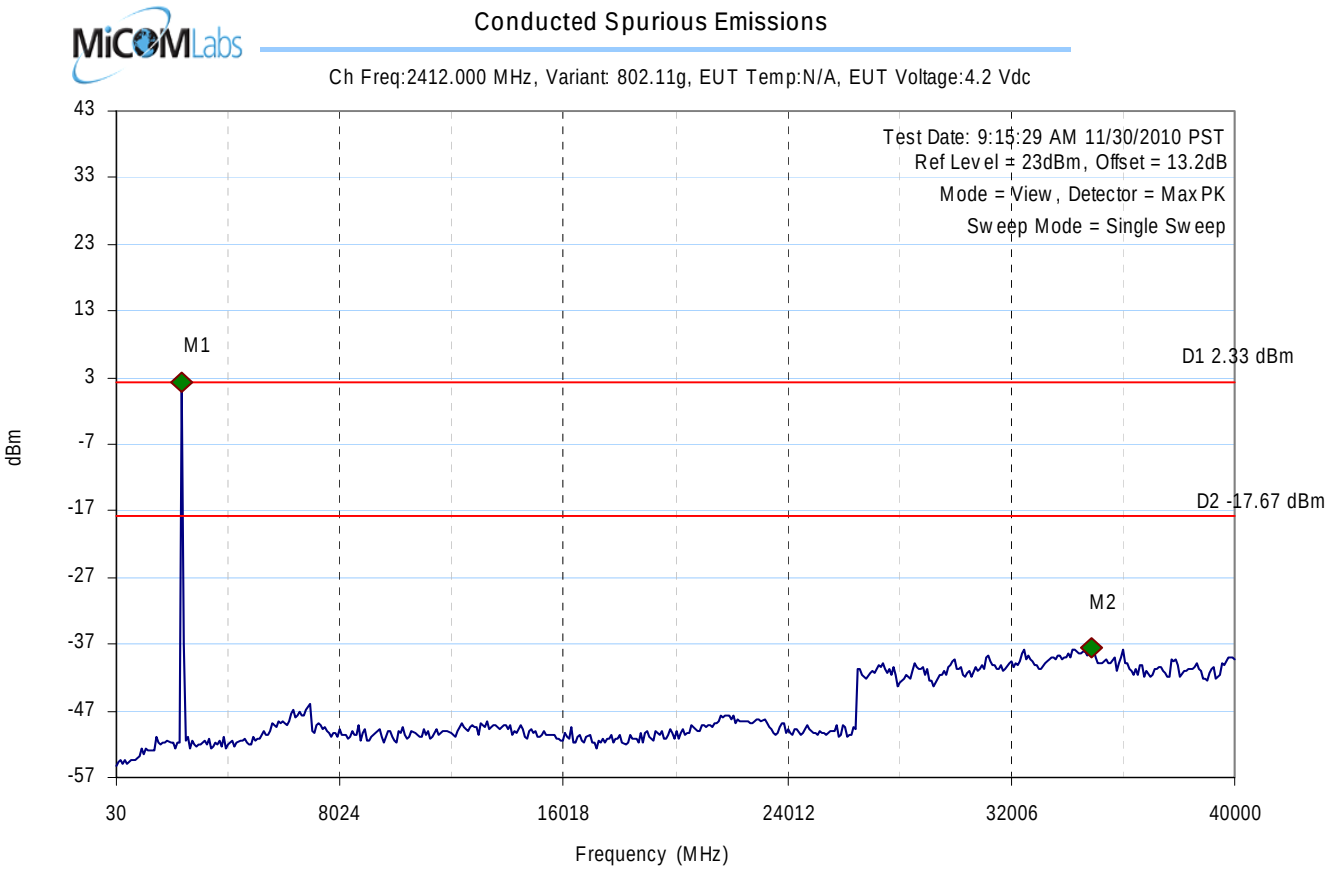
Conducted Spurious Measurement

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	40000.00	-37.61	-17.67
2437.000	30.00	40000.00	-36.25	-18.12
2462.000	30.00	40000.00	-37.62	-16.00

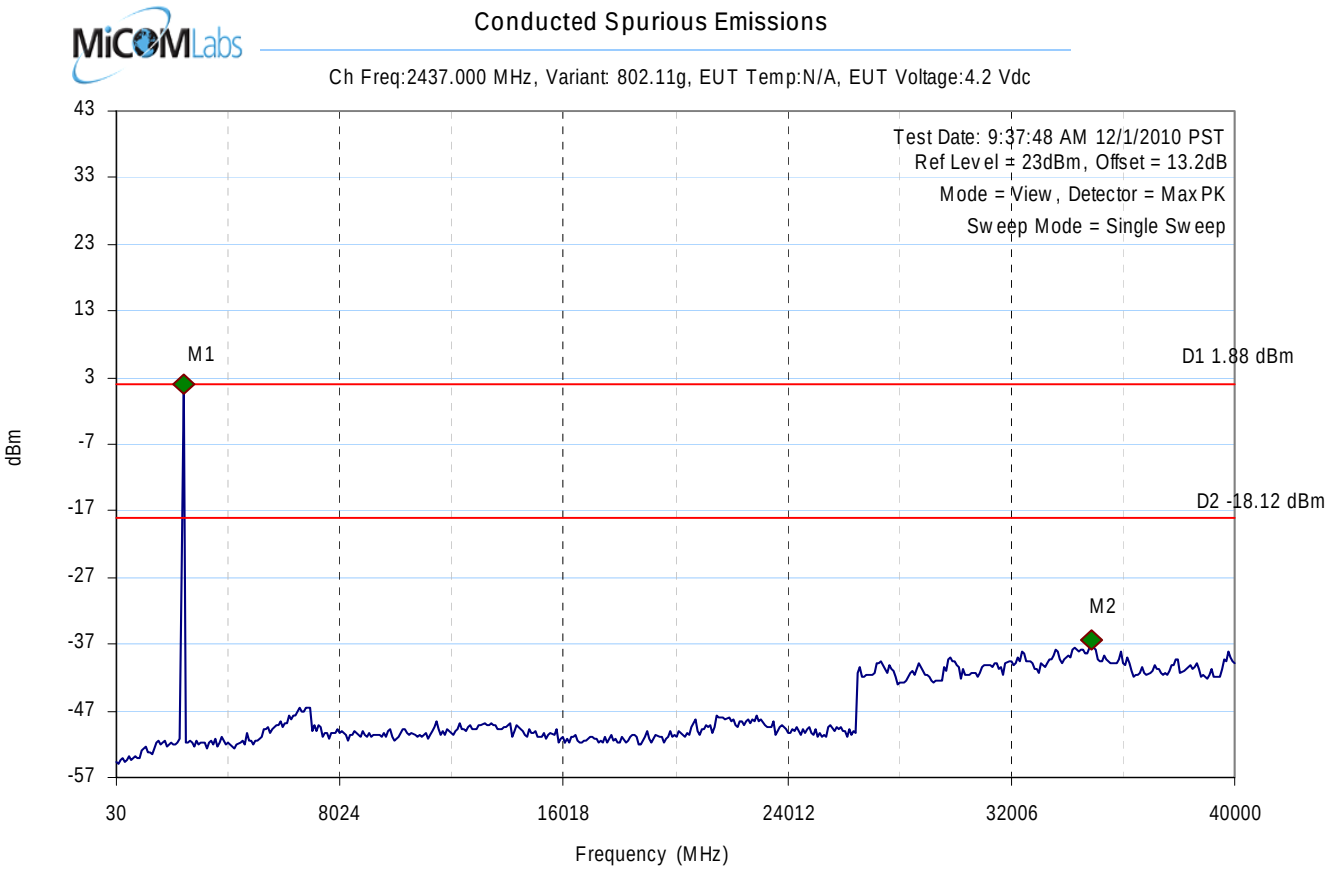
Band-edge Measurement

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	-28.42	-15.55	-12.88
2462.000	2483.50	-39.37	-14.67	-24.70

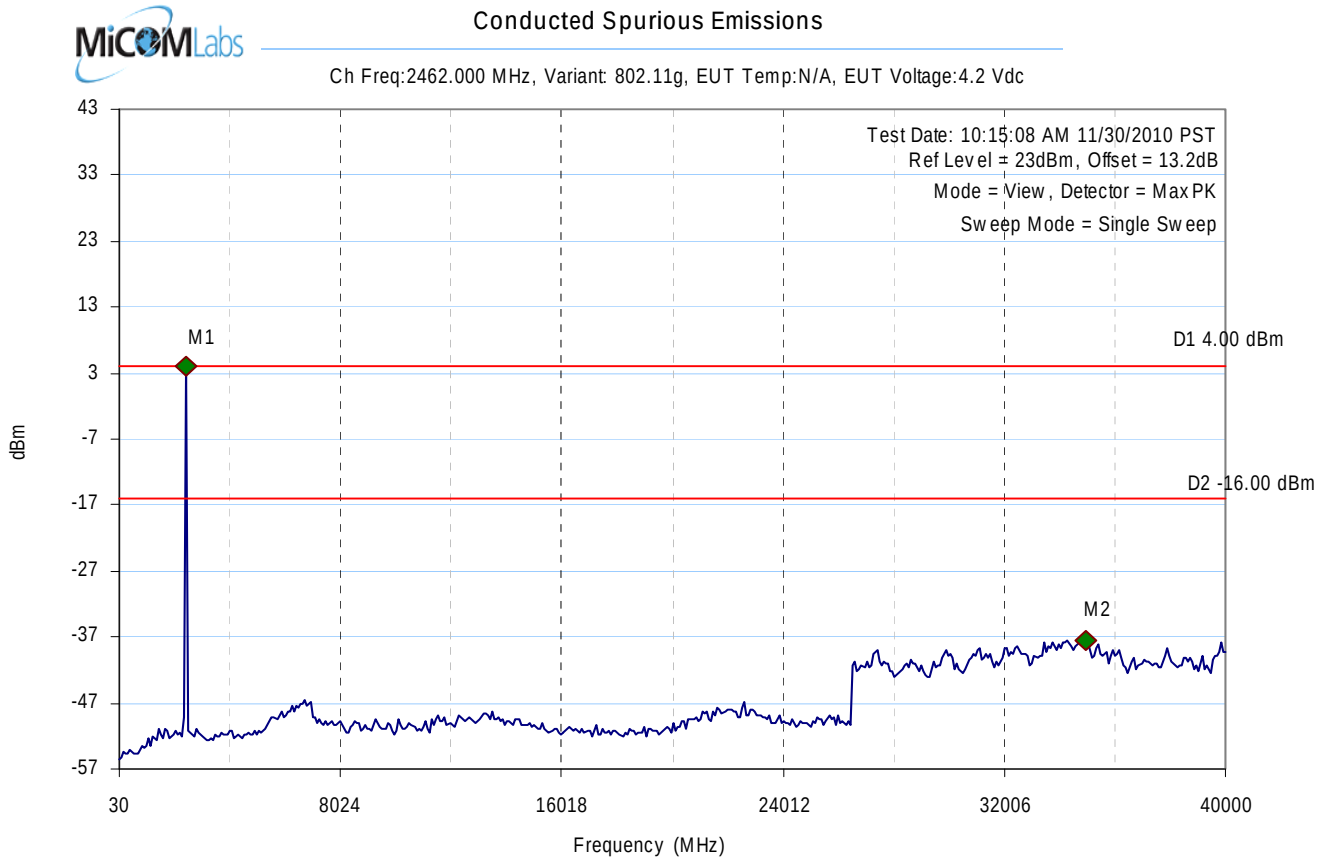
Measurement uncertainty:	±2.81 dB



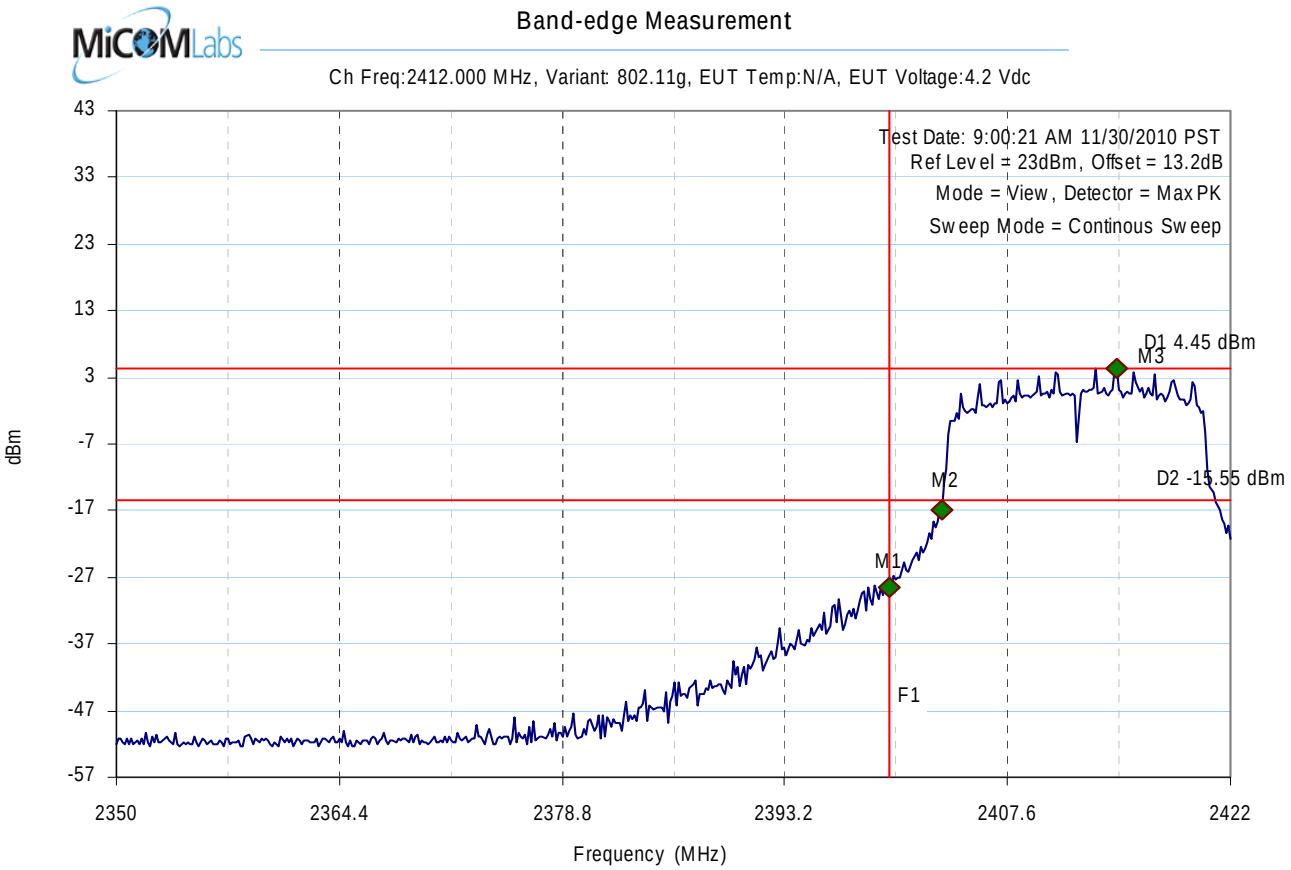
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2352.905812MHz : 2.331dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 34873.587174MHz : -37.612dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



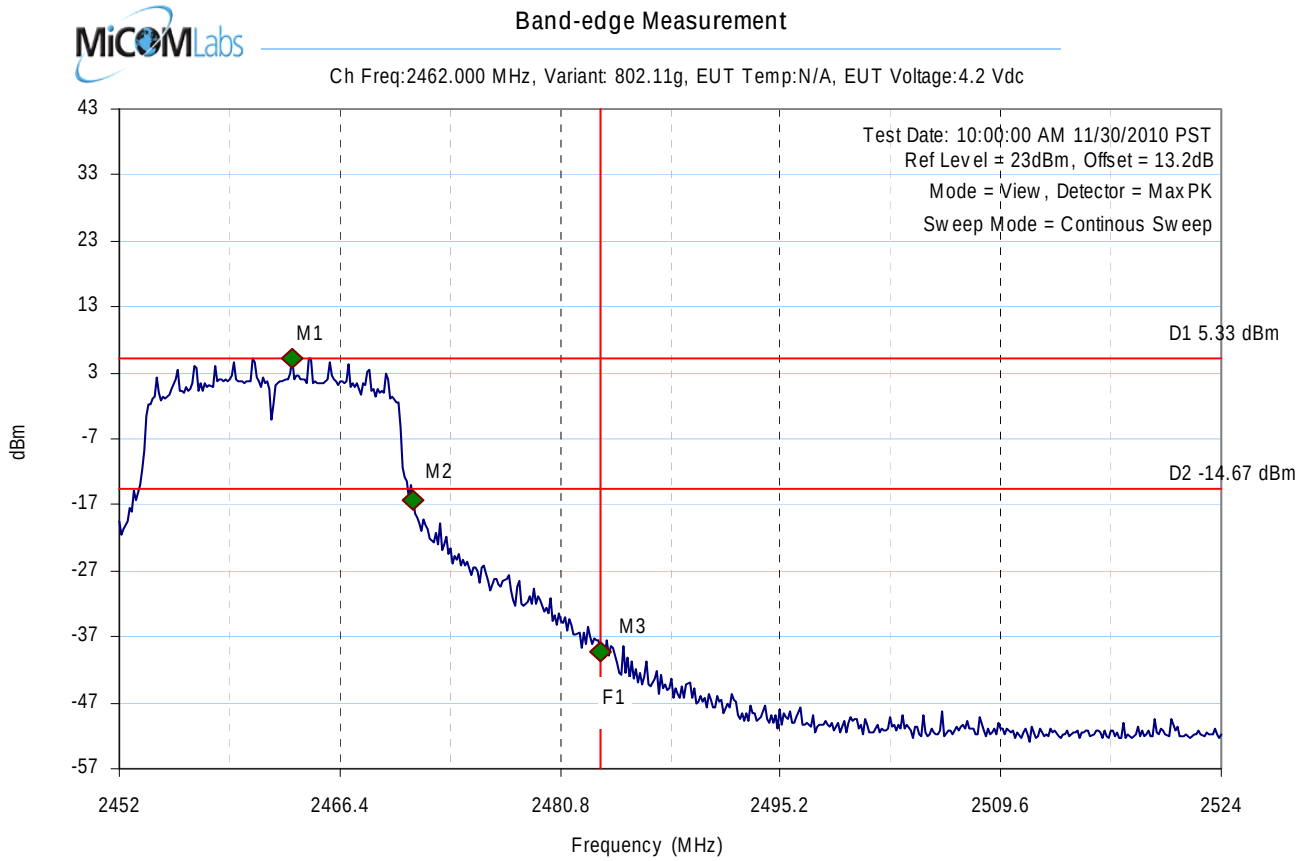
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2433.006012MHz : 1.880dBm	Center frequency = 2437MHz
VBW = 300.00KHz	M2 : 34873.587174MHz : -36.245dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2433.006012MHz : 3.999dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 34953.687374MHz : -37.620dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2400.000000MHz : -28.421dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 2403.386774MHz : -16.750dBm	
Sweep time(s) = 20	M3 : 2414.641283MHz : 4.454dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2463.254509MHz : 5.333dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 2471.190381MHz : -16.388dBm	
Sweep time(s) = 20	M3 : 2483.500000MHz : -39.371dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		

7.5.3 Measurement Results for 802.11n HT-20

Test Conditions:	15.247 (a)(2)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11n HT-20		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	10	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	N/A	dBi
Applied Voltage:	4.20	Vdc			
Notes 1:					
Notes 2:					

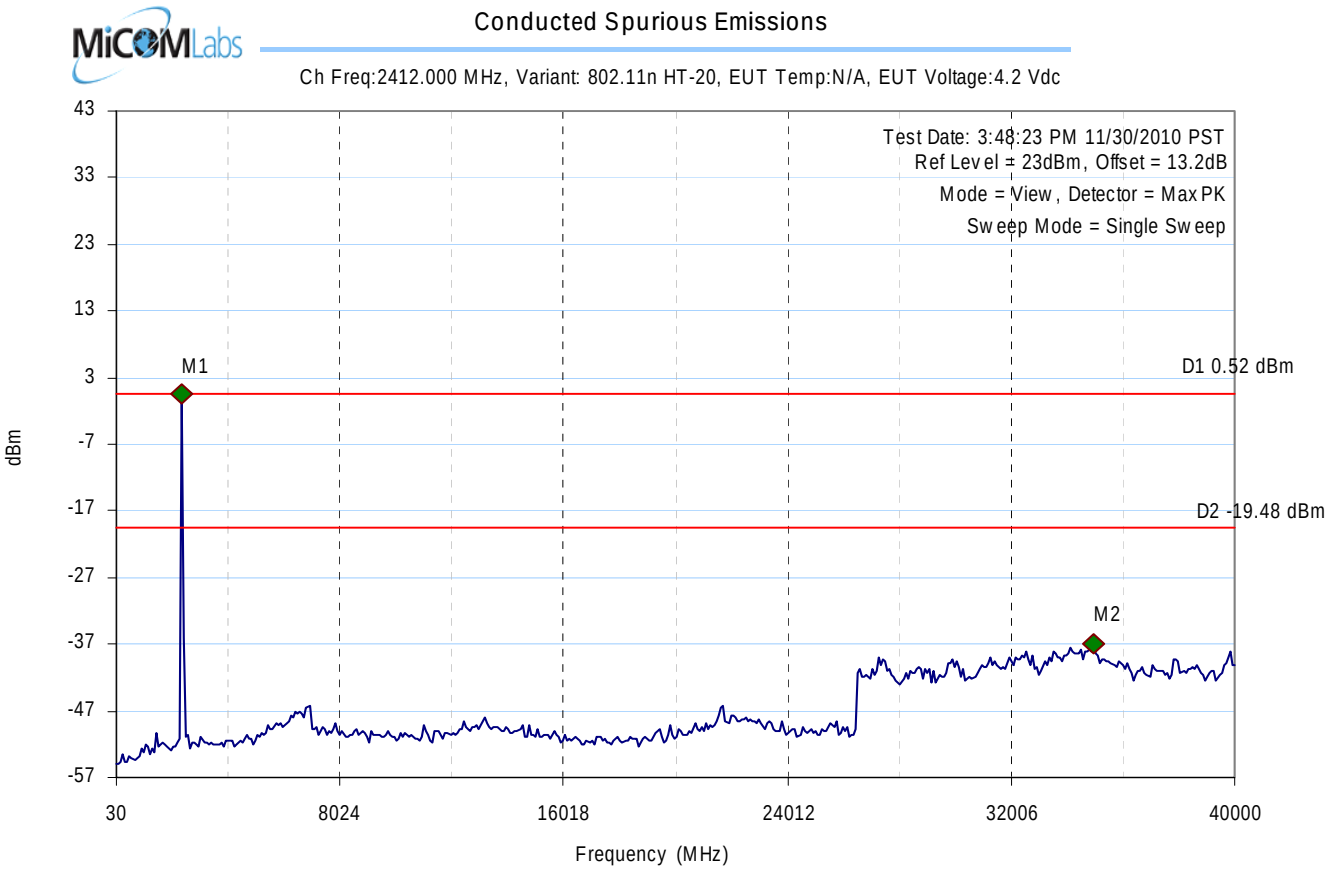
Conducted Spurious Measurement

Test Frequency	Start Frequency	Stop Frequency	Maximum Observed	Limit (20 dB below
MHz	MHz	MHz	dBm	dBm
2412.000	30.00	40000.00	-37.02	-19.48
2437.000	30.00	40000.00	-36.57	-15.82
2462.000	30.00	40000.00	-37.37	-20.08

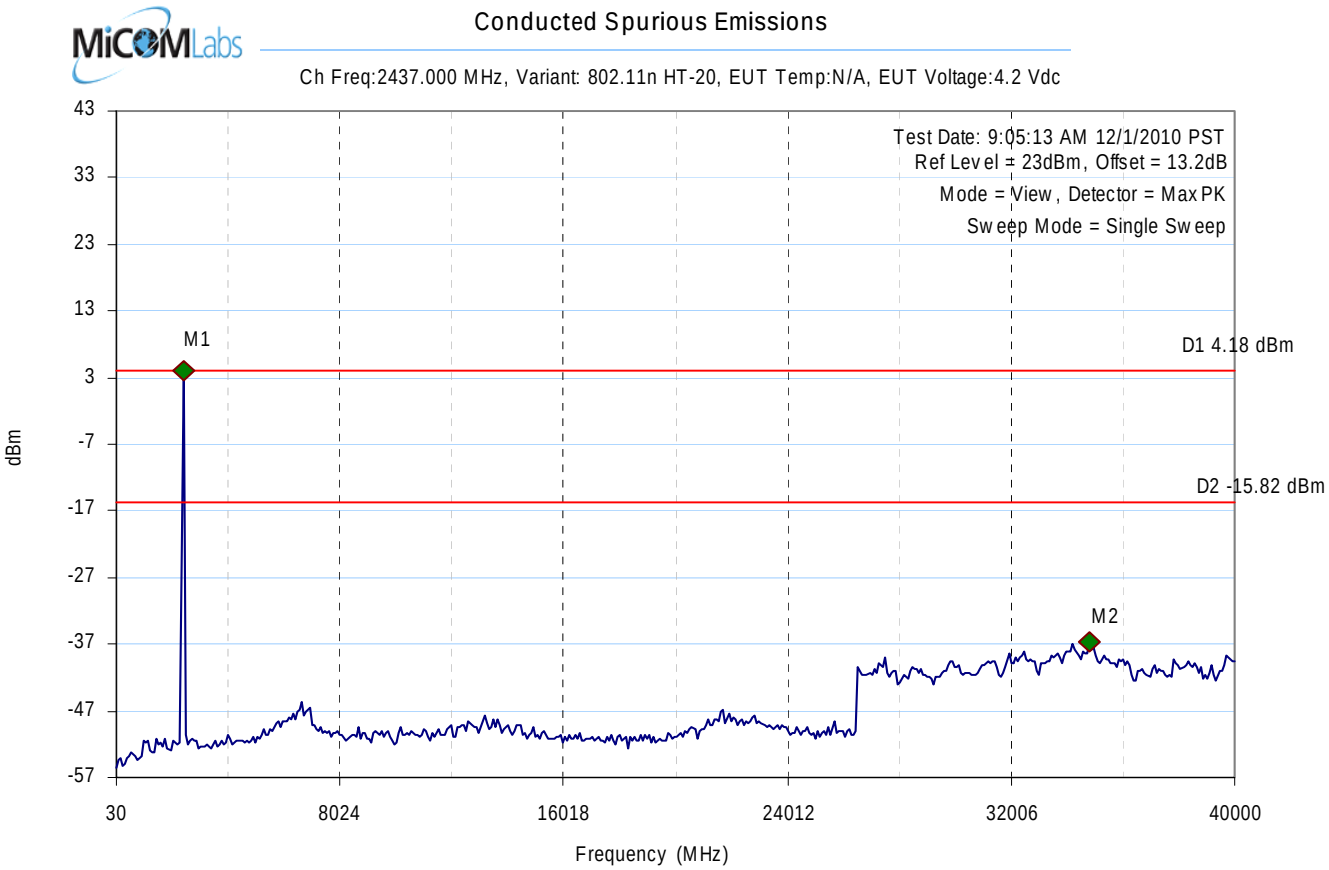
Band-edge Measurement

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	-27.77	-15.62	-12.15
2462.000	2483.50	-38.39	-14.86	-23.53

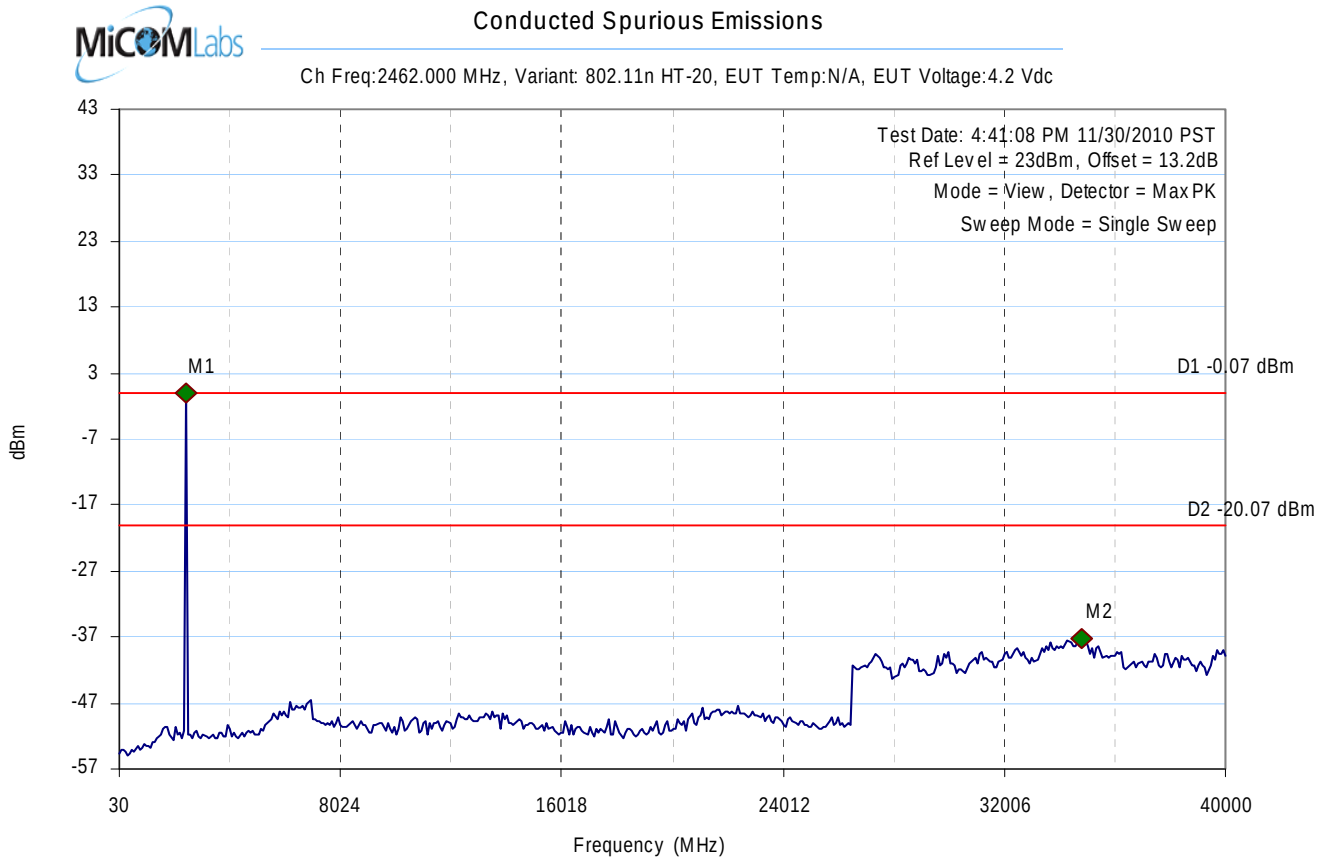
Measurement uncertainty:	±2.81 dB



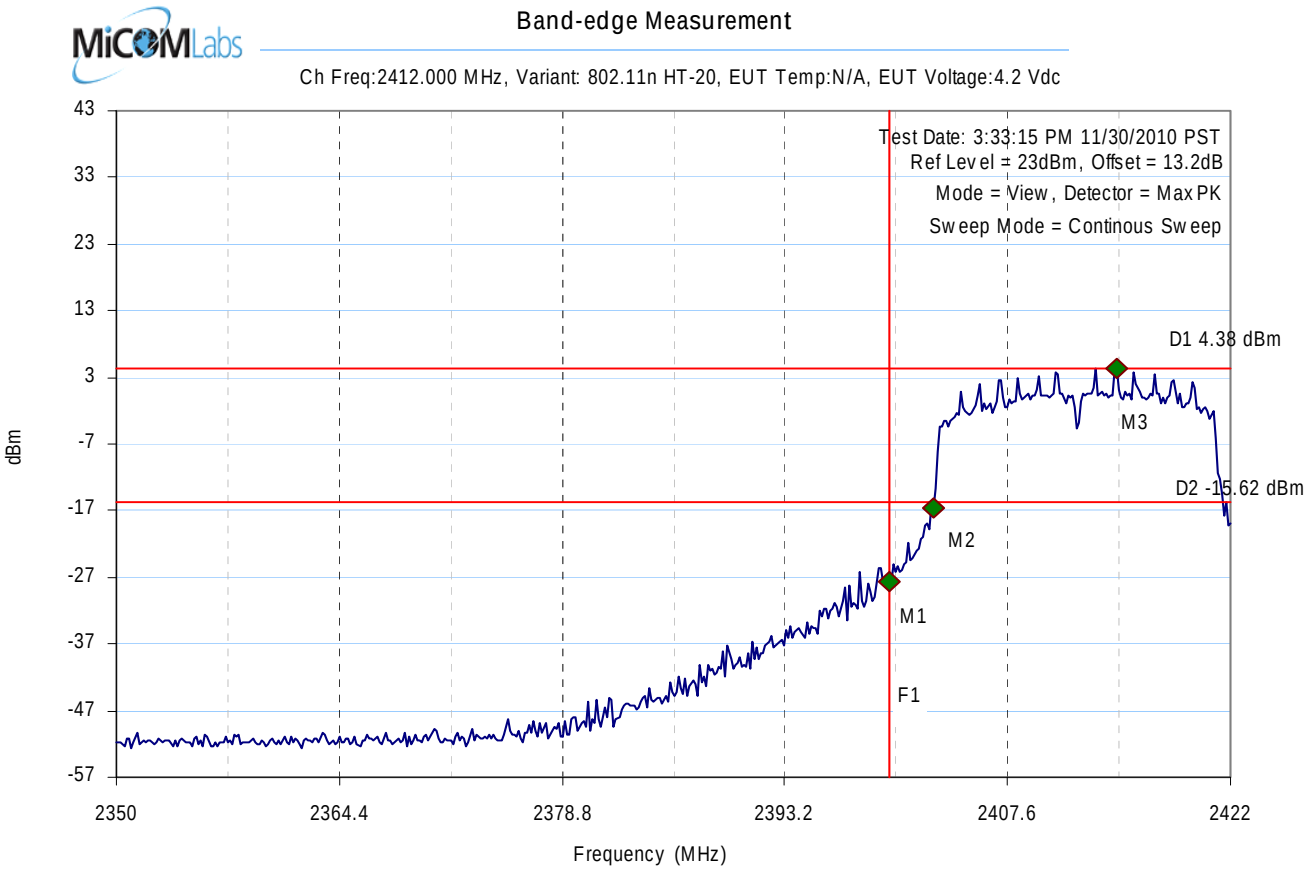
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2352.905812MHz : .521dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 34953.687374MHz : -37.024dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



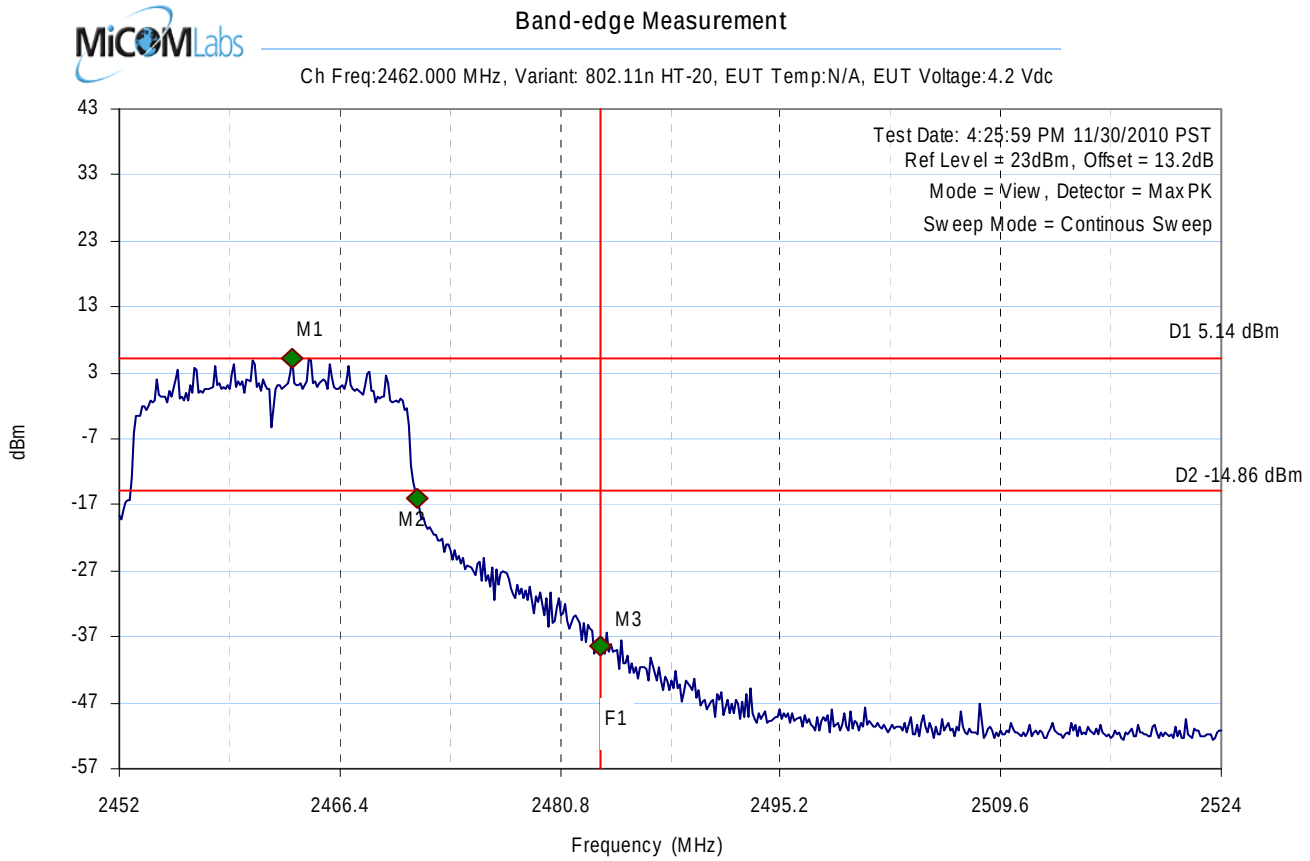
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2433.006012MHz : 4.178dBm	Center frequency = 2437MHz
VBW = 300.00KHz	M2 : 34793.486973MHz : -36.570dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2433.006012MHz : -.075dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 34793.486973MHz : -37.368dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2400.000000MHz : -27.766dBm	Center frequency = 2412MHz
VBW = 300.00KHz	M2 : 2402.809619MHz : -16.693dBm	
Sweep time(s) = 20	M3 : 2414.641283MHz : 4.379dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 2463.254509MHz : 5.142dBm	Center frequency = 2462MHz
VBW = 300.00KHz	M2 : 2471.478958MHz : -16.111dBm	
Sweep time(s) = 20	M3 : 2483.500000MHz : -38.389dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		

7.5.4 Measurement Results for 802.11a

Test Conditions:	15.247 (a)(2)		**Rel. Humidity (%):**	35	to	42
Variant:	802.11a		**Ambient Temp. (ºC):**	19	to	22
TPC:	HIGH		**Pressure (mBars):**	998	to	1003
Modulation:	ON		**Duty Cycle (%):**	10		
Beam Forming	N/A	dB	**Antenna Gain:**	N/A	dBi	
Applied Voltage:	4.20	Vdc				
Notes 1:						
Notes 2:						

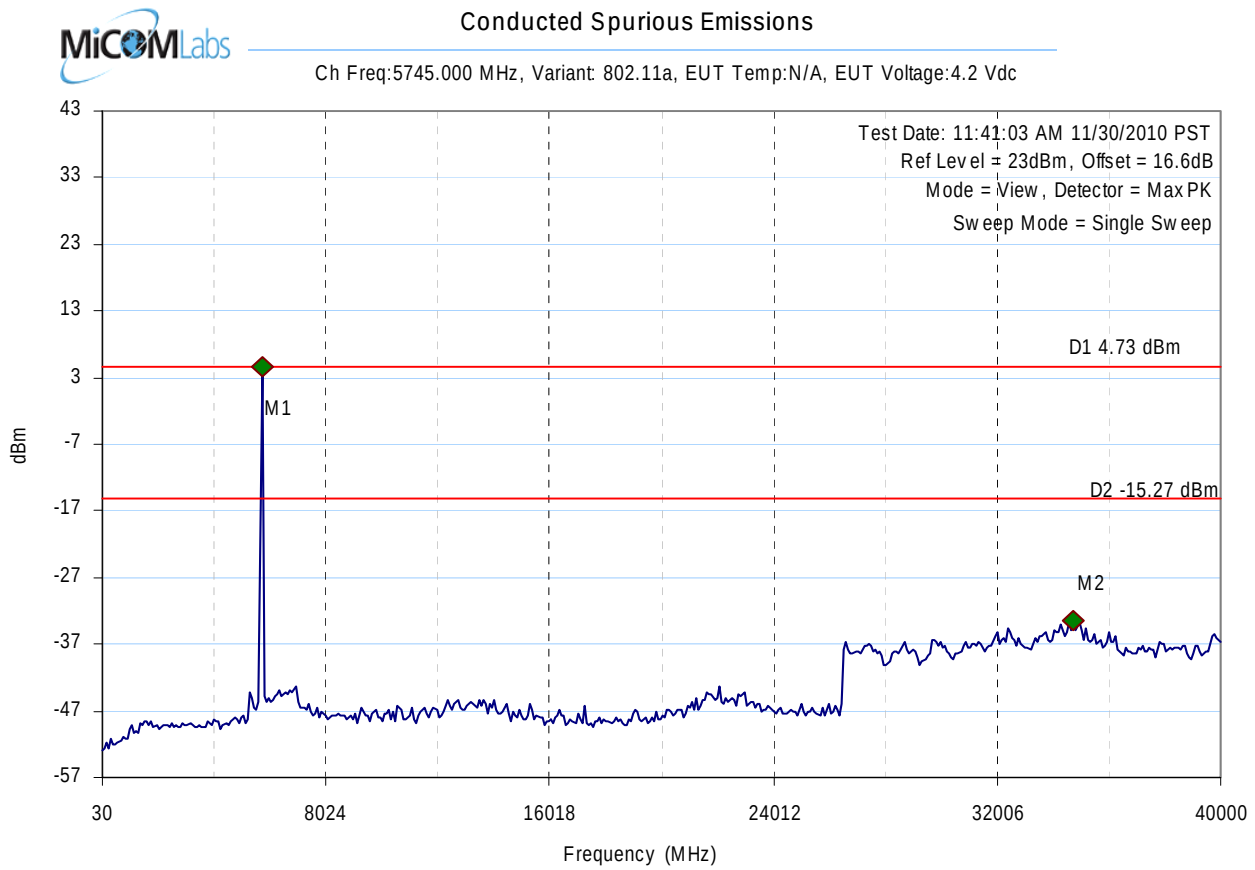
Conducted Spurious Measurement

Test Frequency	Start Frequency	Stop Frequency	Maximum Observed Emission	Limit (20 dB below peak of fundamental)
MHz	MHz	MHz	dBm	dBm
5745.000	30.00	40000.00	-33.39	-15.27
5785.000	30.00	40000.00	-34.00	-12.28
5825.000	30.00	40000.00	-34.01	-15.69

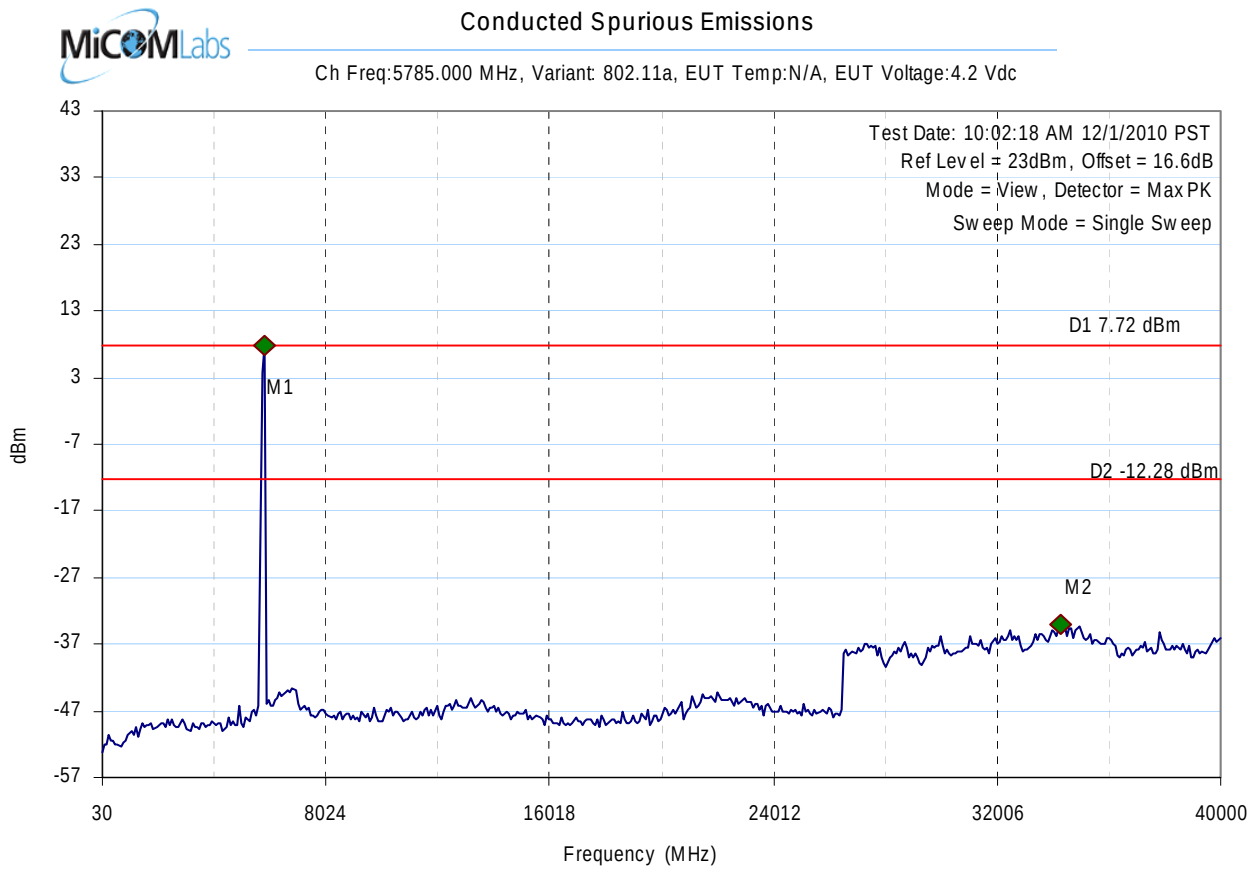
Band-edge Measurement

Test Frequency	Band-edge Frequency	Emission Amplitude @ Band-edge	Limit (20 dB below peak of fundamental)	Margin
MHz	MHz	dBm	dBm	dB
5745.000	5725.00	-29.79	-10.52	-19.26
5825.000	5850.00	-38.15	-11.04	-27.11

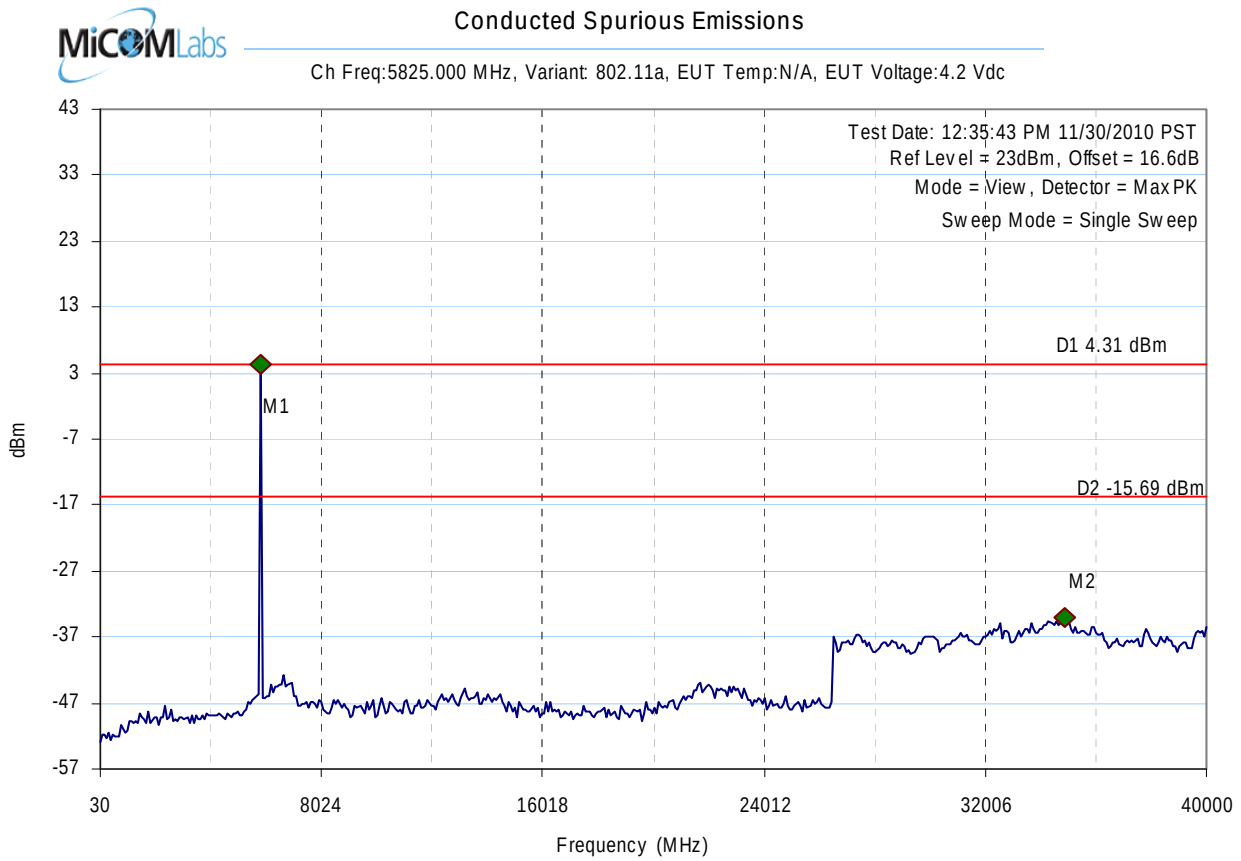
Measurement uncertainty:	±2.81 dB



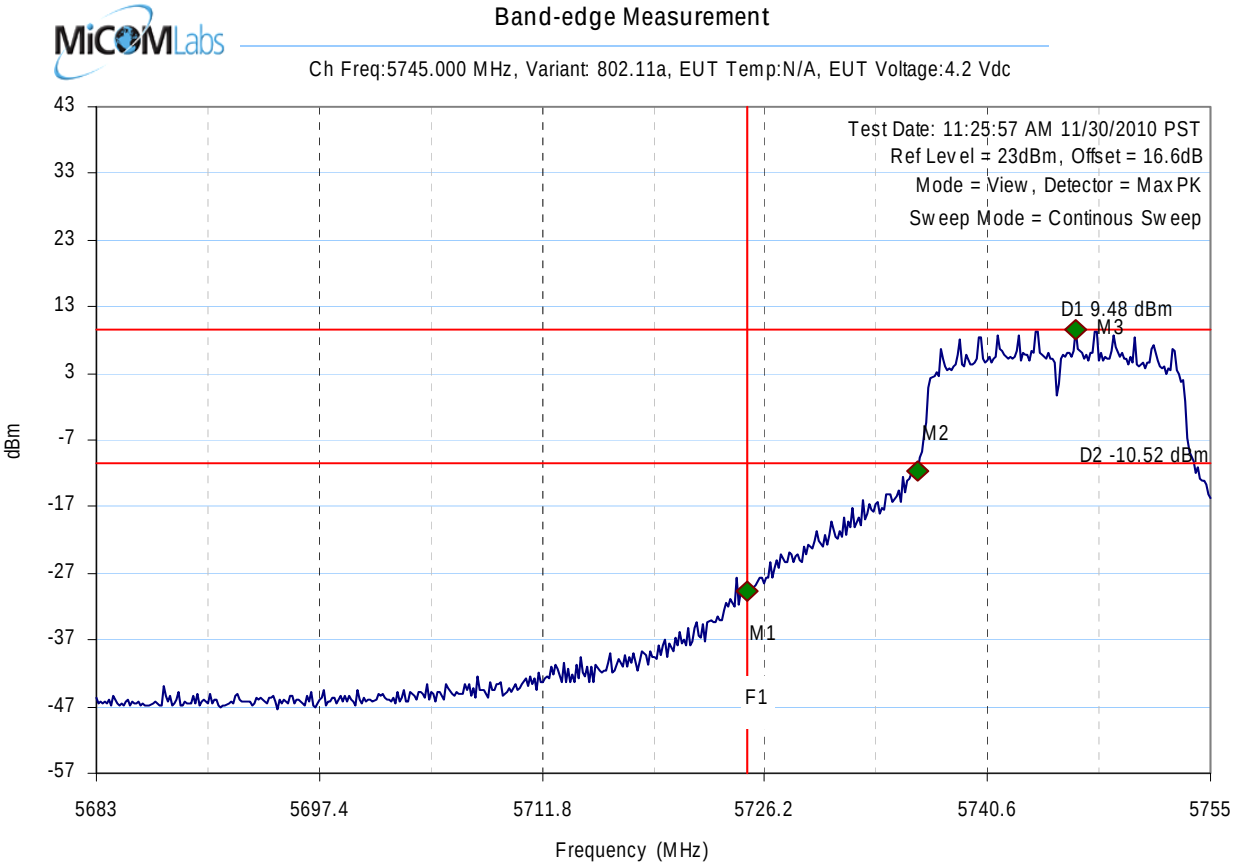
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5717.114228MHz : 4.735dBm	Center frequency = 5745MHz
VBW = 300.00KHz	M2 : 34713.386773MHz : -33.390dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



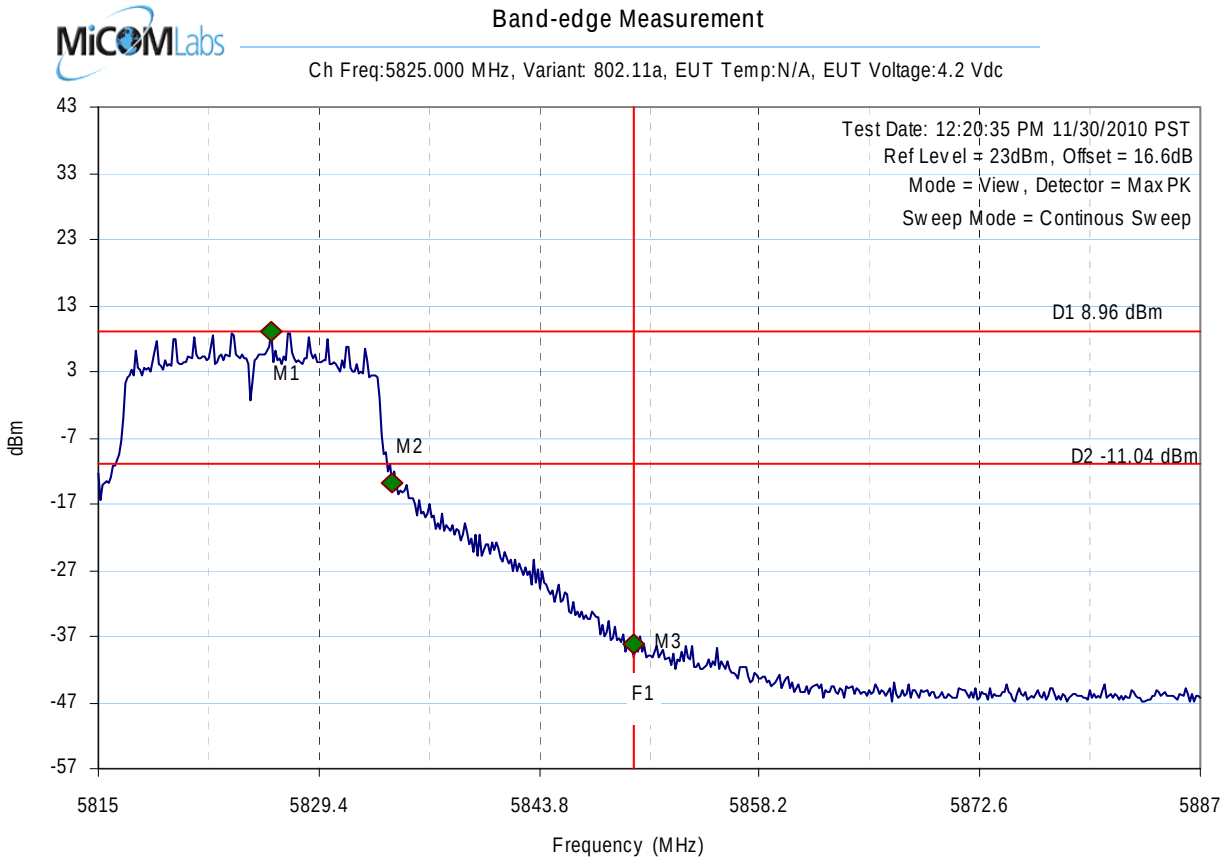
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5797.214429MHz : 7.720dBm	Center frequency = 5785MHz
VBW = 300.00KHz	M2 : 34312.885771MHz : -33.998dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5797.214429MHz : 4.312dBm	Center frequency = 5825MHz
VBW = 300.00KHz	M2 : 34873.587174MHz : -34.014dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5725.000000MHz : -29.786dBm	Center frequency = 5745MHz
VBW = 300.00KHz	M2 : 5736.098196MHz : -11.787dBm	
Sweep time(s) = 20	M3 : 5746.342685MHz : 9.478dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5826.254509MHz : 8.961dBm	Center frequency = 5825MHz
VBW = 300.00KHz	M2 : 5834.190381MHz : -13.876dBm	
Sweep time(s) = 20	M3 : 5850.000000MHz : -38.153dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		

7.5.5 Measurement Results for 802.11n HT-20

Test Conditions:	15.247 (a)(2)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11n HT-20	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	10
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	N/A dBi
Applied Voltage:	4.20 Vdc		
Notes 1:			
Notes 2:			

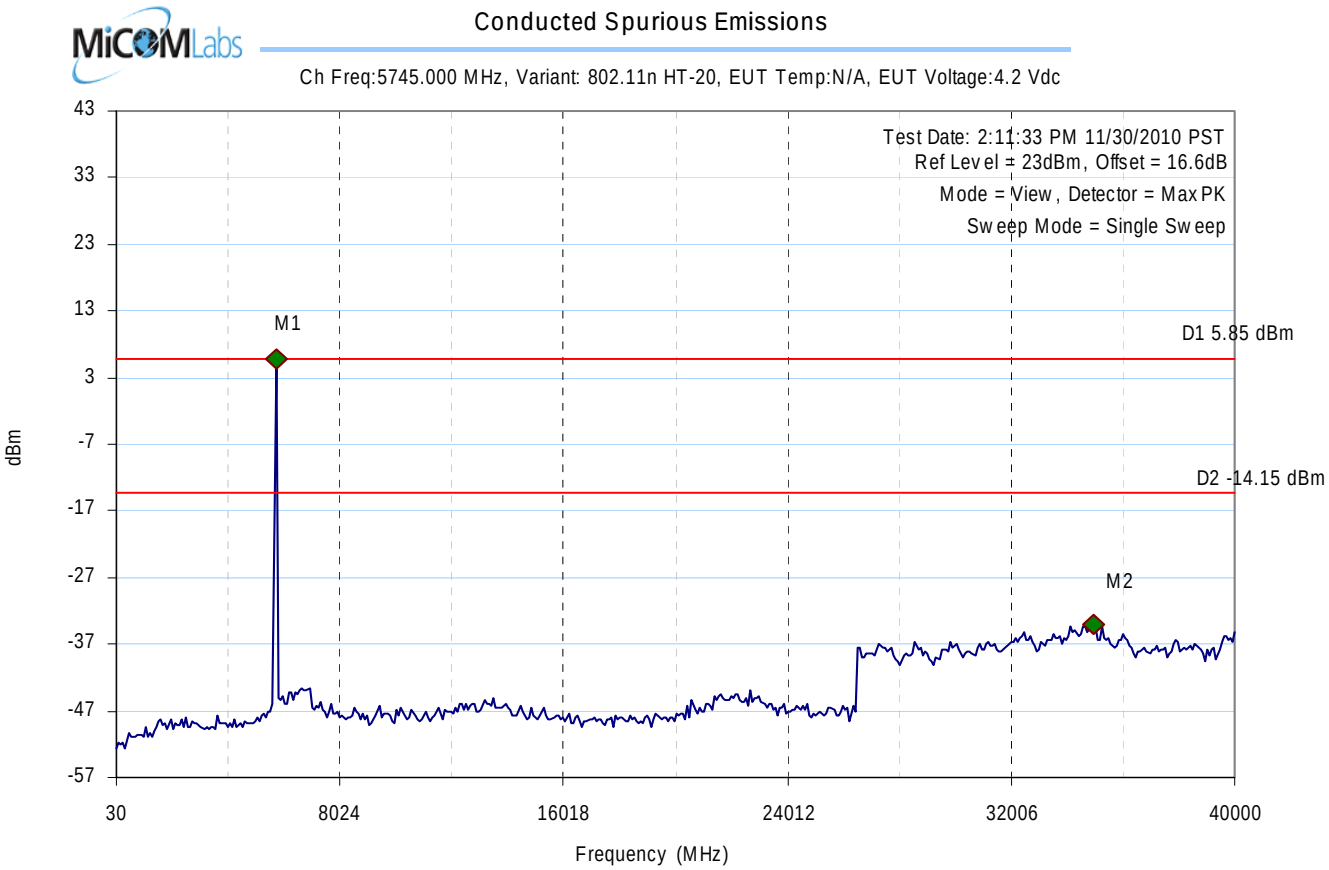
Conducted Spurious Measurement

Test Frequency	Start Frequency	Stop Frequency	Maximum Observed Emission	Limit (20 dB below peak of fundamental)
MHz	MHz	MHz	dBm	dBm
5745.000	30.00	40000.00	-34.00	-14.15
5785.000	30.00	40000.00	-34.17	-13.97
5825.000	30.00	40000.00	-33.35	-15.06

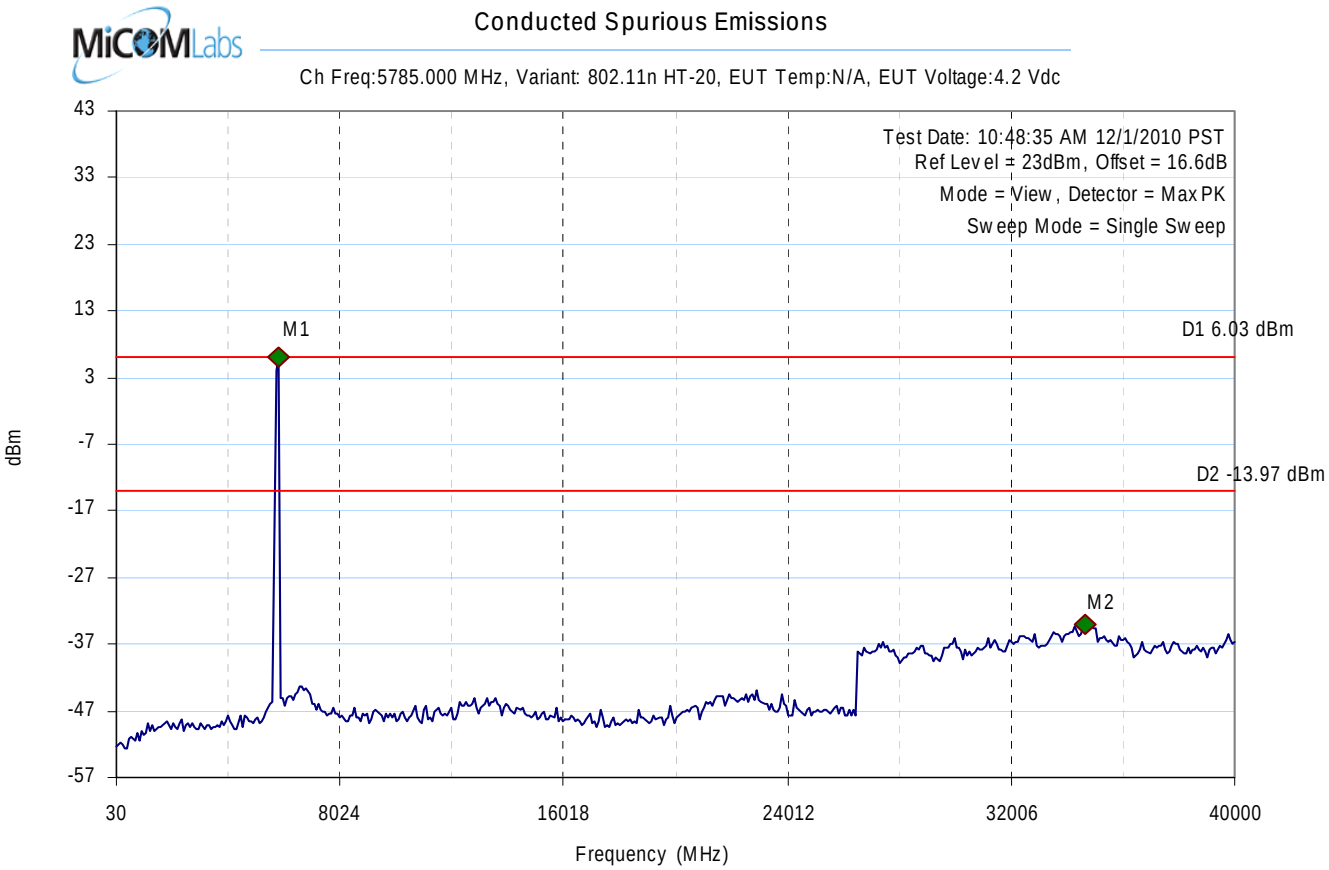
Band-edge Measurement

Test Frequency	Band-edge Frequency	Emission Amplitude @ Band-edge	Limit (20 dB below peak of fundamental)	Margin
MHz	MHz	dBm	dBm	dB
5745.000	5725.00	-28.16	-10.41	-17.76
5825.000	5850.00	-36.72	-11.19	-25.53

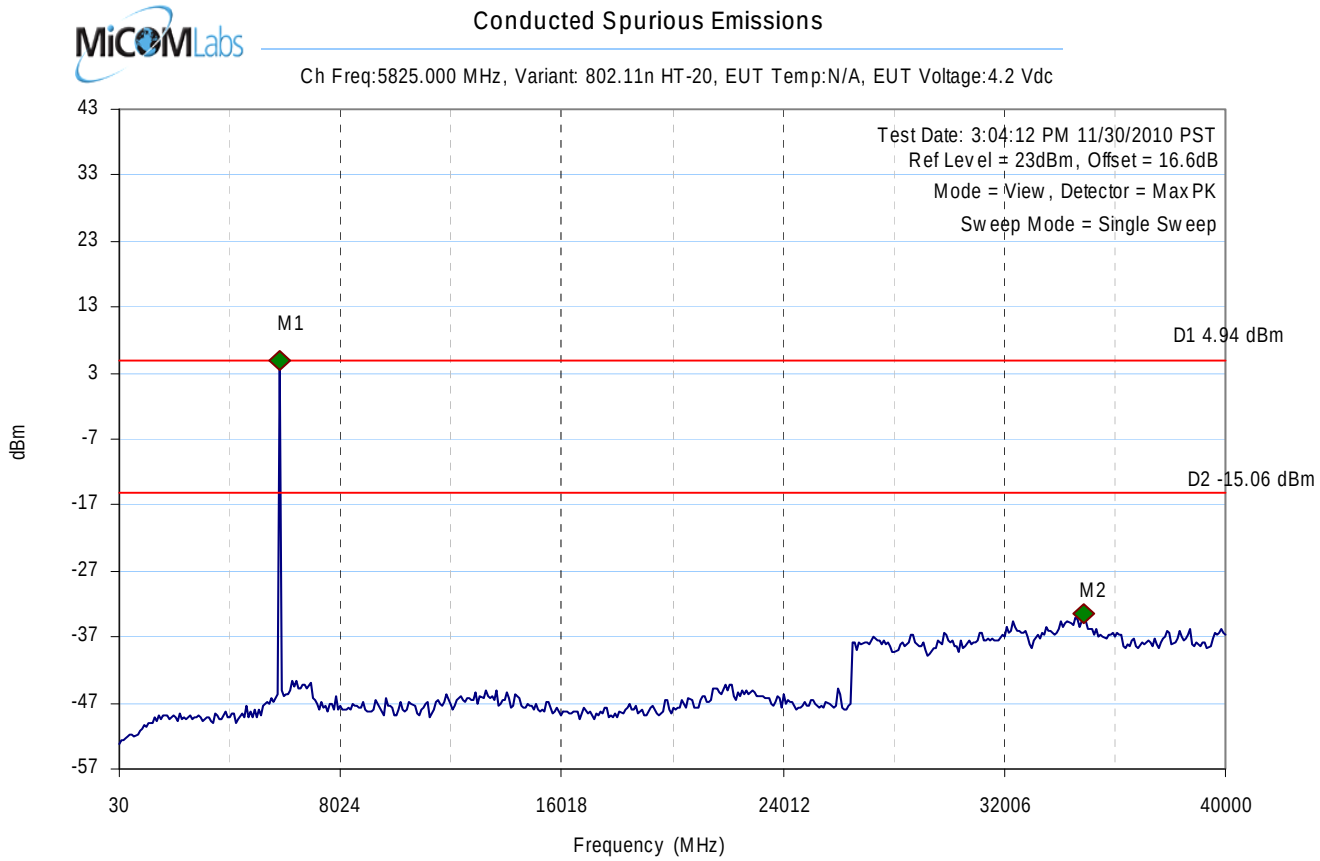
Measurement uncertainty:	±2.81 dB



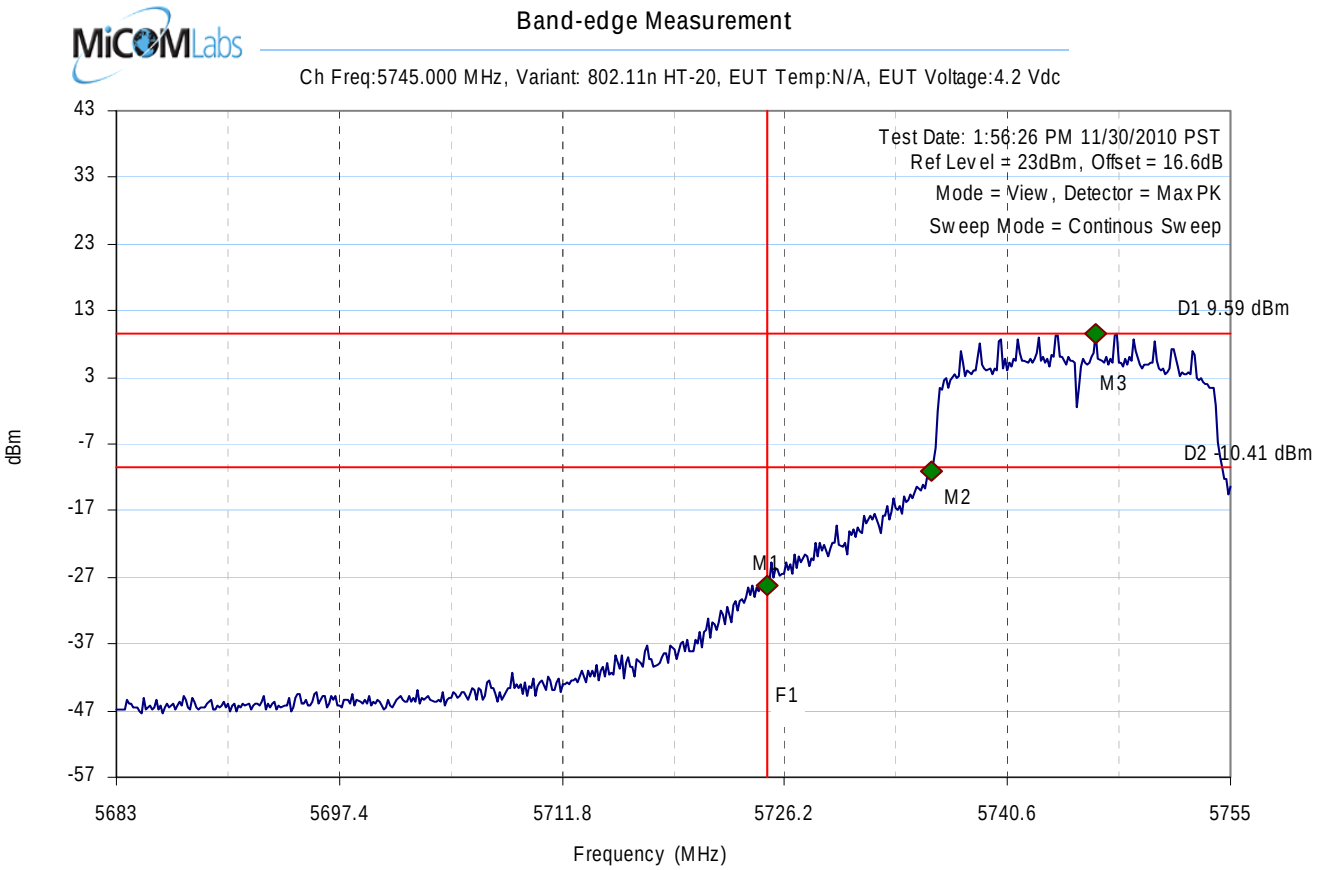
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5717.114228MHz : 5.853dBm	Center frequency = 5745MHz
VBW = 300.00KHz	M2 : 34953.687374MHz : -34.000dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



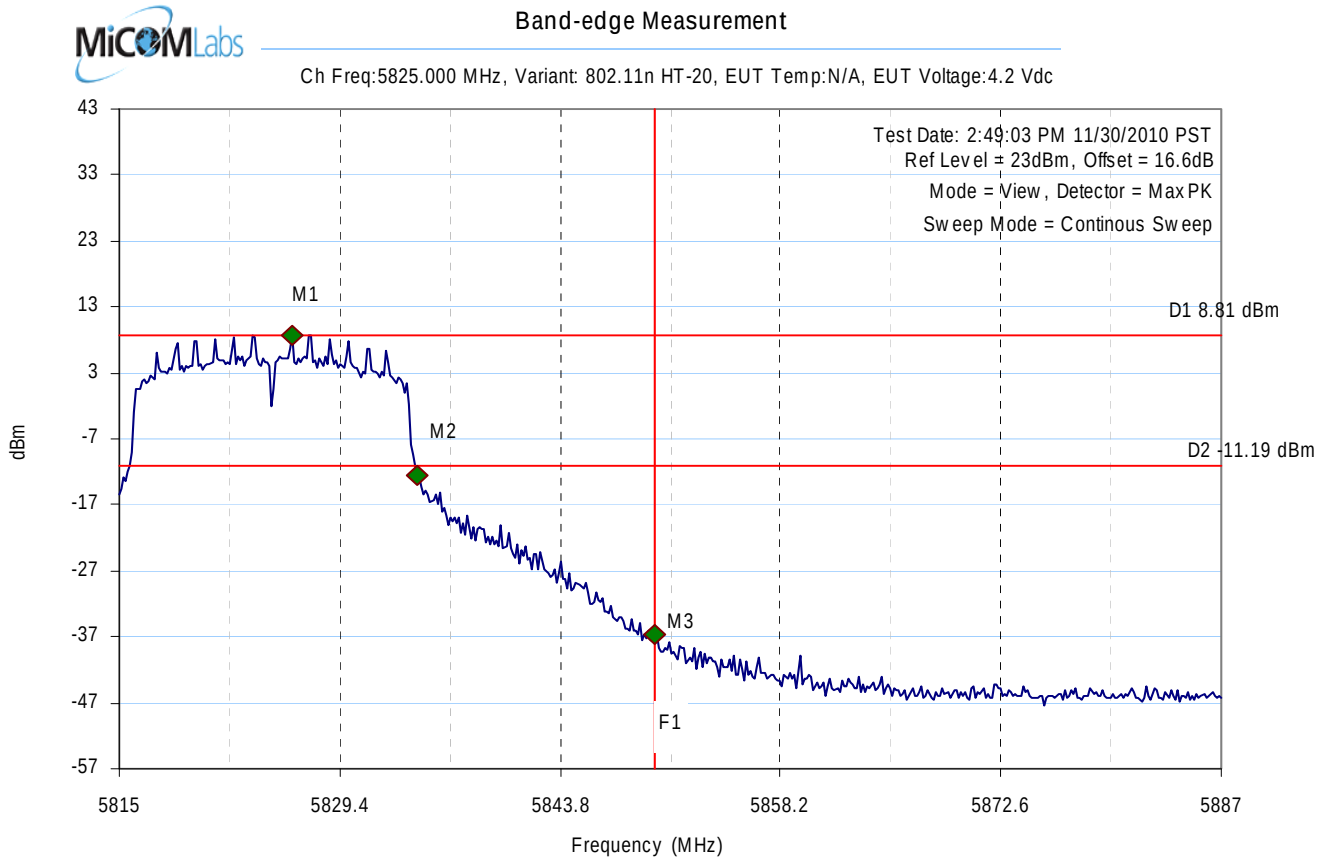
Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5797.214429MHz : 6.030dBm	Center frequency = 5785MHz
VBW = 300.00KHz	M2 : 34633.286573MHz : -34.173dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5797.214429MHz : 4.938dBm	Center frequency = 5825MHz
VBW = 300.00KHz	M2 : 34873.587174MHz : -33.347dBm	
Sweep time(s) = 60		
RF Atten (dB) = 10		
Span = 39.97GHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5725.000000MHz : -28.161dBm	Center frequency = 5745MHz
VBW = 300.00KHz	M2 : 5735.665331MHz : -11.037dBm	
Sweep time(s) = 20	M3 : 5746.342685MHz : 9.594dBm	
RF Atten (dB) = 10		
Span = 72.00MHz		



Analyser Setup	Marker : Frequency : Amplitude	Test Results
RBW = 100.00KHz	M1 : 5826.254509MHz : 8.813dBm	Center frequency = 5825MHz
VBW = 300.00KHz	M2 : 5834.478958MHz : -12.538dBm	
Sweep time(s) = 20	M3 : 5850.000000MHz : -36.715dBm	
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.

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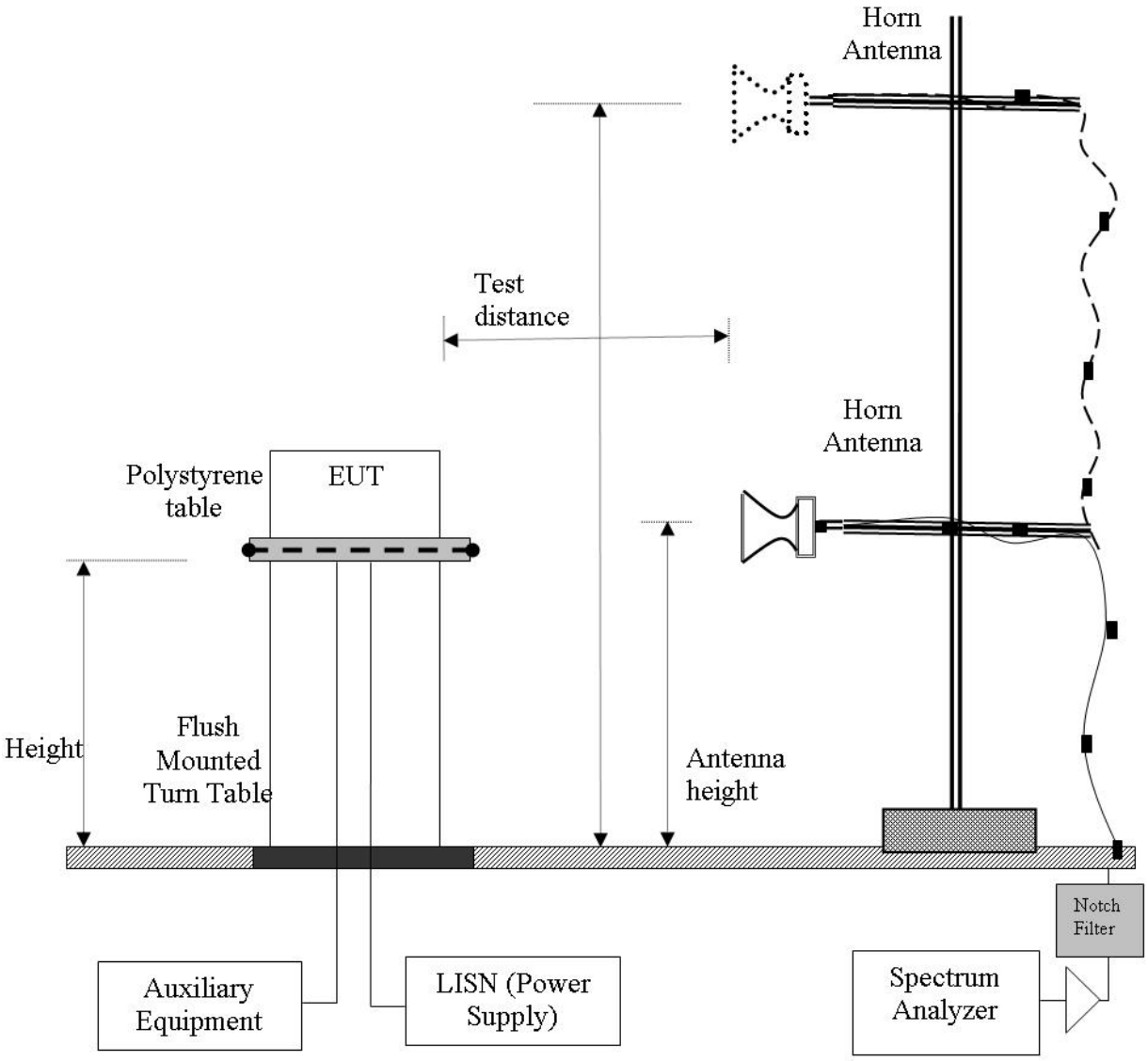
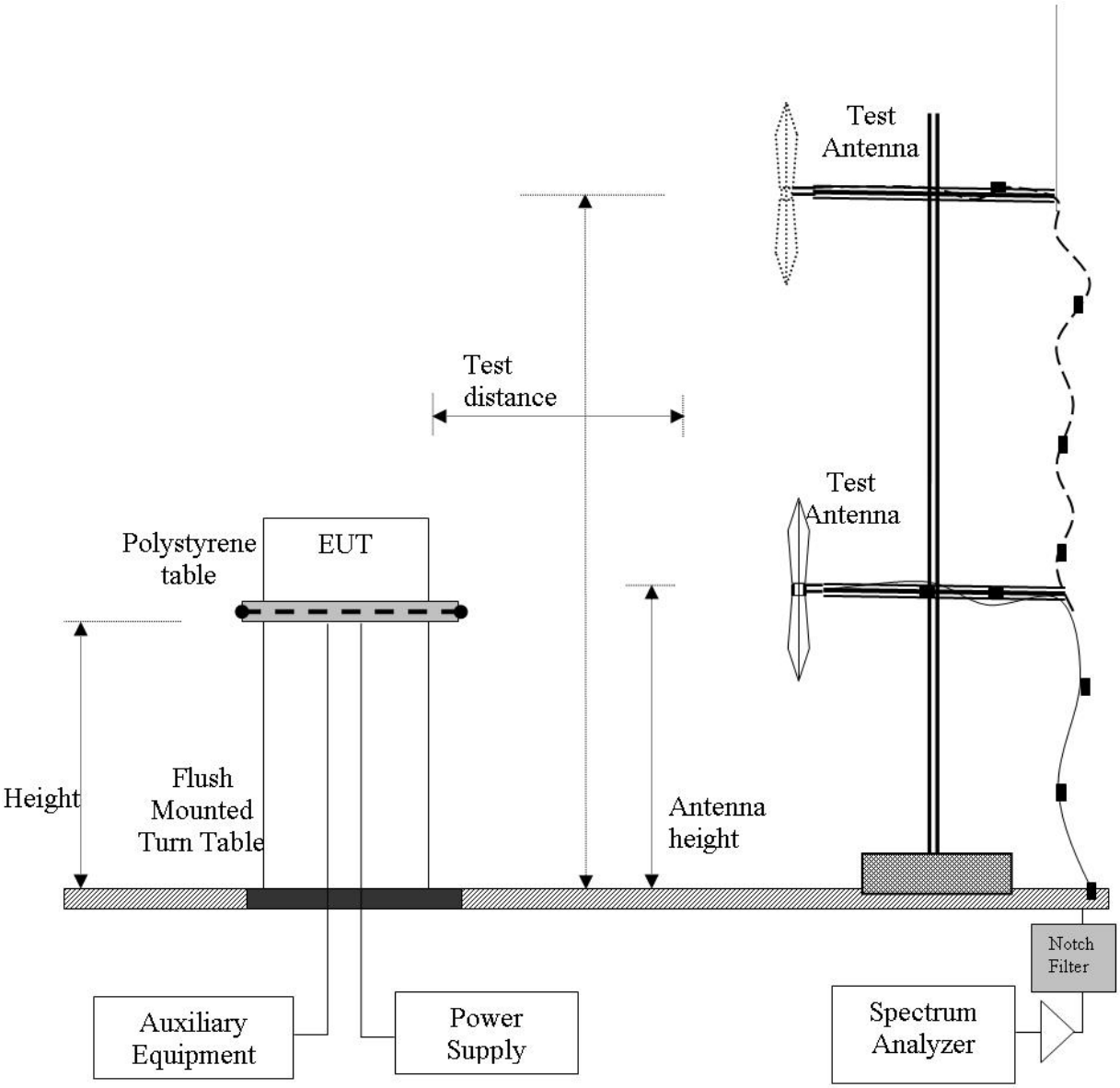
Radiated Emission Measurement Setup – Above 1 GHz



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 for FCC Part 15 Radiated Spurious Emissions

FCC §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.

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)).

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 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

Specification for Industry Canada RSS-210 Radiated Spurious Emissions

RSS-210 §2.1 RSS-Gen Compliance
In addition to RSS-210, the requirements in RSS-Gen, General Requirements and Information for the Certification of Radio Apparatus, must be met.

RSS-210 §2.2 Emissions Falling Within Restricted Frequency Bands
Category I license-exempt equipment is required to comply with the provisions in RSS-Gen with respect to emissions falling within restricted frequency bands. These restricted frequency bands are listed in RSS-Gen.

RSS-210 §2.3 Receivers
Category I equipment receivers for use with transmitters subject to RSS-210 must comply with the applicable requirements set out in RSS-Gen and be certified under RSS-210. Category II equipment receivers for use with transmitters subject to RSS-210 are exempt from certification, but are subject to compliance with RSS-Gen and RSS-310.

RSS-210 §2.5 General Field Strength Limits
RSS-Gen includes the general field strength limits of unwanted emissions, where applicable, for transmitters and receivers operating in accordance with the provisions specified in this standard.

Unwanted emissions of transmitters and receivers are permitted to fall within the restricted bands listed in RSS-Gen, and including the TV bands, but fundamental emissions are prohibited in the restricted bands.

Specification for Industry Canada RSS-Gen Radiated Transmitter Spurious Emissions

RSS-Gen §7.2.5 Transmitter Spurious Emissions Limits
Spurious emissions from license-exempt transmitters shall comply with the field strength limits shown below. Additionally, the level of any transmitter spurious emission shall not exceed the level of the transmitter's fundamental emission.

Table 1: RSS-Gen §7.2.5 Radiated Transmitter 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

Specification for Industry Canada RSS-Gen Radiated Receiver Spurious Emissions

RSS-Gen §6.1 Receiver Spurious Emissions Limits
Radiated spurious emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals.

Spurious emissions from receivers shall not exceed the radiated limits shown in the table below.

Table 1: RSS-Gen §6.1 Radiated Receiver 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	0287, 0193, 0342, 0158, 0303, 0304, 0134, 0310, 0312

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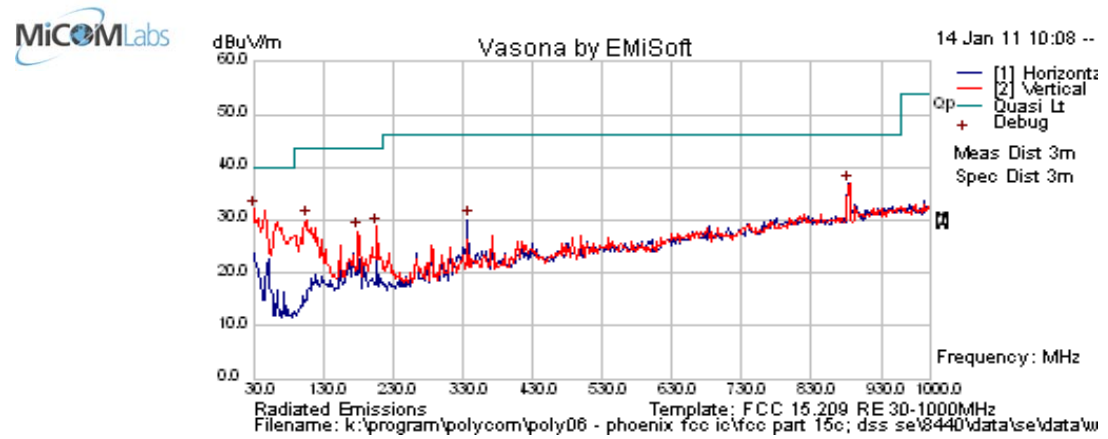
7.6.1 Transmitter Radiated Spurious Emissions

All frequencies and modes were checked per 15.247 for radio emissions below 1GHz.

Test Freq.	N/A	**Engineer**	EVF
Variant	WLAN - 802.11a, b, g, n HT-20	**Temp (ºC)**	18.5
Freq. Range	30 - 1000 MHz	**Rel. Hum. (%)**	47
Power Setting	Utility Setting 24 - Maximum	**Press. (mBars)**	1016
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC1010320232) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Tx; WLAN=1, BT=0, BC=0, DK=0		

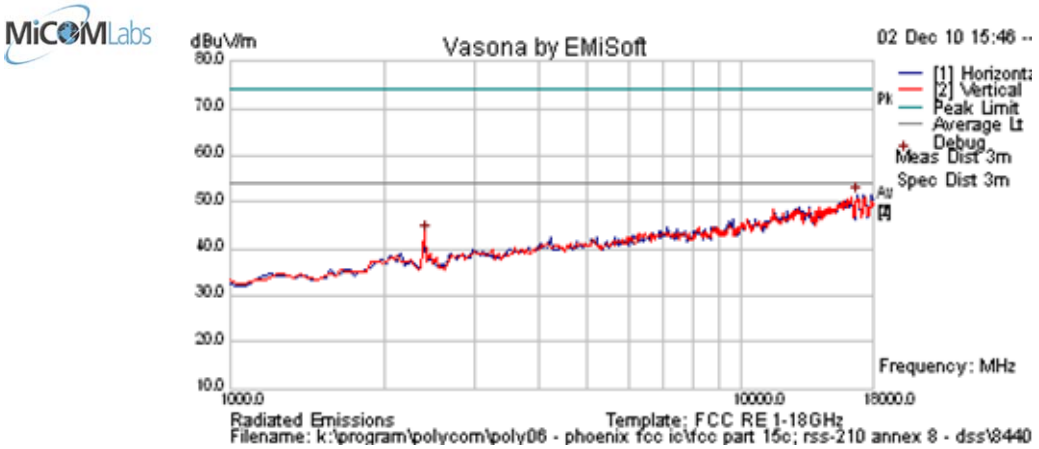


Formally measured emission peaks

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
882.835	31.7	7.3	-7.4	31.5	Quasi Max	H	331	37	46.0	-14.5	Pass	AMB
107.222	38.0	4.2	-18.9	23.3	Quasi Max	V	142	107	43.5	-20.2	Pass	DIG
208.012	42.7	4.8	-19.6	27.9	Quasi Max	V	98	217	43.5	-15.6	Pass	DIG
179.999	42.6	4.7	-19.7	27.5	Quasi Max	V	98	258	43.5	-16.0	Pass	DIG
338.002	38.6	5.4	-16.2	27.8	Quasi Max	H	98	170	46	-18.2	Pass	DIG
120.010	37.2	4.3	-17.2	24.3	Quasi Max	V	111	266	43.5	-19.2	Pass	DIG
155.996	36.8	4.5	-18.4	22.9	Quasi Max	V	103	238	43.5	-20.6	Pass	DIG
372.285	35.7	5.6	-15.3	26.0	Quasi Max	V	374	154	46	-20.0	Pass	DIG

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; AMB-Ambient
	NRB = Non-Restricted Band. RB = Restricted Band.

Test Freq.	2412 MHz	**Engineer**	EVF
Variant	802.11b; 1 Mbs	**Temp (ºC)**	21.4
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 01 Transmit; WLAN=1, BT=0, BC=0, DK=0		

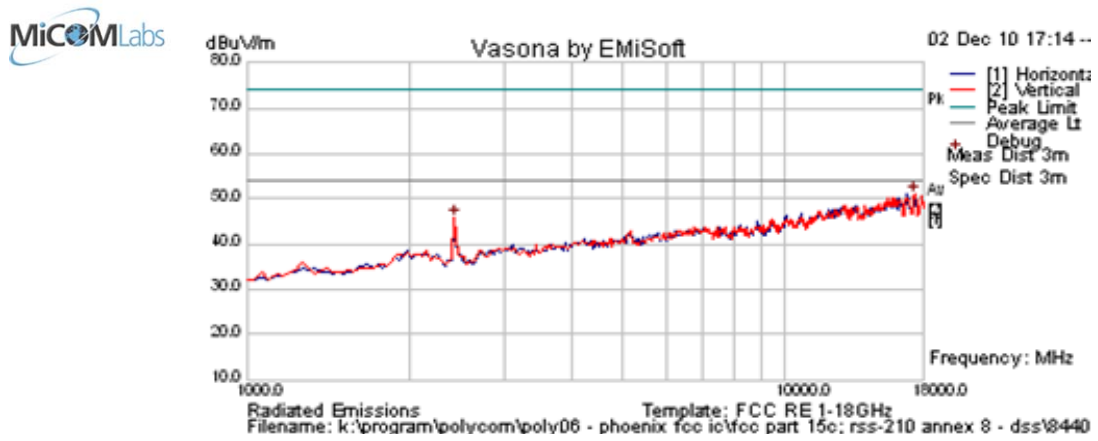


Formally measured emission peaks

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
No radio emissions within 6dB of limit.												

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**	EVF
Variant	802.11b; 1 Mbs	**Temp (ºC)**	21.4
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 06 Transmit; WLAN=1, BT=0, BC=0, DK=0		

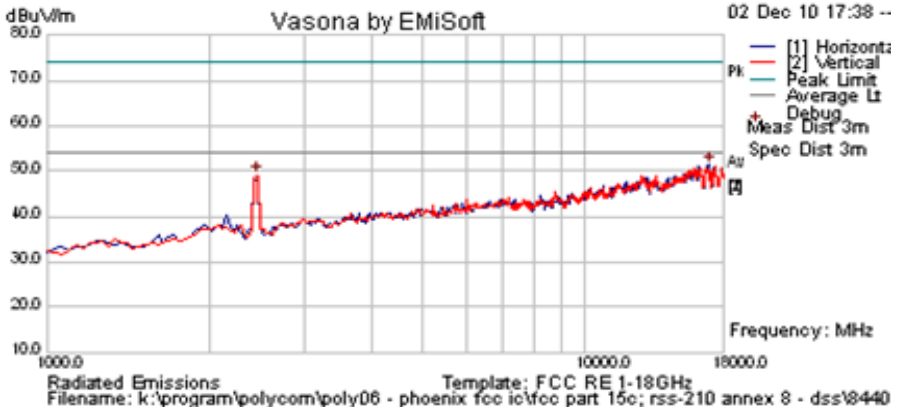


Formally measured emission peaks

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
No radio emissions within 6dB of limit.												

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**	EVF
Variant	802.11b; 1 Mbs	**Temp (ºC)**	21.4
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 11 Transmit; WLAN=1, BT=0, BC=0, DK=0		

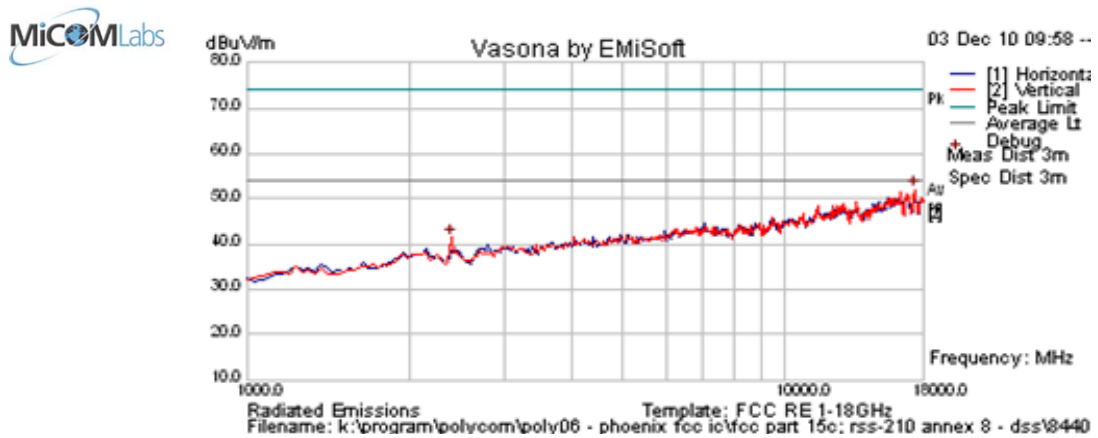


Formally measured emission peaks

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
No radio emissions within 6dB of limit.												

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**	EVF
Variant	802.11g; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 01 Transmit; WLAN=1, BT=0, BC=0, DK=0		

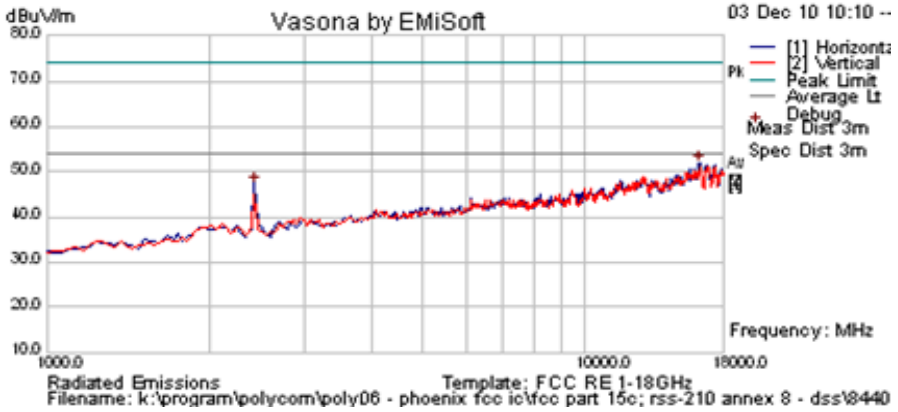


Formally measured emission peaks

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
No radio emissions within 6dB of limit.												

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**	EVF
Variant	802.11g; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 06 Transmit; WLAN=1, BT=0, BC=0, DK=0		

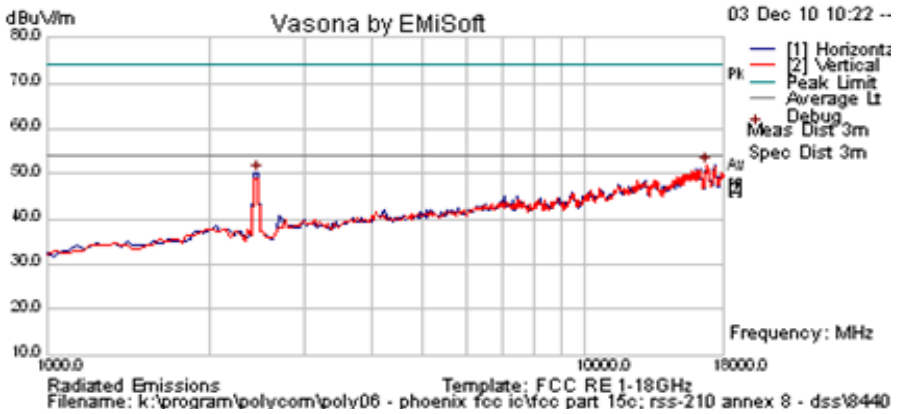


Formally measured emission peaks

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
No radio emissions within 6dB of limit.												

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**	EVF
Variant	802.11g; 6 Mbs	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 11 Transmit; WLAN=1, BT=0, BC=0, DK=0		

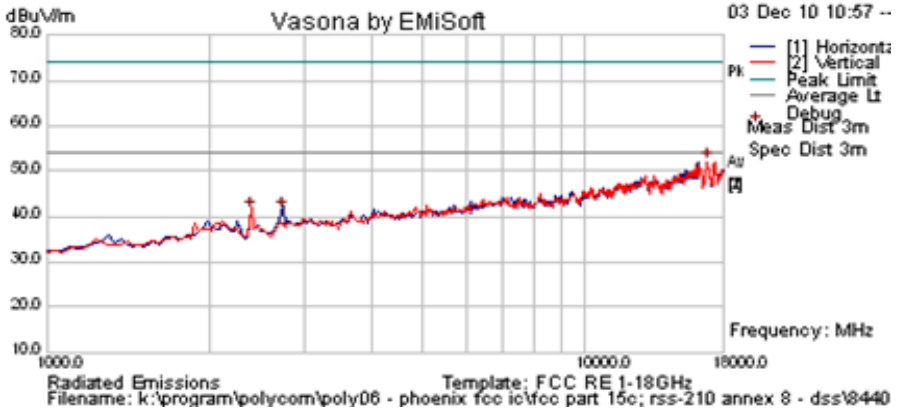


Formally measured emission peaks

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
No radio emissions within 6dB of limit.												

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**	EVF
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 01 Transmit; WLAN=1, BT=0, BC=0, DK=0		

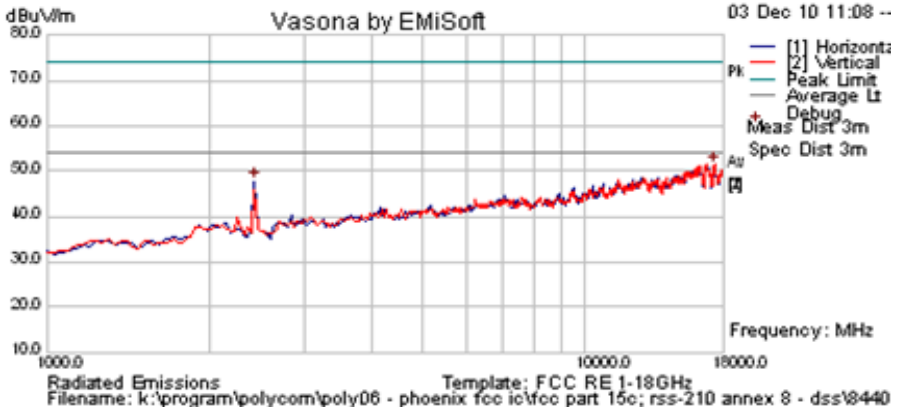


Formally measured emission peaks

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
No radio emissions within 6dB of limit.												

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**	EVF
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 06 Transmit; WLAN=1, BT=0, BC=0, DK=0		

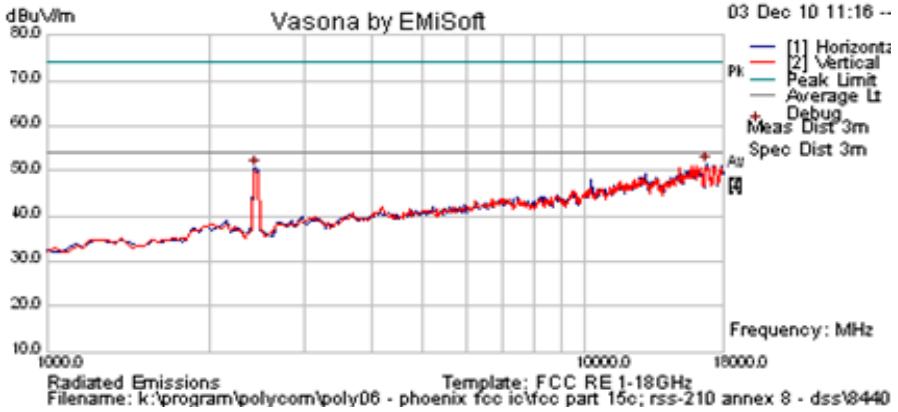


Formally measured emission peaks

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
No radio emissions within 6dB of limit.												

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**	EVF
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	21
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 11 Transmit; WLAN=1, BT=0, BC=0, DK=0		



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
No radio emissions within 6dB of limit.												

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.	5745 MHz	**Engineer**	EVF
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21.4
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 149 Transmit; WLAN=1, BT=0, BC=0, DK=0		

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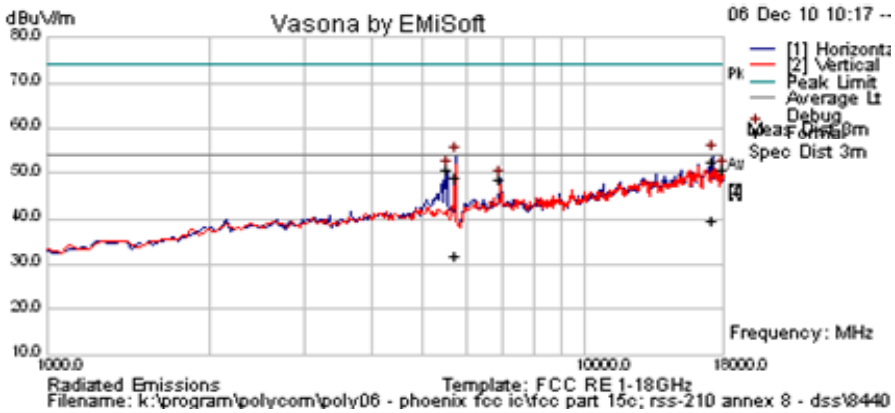
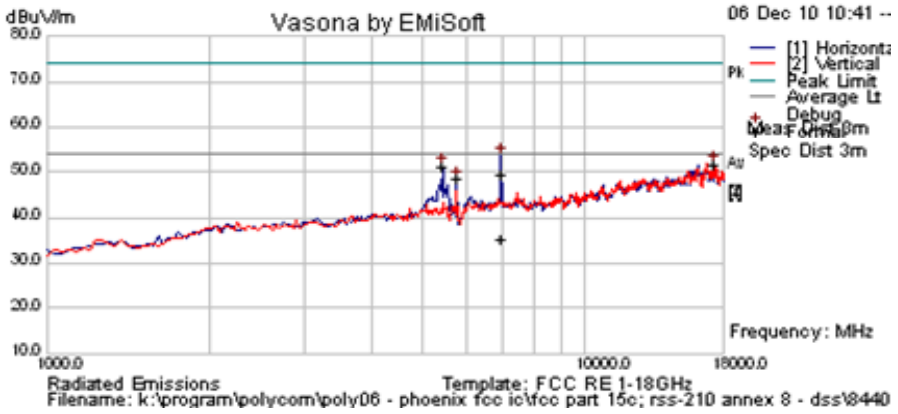


Formally measured emission peaks

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
5531.062	54.7	4.6	-8.7	50.7	Peak [Scan]	H	100	0	54	-3.3	Pass	NRB
6961.924	48.9	5.4	-5.5	48.7	Peak [Scan]	H	100	0	54	-5.3	Pass	NRB
17253.066	29.4	8.6	1.6	39.6	Average Max	H	99	8	54	-14.4	Pass	NRB
17253.066	42.5	8.6	1.6	52.7	Peak Max	H	99	8	74.0	-21.3	Pass	NRB
17931.864	40.6	8.8	1.4	50.8	Peak [Scan]	V	200	0	54	-3.2	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.	5785 MHz	**Engineer**	EVF
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21.4
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 157 Transmit; WLAN=1, BT=0, BC=0, DK=0		

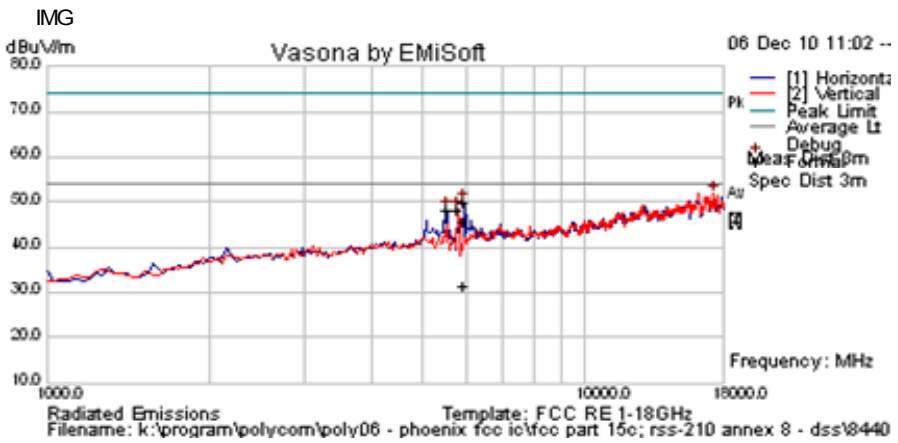


Formally measured emission peaks

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
6971.911	49.3	5.4	-5.2	49.5	Peak Max	H	201	0	74.0	-24.5	Pass	NRB
6971.911	35.0	5.4	-5.2	35.2	Average Max	H	201	0	54.0	-18.8	Pass	NRB
17318.637	41.3	8.7	1.7	51.7	Peak [Scan]	V	200	0	54	-2.3	Pass	noise floor
5428.858	55.7	4.6	-9.2	51.1	Peak [Scan]	H	100	0	54	-2.9	Pass	NRB
5769.539	52.0	4.8	-8.3	48.4	Peak [Scan]	H	100	0	54	-5.6	Pass	FUND

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.	5825 MHz	**Engineer**	EVF
Variant	802.11a; 6 Mbs	**Temp (ºC)**	21.4
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 165 Transmit; WLAN=1, BT=0, BC=0, DK=0		

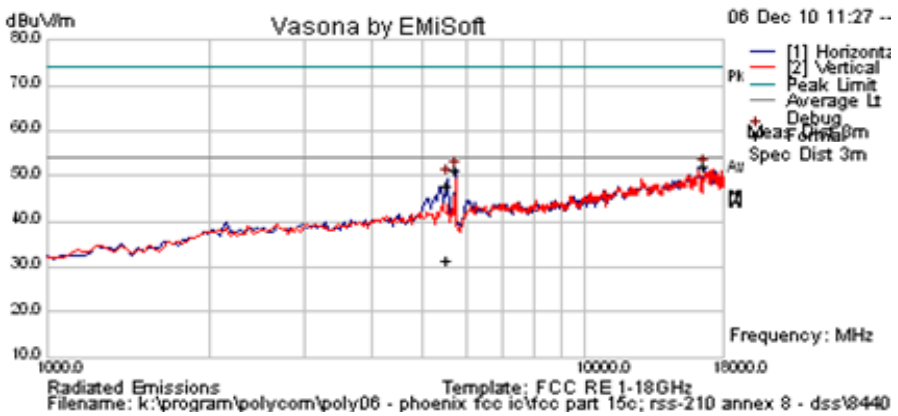


Formally measured emission peaks

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
5973.948	49.1	4.9	-8.2	45.7	Peak Max	H	149	229	74.0	-28.3	Pass	NRB
5973.9479	34.7	4.9	-8.2	31.3	Average Max	H	149	229	54.0	-22.7	Pass	NRB
5803.607	51.8	4.8	-8.3	48.3	Peak [Scan]	V	200	0	54	-5.7	Pass	FUND
5531.062	52.1	4.6	-8.7	48.1	Peak [Scan]	H	150	0	54	-5.9	Pass	NRB
17318.637	41.5	8.7	1.7	51.9	Peak [Scan]	V	100	0	54	-2.1	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.	5745 MHz	**Engineer**	EVF
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	31
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010.1
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 149 Transmit; WLAN=1, BT=0, BC=0, DK=0		

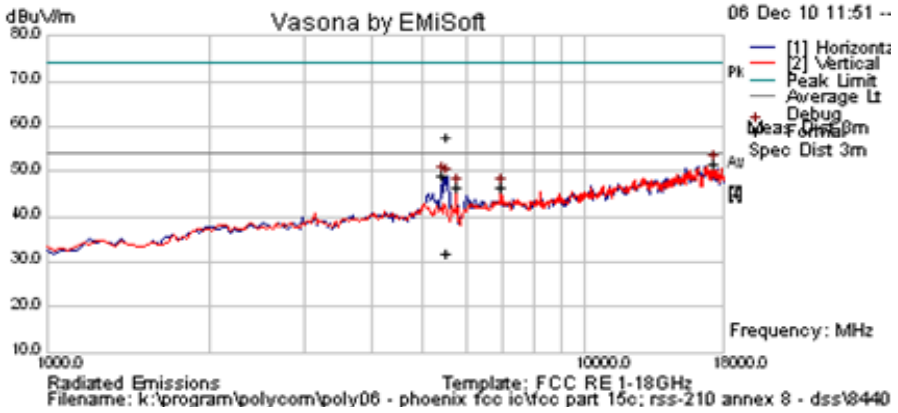


Formally measured emission peaks

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
5551.343	51.5	4.7	-8.6	47.6	Peak Max	H	106	228	74.0	-26.4	Pass	NRB
5551.343	35.3	4.7	-8.6	31.3	Average Max	H	106	228	54.0	-22.7	Pass	NRB
16671.343	41.5	8.7	1.7	51.9	Peak [Scan]	H	100	0	54	-2.2	Pass	noise floor
5735.471	54.7	4.8	-8.2	51.3	Peak [Scan]	H	150	0	54	-2.8	Pass	FUND

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.	5785 MHz	**Engineer**	EVF
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	31
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010.1
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 157 Transmit; WLAN=1, BT=0, BC=0, DK=0		

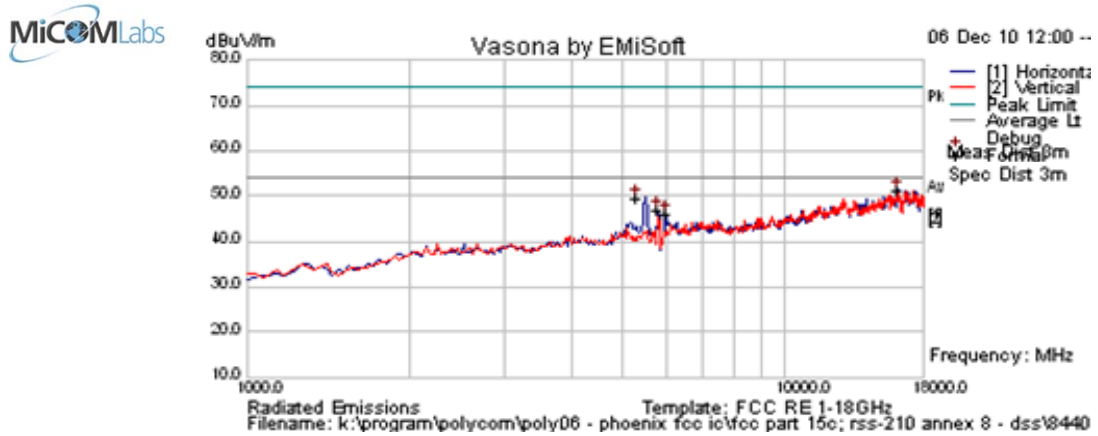


Formally measured emission peaks

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
5544.981	61.5	4.7	-8.6	57.5	Peak Max	H	141	360	74.0	-16.5	Pass	NRB
5544.981	35.9	4.7	-8.6	31.9	Average Max	H	141	360	54.0	-22.1	Pass	NRB
17318.637	41.1	8.7	1.7	51.5	Peak [Scan]	V	100	0	54	-2.6	Pass	noise floor
5428.858	53.5	4.6	-9.2	49.0	Peak [Scan]	H	150	0	54	-5.0	Pass	RB see band edge
5770.998	50.0	4.8	-8.3	46.5	Peak [Scan]	H	98	360	54	-7.5	Pass	FUND
6964.138	46.5	5.4	-5.4	46.5	Peak [Scan]	H	98	360	54	-7.5	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

Test Freq.	5825 MHz	**Engineer**	EVF
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	31
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010.1
Antenna	Integral	**Duty Cycle (%)**	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 165 Transmit; WLAN=1, BT=0, BC=0, DK=0		



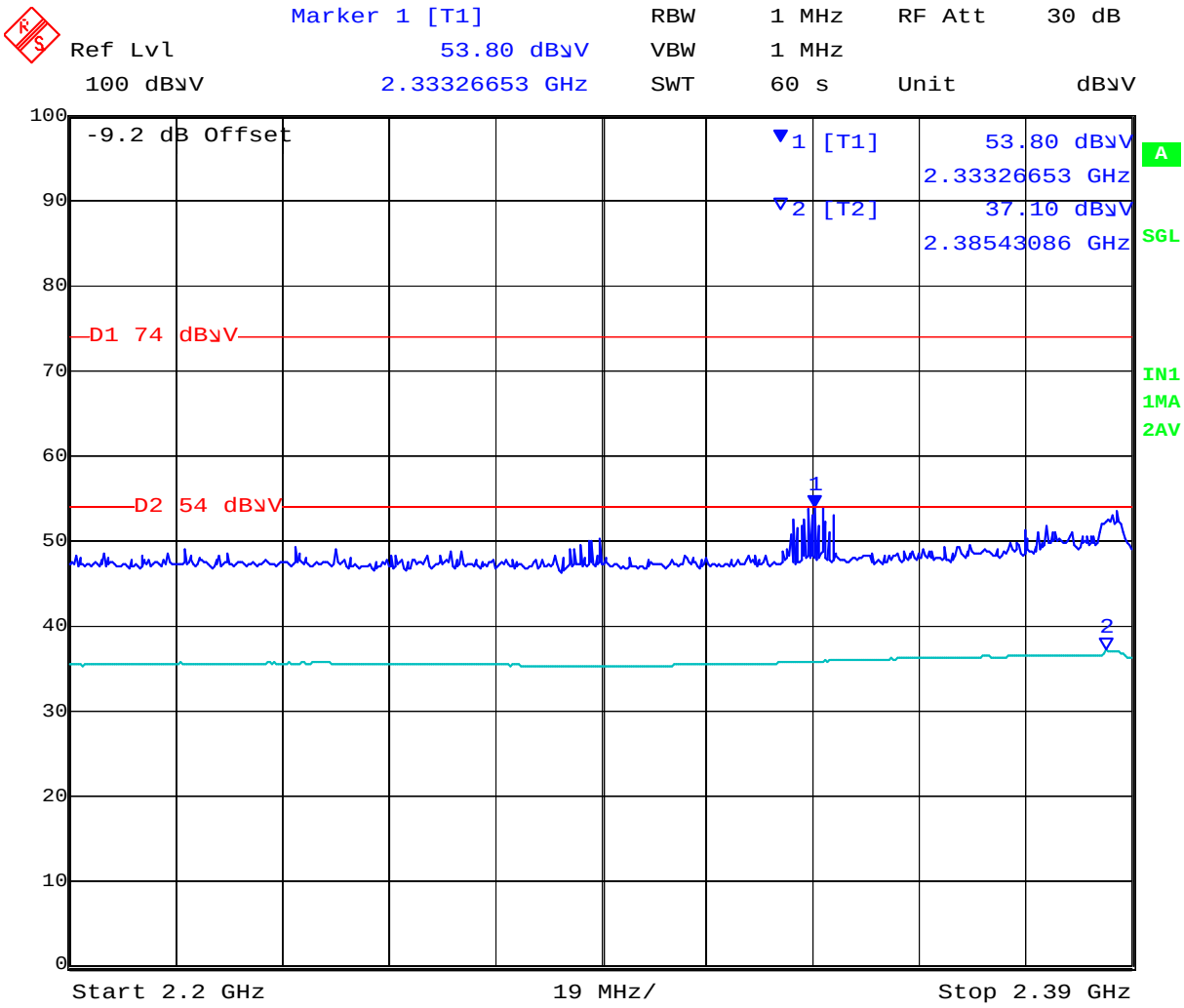
Formally measured emission peaks

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
16194.389	41.1	8.9	1.3	51.4	Peak [Scan]	H	100	0	54.0	-2.6	Pass	noise floor
5309.74	54.7	4.6	-9.6	49.7	Peak [Scan]	H	150	0	54.0	-4.3	Pass	RB see band edge
5806.758	50.3	4.8	-8.3	46.8	Peak [Scan]	H	98	360	54	-7.2	Pass	FUND
5980.132	49.4	4.9	-8.3	46.0	Peak [Scan]	V	98	360	54	-8.0	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

7.6.2 Band-Edge Measurements

POLY06 Band-Edge 2412MHz; 802.11b 2200-2390 MHz Power=24 Vert. Hg=101 Ang=119

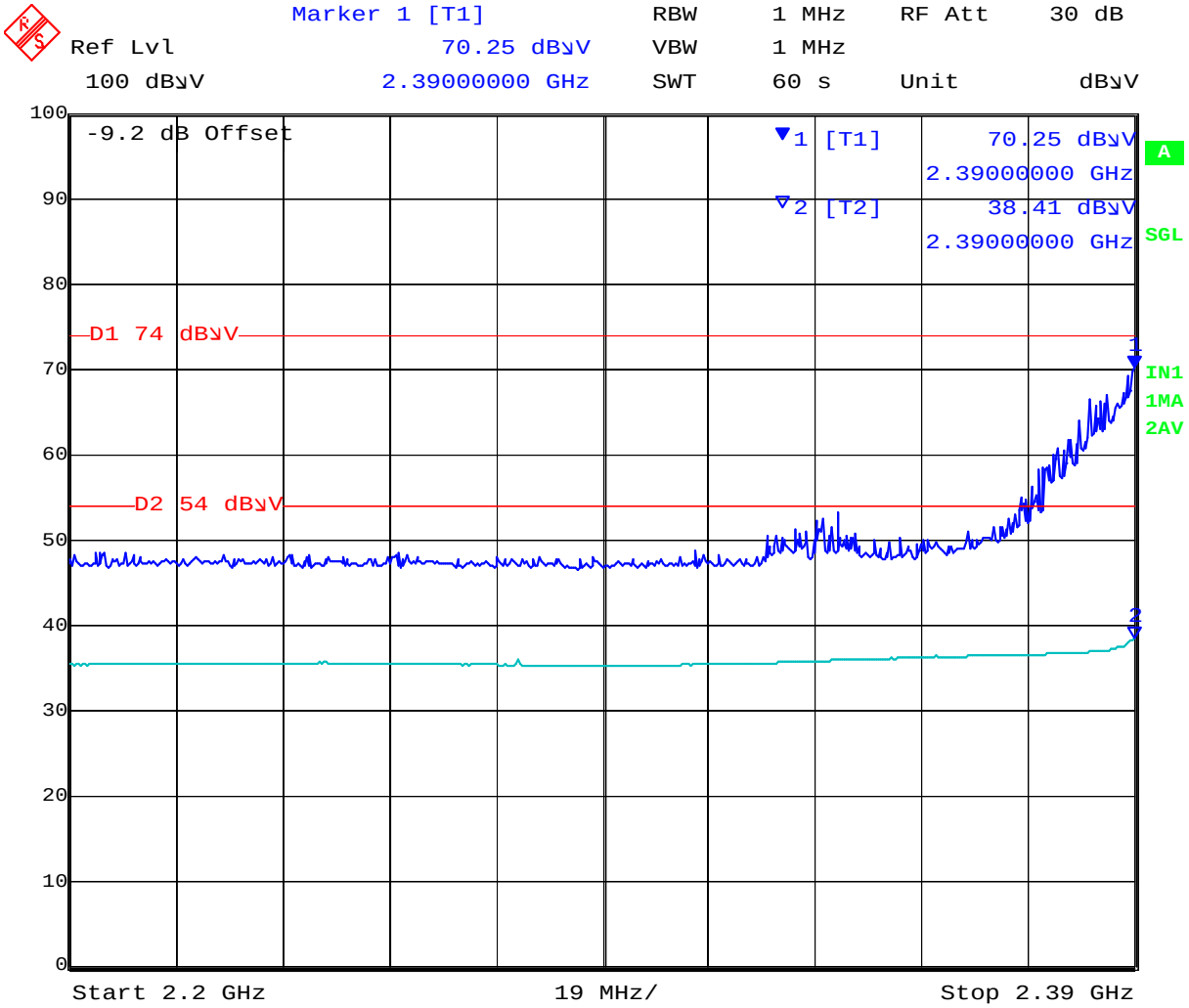


Date: 6.DEC.2010 14:24:47

POLY06 Band Edge 2412MHz 802.11g 2200-2390 MHz Pwr=24 Vert. Hg=103 Ang=114

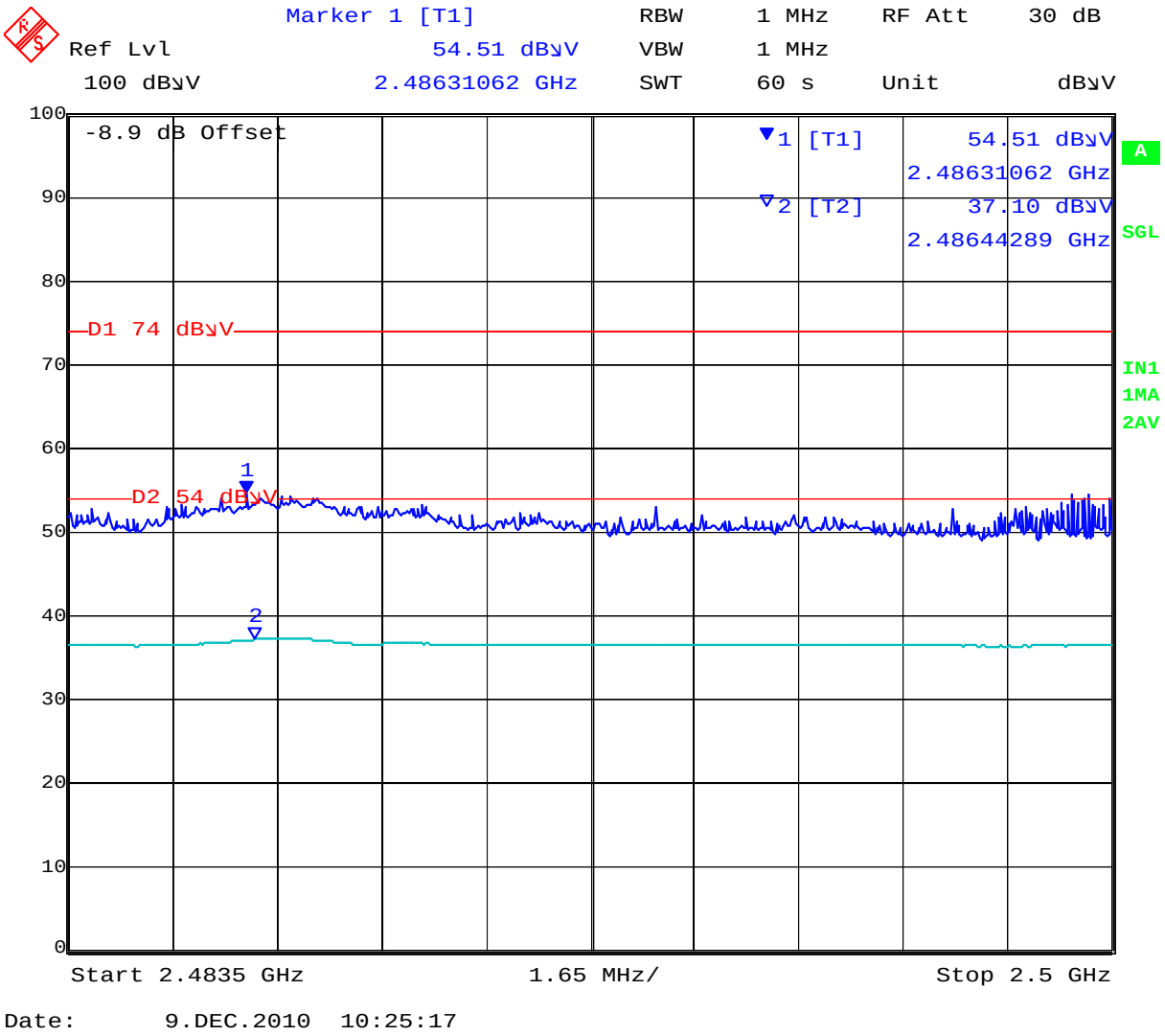
Date: 6.DEC.2010 15:52:40

POLY06 Band Edge 2412MHz 802.11n HT20 2200-2390 MHz Pwr=24 Vert. Hg=98 Ang=126



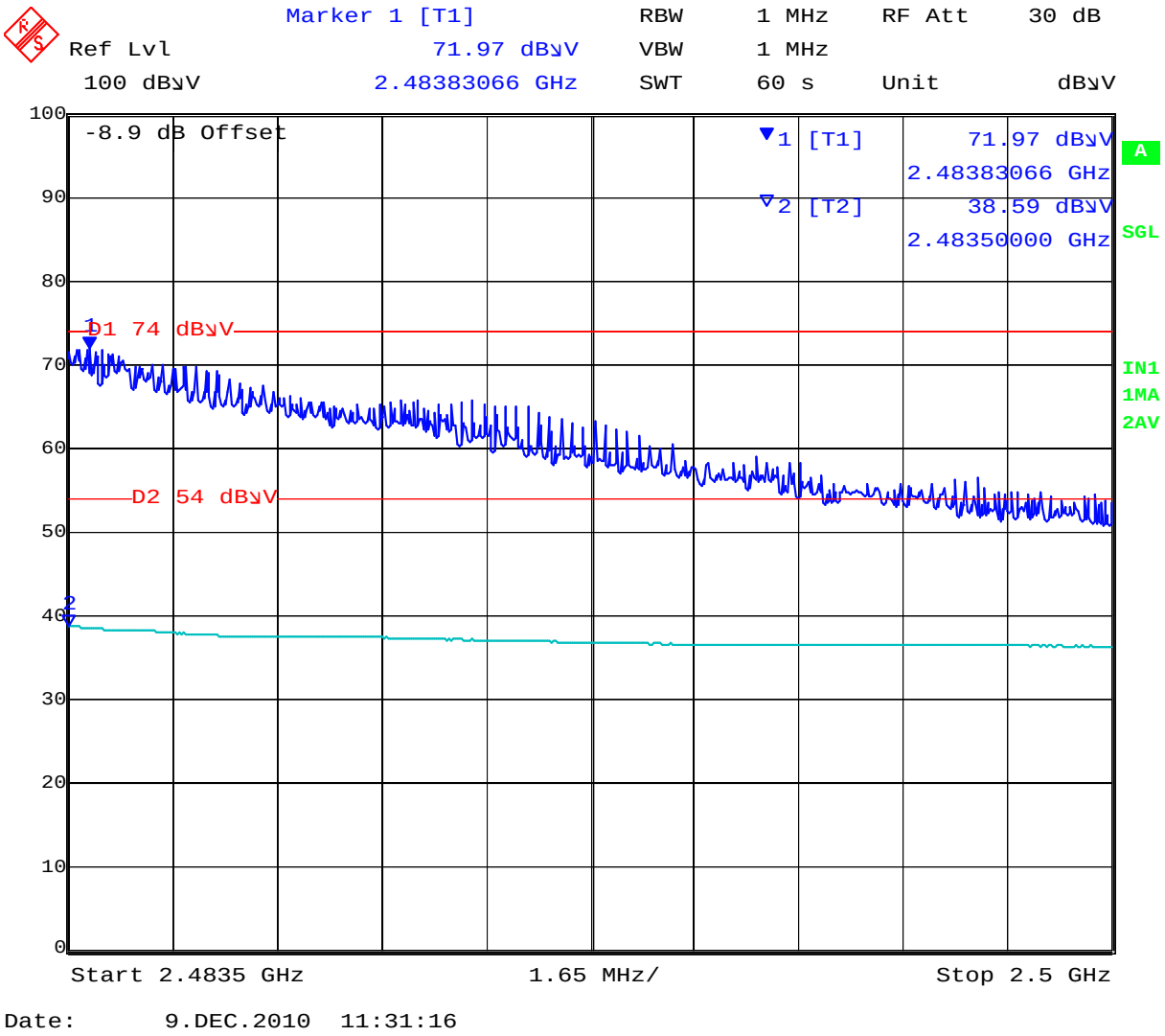
Date: 6.DEC.2010 16:15:27

POLY06 Band Edge 2462MHz 802.11b 2483.5-2500 MHz Pwr=24 Vert. Hg=98 Ang=116



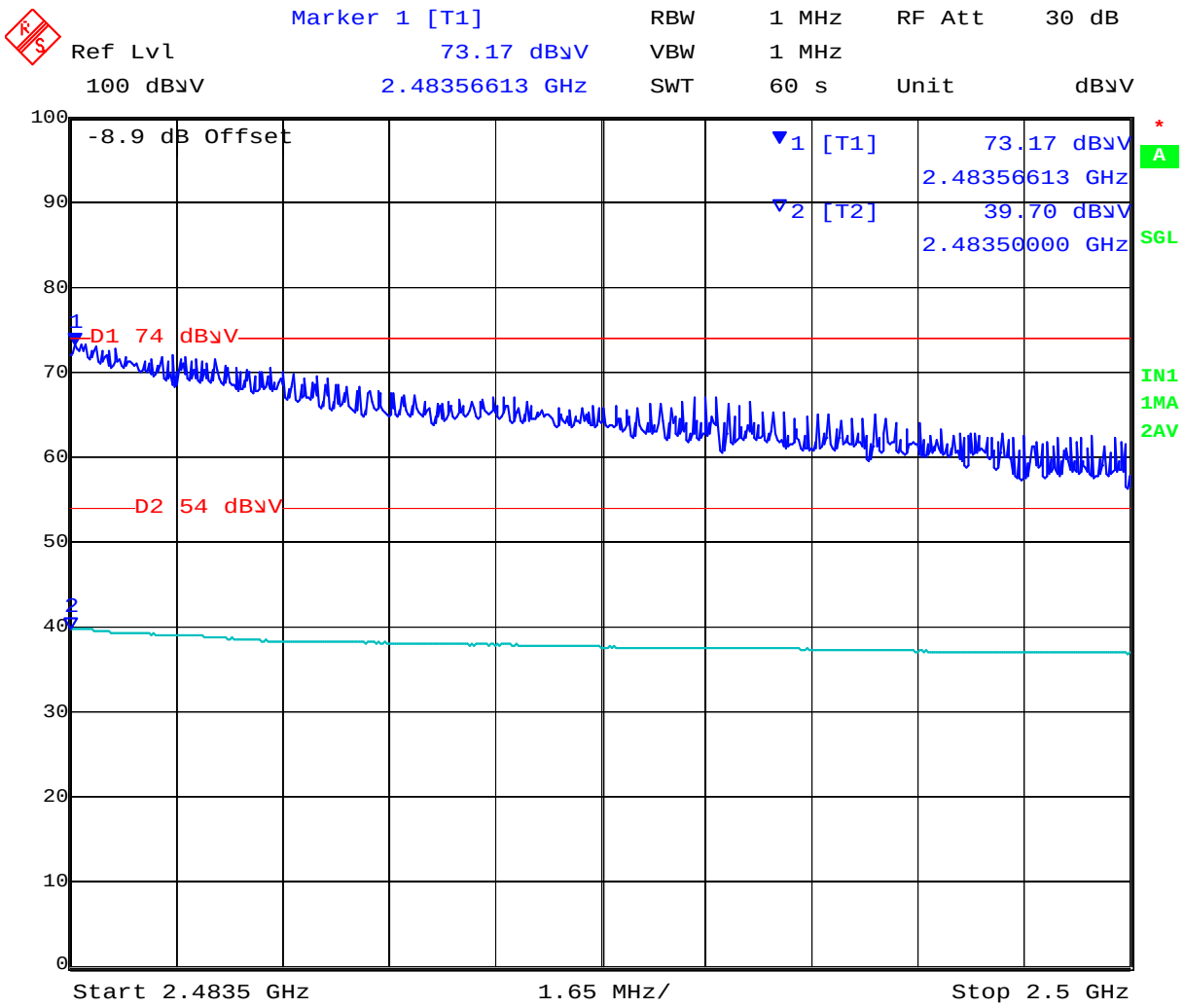
Date: 9.DEC.2010 10:25:17

POLY06 Band Edge 2462MHz 802.11g 2483.5-2500 MHz Pwr=15 Vert. Hg=98 Ang=99



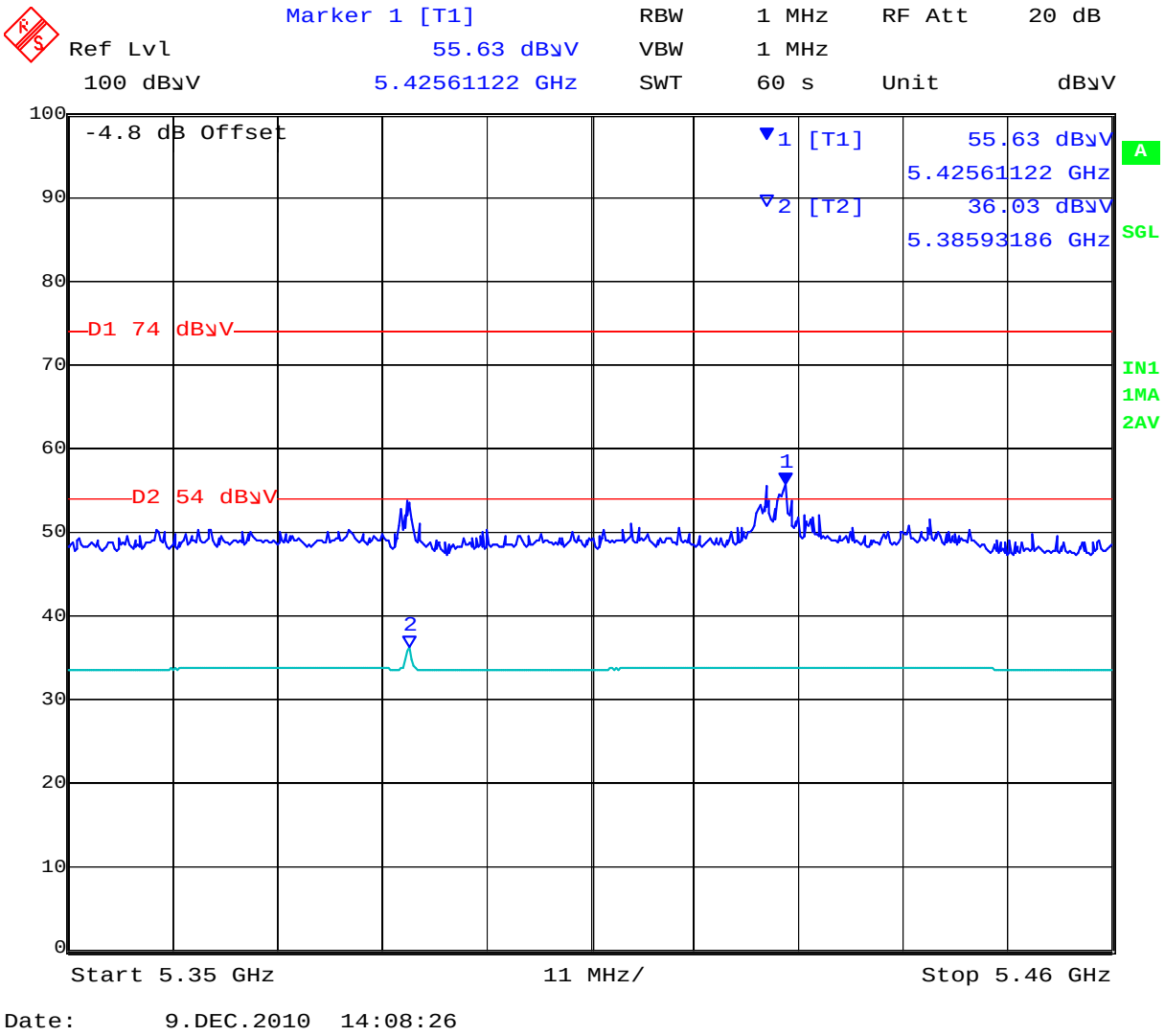
Date: 9.DEC.2010 11:31:16

POLY06 Band Edge 2462MHz 802.11n HT-20 2483.5-2500 MHz Pwr 16 Vert Hg=98 Ang=120



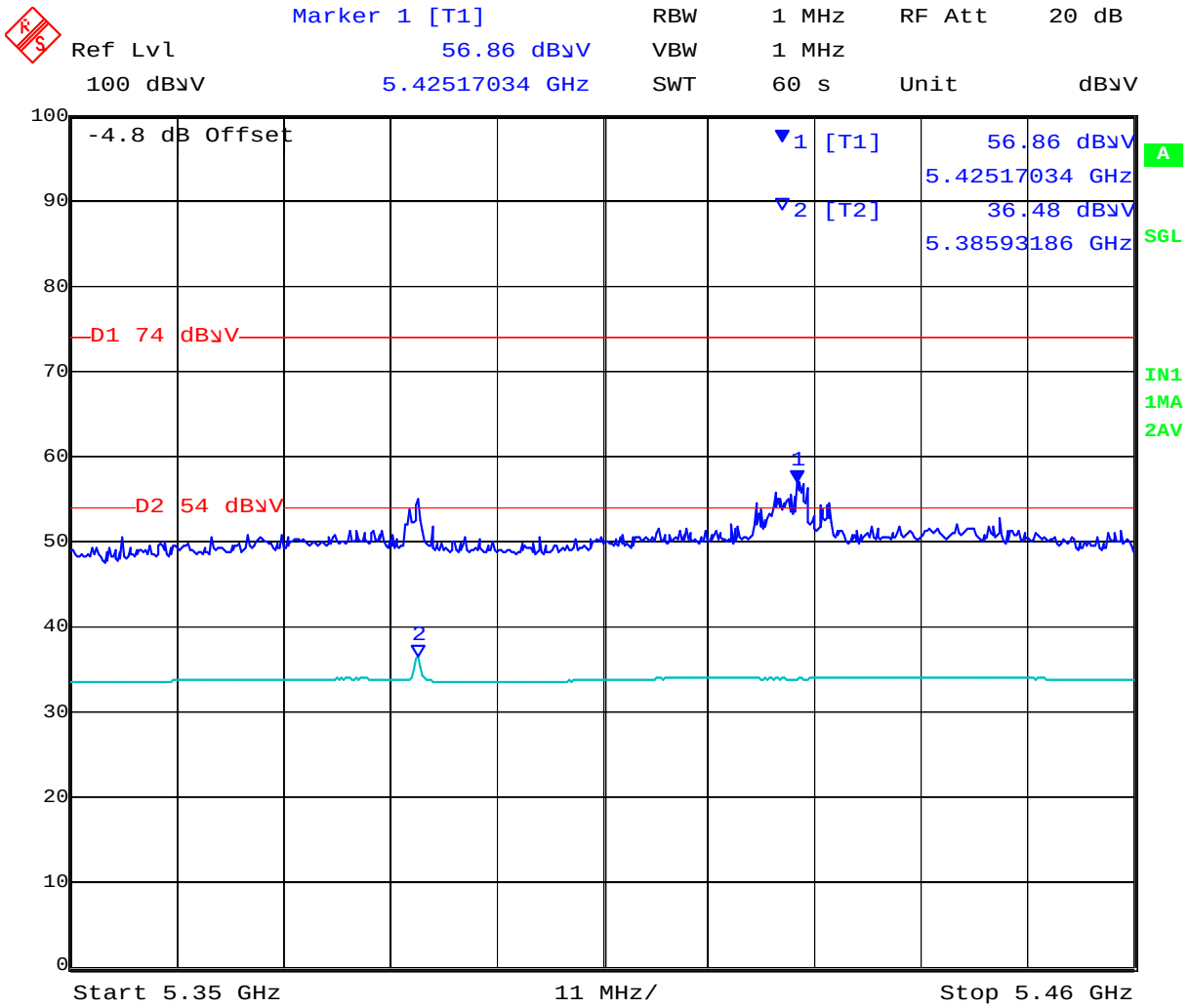
Date: 10.DEC.2010 08:57:59

POLY06 Band Edge 5745MHz 802.11a 5350-5460 MHz Pwr=24 Hor. Hg=107 Ang=350



Date: 9.DEC.2010 14:08:26

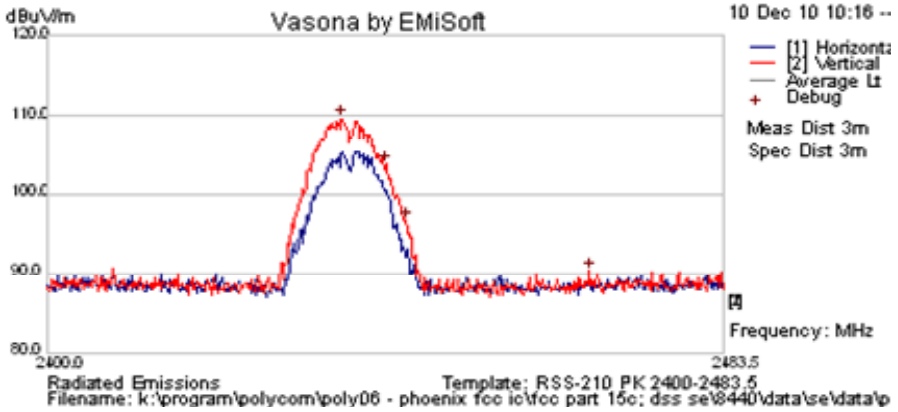
POLY06 Band Edge 5745MHz 802.11n HT-20 5350-5460 MHz Pwr=24 Hor. Hg=104 Ang=350



Date: 9.DEC.2010 14:20:57

7.6.3 Peak Emissions

Test Freq.	2437 MHz	**Engineer**	EVF
Variant	802.11b; 1 Mbs	**Temp (ºC)**	23
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	48
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	integral	**Duty Cycle (%)**	10
Test Notes 1	Handset (Model: 8440) w ith battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 06 Transmit; WLAN=1, BT=0, BC=0, DK=0		

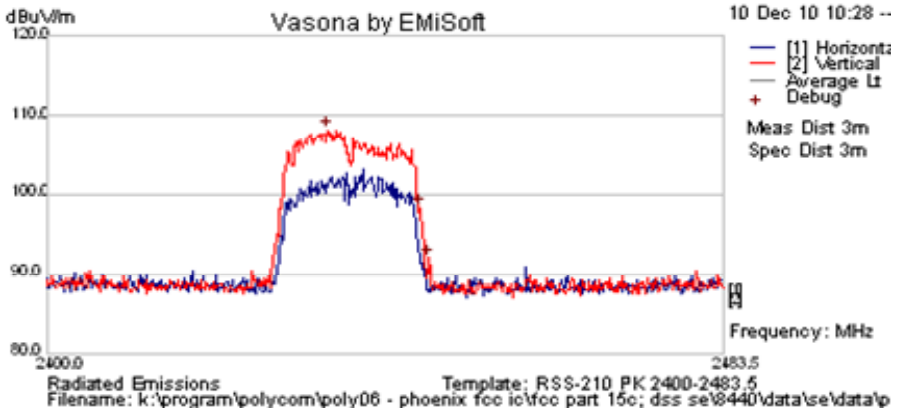


Formally measured emission peaks

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
2435.977	64.4	13.0	32.2	109.7	Peak [Scan]	V						FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

Test Freq.	2437 MHz	**Engineer**	EVF
Variant	802.11g; 6 Mbs	**Temp (ºC)**	23
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	48
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	integral	**Duty Cycle (%)**	10
Test Notes 1	Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 06 Transmit; WLAN=1, BT=0, BC=0, DK=0		

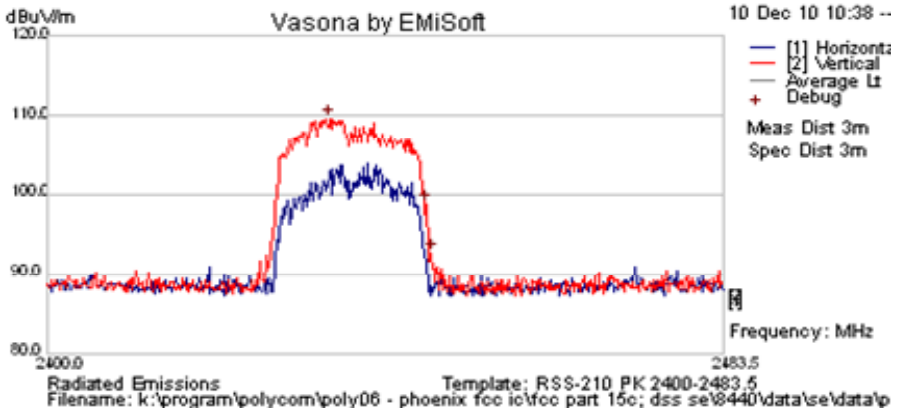


Formally measured emission peaks

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
2434.304	63.0	13.0	32.2	108.2	Peak [Scan]	V						FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

Test Freq.	2437 MHz	**Engineer**	EVF
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	23
Freq. Range	2400 - 2483.5 MHz	**Rel. Hum.(%)**	48
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	integral	**Duty Cycle (%)**	10
Test Notes 1	Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 06 Transmit; WLAN=1, BT=0, BC=0, DK=0		

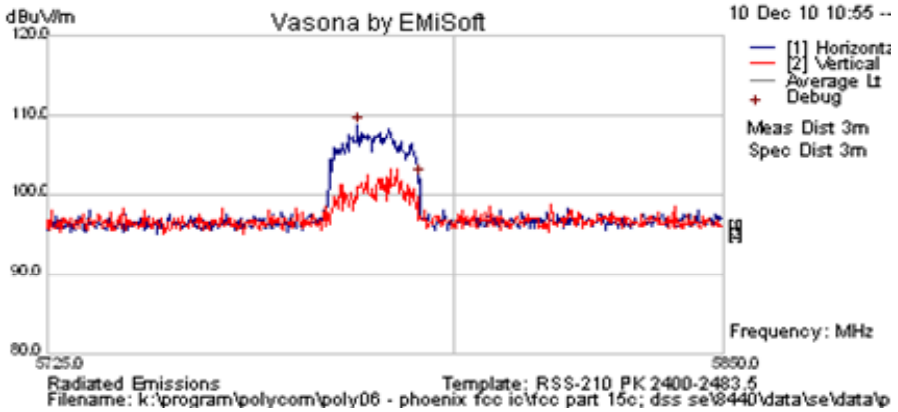


Formally measured emission peaks

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
2434.638	64.4	13.0	32.2	109.6	Peak [Scan]	V						FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

Test Freq.	5785 MHz	**Engineer**	EVF
Variant	802.11a; 6 Mbs	**Temp (ºC)**	23
Freq. Range	5725-5850 MHz	**Rel. Hum.(%)**	48
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	integral	**Duty Cycle (%)**	10
Test Notes 1	Handset (Model: 8440) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 157 Transmit; WLAN=1, BT=0, BC=0, DK=0		

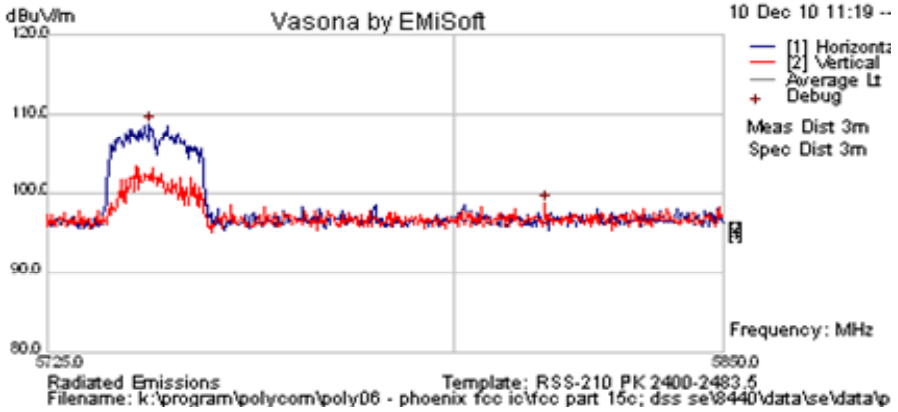


Formally measured emission peaks

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
5782.114	59.0	14.8	35.0	108.7	Peak [Scan]	H						FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

Test Freq.	5745 MHz	**Engineer**	EVF
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	23
Freq. Range	5725-5850 MHz	**Rel. Hum.(%)**	48
Power Setting	24 in test utility (maximum)	**Press. (mBars)**	1010
Antenna	integral	**Duty Cycle (%)**	10
Test Notes 1	Handset (Model: 8440) w ith battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 149 Transmit; WLAN=1, BT=0, BC=0, DK=0		



Formally measured emission peaks

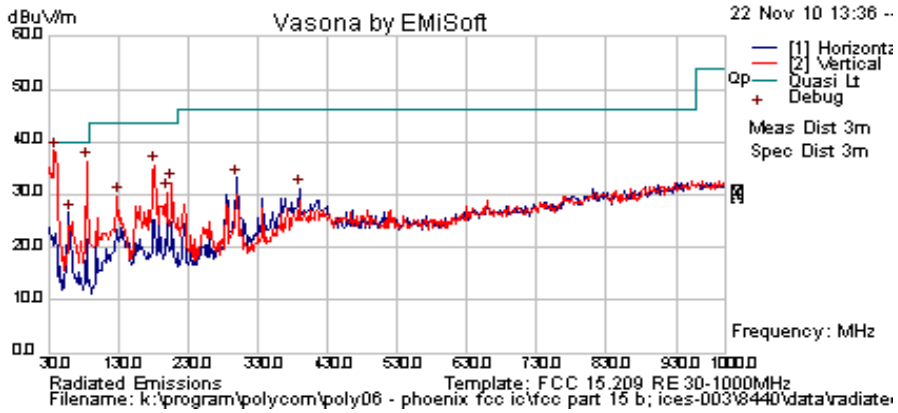
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5743.788	59.0	14.8	35.0	108.8	Peak [Scan]	H						FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

7.6.4 Receiver Radiated Emissions

Stand alone Charger (SA106B-05) - Measurement Results for Radiated Spurious Emissions – Receiver

Test Freq.	N/A	**Engineer**	EVF
Variant	Digital Emissions	**Temp (ºC)**	21
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum. (%)**	34
Power Setting	Charger: 120VAC/ 60Hz	**Press. (mBars)**	1009
Antenna	Integral		
Test Notes 1	Handset (Model: 8440) w ith discharged battery (SN: AC101032008E) , headset connected, also connected to charger (Model: SA106B-05)		
Test Notes 2	Preliminary testing performed. EUT tested in vertical position/ Mode: BT Channel 39 Receive; WLAN Channel 06 Receive; WLAN=1, BT=1, BC=0, DK=1		

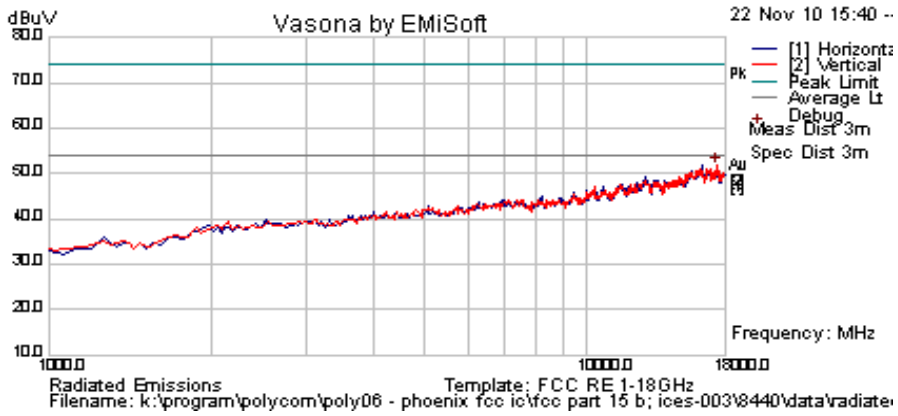


Formally measured emission peaks

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
40.423	48.0	3.6	-17.1	34.5	Quasi Max	V	137	77	40	-5.5	Pass	DIG
85.932	47.4	4.0	-23.7	27.8	Quasi Max	V	98	246	40	-12.3	Pass	DIG
182.000	49.5	4.7	-19.6	34.5	Quasi Max	V	104	167	43.5	-9.0	Pass	DIG
207.999	46.1	4.8	-19.6	31.3	Quasi Max	V	102	171	43.5	-12.2	Pass	DIG
299.999	45.0	5.2	-16.9	33.4	Quasi Max	H	120	51	46	-12.6	Pass	DIG
200.461	45.0	4.8	-17.9	31.9	Quasi Max	V	98	0	43.5	-11.6	Pass	DIG

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.	N/A	**Engineer**	EVF
Variant	Digital Emissions	**Temp (ºC)**	21.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum. (%)**	33
Power Setting	Charger: 120VAC/ 60Hz	**Press. (mBars)**	1007
Antenna	Integral		
Test Notes 1	Handset (Model: 8440) w ith discharged battery (SN: AC101032008E) , headset connected, also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: BT Channel 39 Receive; WLAN Channel 06 Receive; WLAN=1, BT=1, BC=0, DK=1		

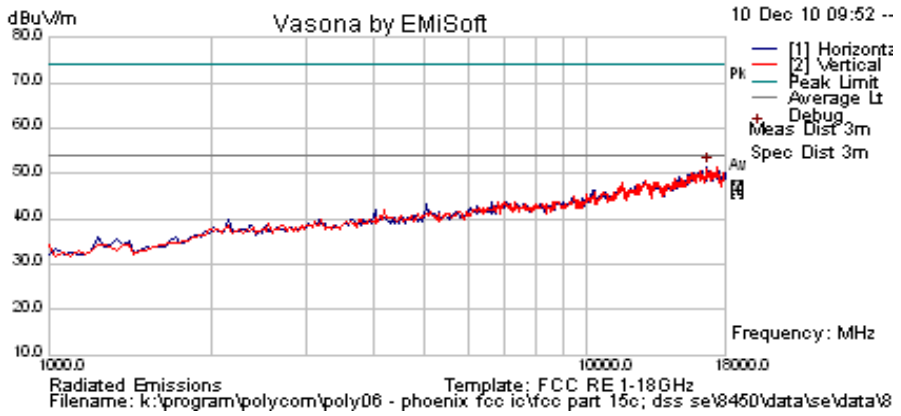


Formally measured emission peaks

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
No emissions above 1 GHz.												

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.	5785 MHz	**Engineer**	CSB
Variant	Receive in Test Utility	**Temp (°C)**	23
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Not Applicable in Receive Mode	**Press. (mBars)**	999
Antenna	Integral Antenna's connected during testing		
Test Notes 1	Handset (Model: 8450) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: WLAN Channel 157 Receive; WLAN=1, BT=0, BC=0, DK=0		



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
No Receiver Emissions within 6dB of limit.												

Legend:	TRANS = Transient Emission; RB = Restricted Band; NRB = Non-Restricted Band;
	BE = Emission in Restricted Band Nearest Transmission Band Edge; FUND = Fundamental Freq.

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

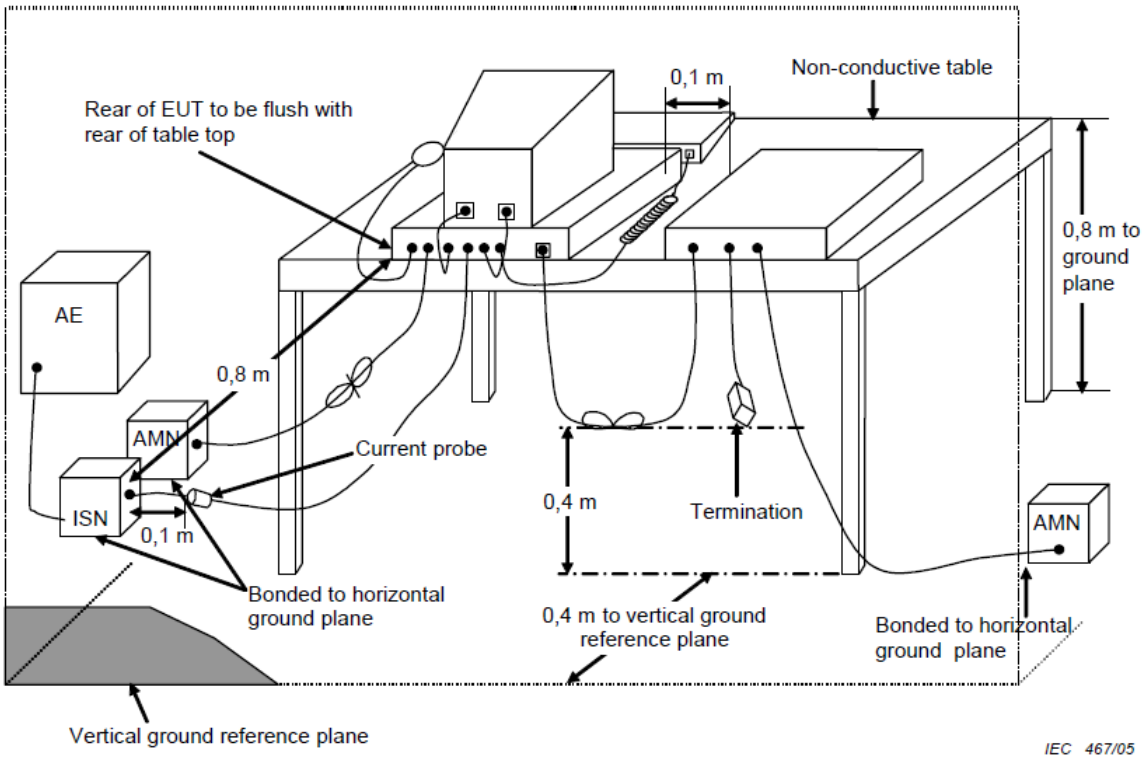
Test Procedure

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 Setup



Measurement setup for Conducted Disturbance at Mains Terminals

Specification for Conducted Disturbance at Mains Terminal – Digital Apparatus

FCC §15.207 (a)

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. 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.

RSS-GEN §7.2.4

AC Power Line Conducted Emissions Limits: Except when the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply, either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The more stringent limit applies at the frequency range boundaries.

The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network (LISN).

Limits

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

* Decreases with the logarithm of the frequency

Traceability

Laboratory Measurement Uncertainty for Conducted Emissions

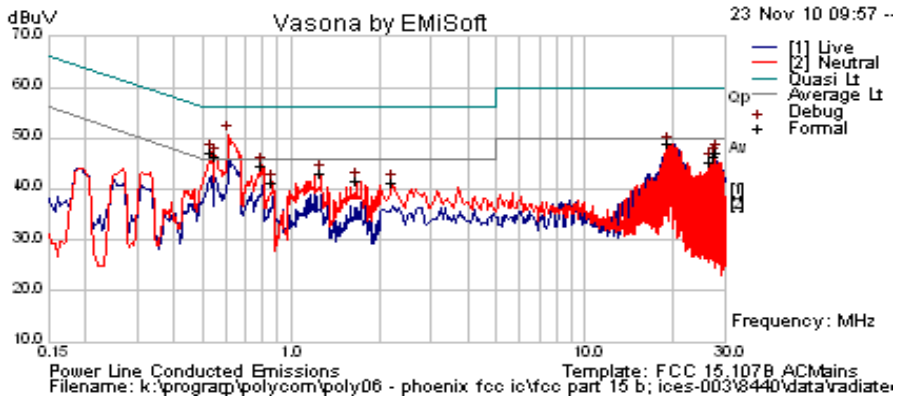
Measurement uncertainty	±2.64 dB

Traceability

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

7.7.1 Stand Alone Charger - Conducted Disturbance at Mains Terminal (150 kHz – 30 MHz)

Test Freq.	N/A	**Engineer**	EVF
Variant	AC Line Emissions	**Temp (ºC)**	19.5
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum. (%)**	37
Power Setting	Charger: 120VAC/ 60Hz	**Press. (mBars)**	1002
Antenna	Integral		
Test Notes 1	Handset (Model: 8440) with discharged battery (SN: AC101032008E) , headset connected, also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: BT Channel 39 Receive; WLAN Channel 06 Receive; WLAN=1, BT=1, BC=0, DK=1		

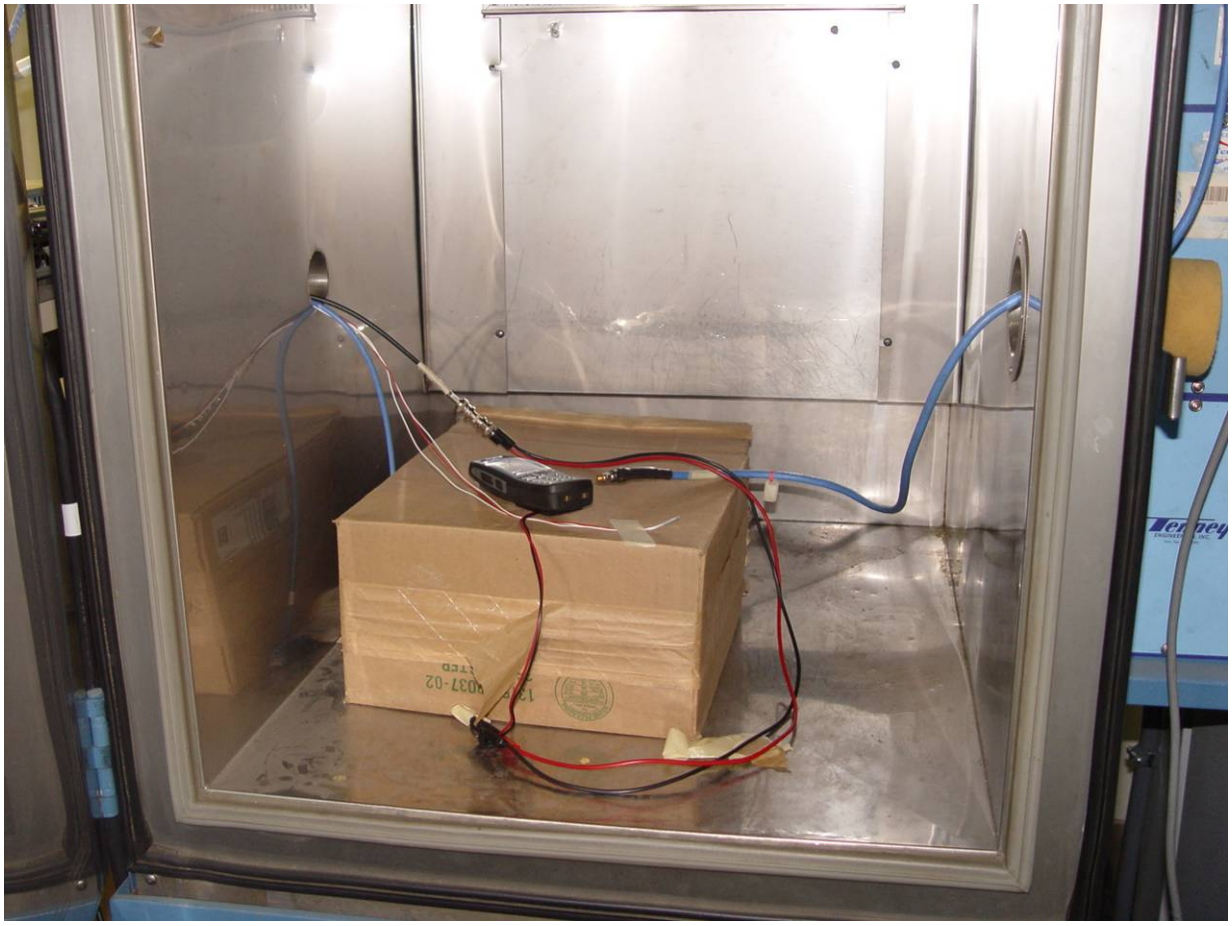


Formally measured emission peaks

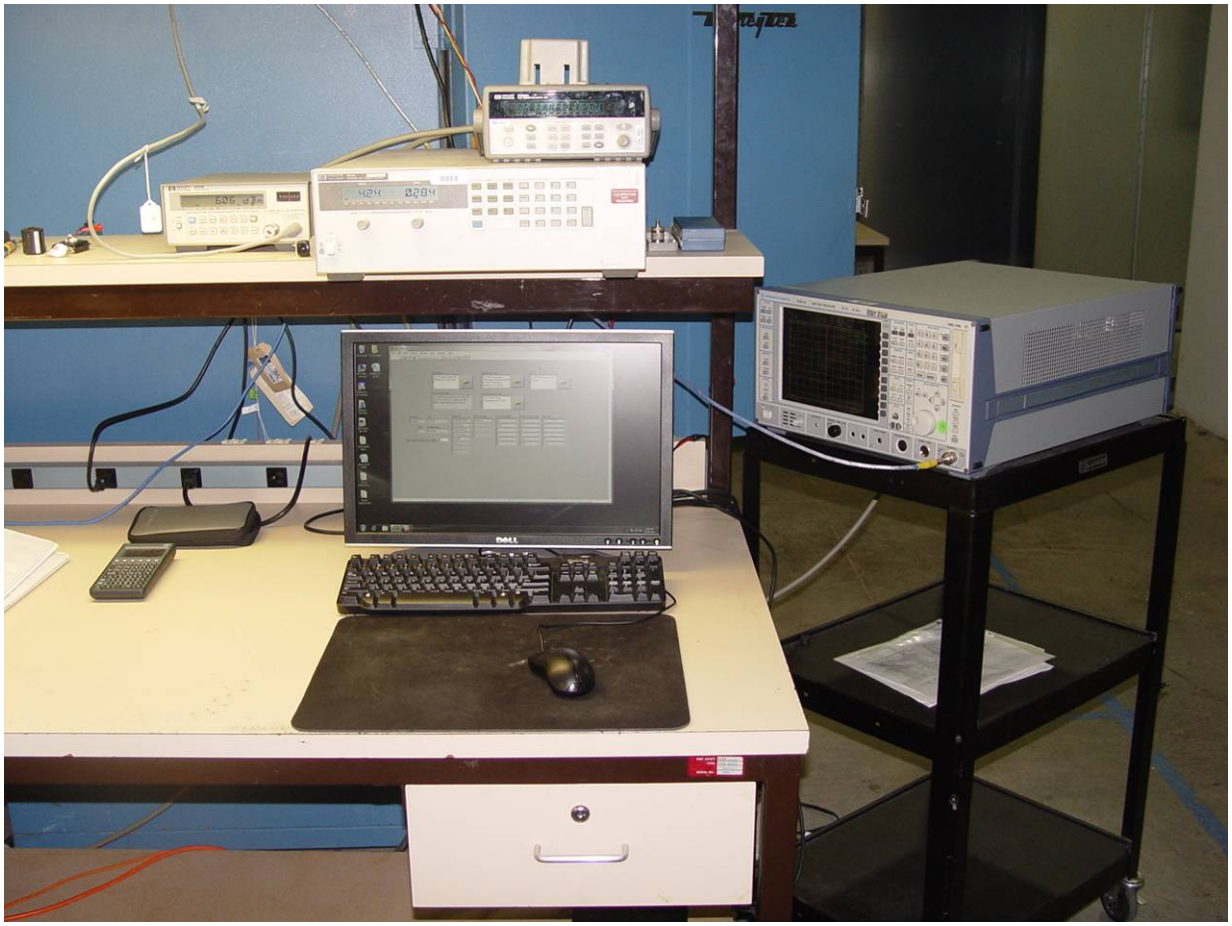
Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.534	21.4	9.9	0.1	31.4	Average	Neutral	46.0	-14.6	Pass	
0.534	36.0	9.9	0.1	46.0	Quasi Peak	Neutral	56	-10.0	Pass	
0.553	22.5	9.9	0.1	32.5	Average	Neutral	46	-13.5	Pass	
0.553	35.9	9.9	0.1	45.9	Quasi Peak	Neutral	56	-10.1	Pass	
0.614	25.7	10.0	0.1	35.7	Average	Neutral	46.0	-10.3	Pass	
0.614	39.7	10.0	0.1	49.8	Quasi Peak	Neutral	56	-6.3	Pass	
0.801	22.5	10.0	0.1	32.5	Average	Neutral	46	-13.5	Pass	
0.801	33.3	10.0	0.1	43.3	Quasi Peak	Neutral	56	-12.7	Pass	
0.869	16.9	9.9	0.1	26.9	Average	Neutral	46.0	-19.1	Pass	
0.869	29.8	9.9	0.1	39.8	Quasi Peak	Neutral	56	-16.2	Pass	
1.269	20.4	10.0	0.1	30.4	Average	Neutral	46.0	-15.6	Pass	
1.269	30.2	10.0	0.1	40.3	Quasi Peak	Neutral	56	-15.7	Pass	

8 Photographs

8.1 Conducted RF Emissions - EUT



8.2 Conducted RF Emissions - Test Equipment



8.3 Transmitter Radiated Spurious Emission above 1 GHz with Charger

8.4 Receiver Radiated Emissions below 1 GHz with Charger

8.5 Receiver Radiated Emissions above 1 GHz with Charger

8.6 AC Mains Conducted Emissions with Charger

9 TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #
0134	Amplifier	Com Power	PA 122	181910
0158	Barometer /Thermometer	Control Co.	4196	E2846
0287	EMI Receiver	Rhode & Schwartz	ESIB 40	100201
0193	EMI Receiver	Rhode & Schwartz	ESIB 7	838496/007
0252	SMA Cable	Megaphase	Sucoflex 104	None
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	30dB N-Type Attenuator	ARRA	N9444-30	1623
0070	Power Meter	Hewlett Packard	437B	3125U11552
0116	Power Sensor	Hewlett Packard	8485A	3318A19694
0117	Power Sensor	Hewlett Packard	8487D	3318A00371
0184	Pulse Limiter	Rhode & Schwartz	ESH3Z2	357.8810.52
0190	LISN	Rhode & Schwartz	ESH3Z5	836679/006
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001
0301	5.6 GHz Notch Filter	Micro-Tronics	RBC50704	001
0302	5.25 GHz Notch Filter	Micro-Tronics	BRC50703	002
0303	5.8 GHz Notch Filter	Micro-Tronics	BRC50705	003
0304	2.4GHzHz Notch Filter	Micro-Tronics	--	001
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002
0335	1-18GHz Horn Antenna	ETS- Lindgren	3117	00066580
0337	Amplifier	MiCOM Labs	--	--
0338	Antenna	Sunol Sciences	JB-3	A052907
0342	2.4 GHz Notch Filter	EWT	EWT-14-0203	H1

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