Test of AP0127450, AP0127460

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

Test Report Serial No.: RDWN14-U6 Rev A

TEST REPORT

FROM

Test of AP0127450, AP0127460

to

To FCC 47 CFR Part 15.247 & IC RSS-210

Test Report Serial No.: RDWN14-U6 Rev A

This report supersedes: NONE

Applicant: RADWIN Ltd
27 Habarzel Street
Tel Aviv, 69710
Israel

Product Function: 2.4 GHz 2x2 and 3x3 MIMO RF module

Copy No: pdf Issue Date: 14th December 2012

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
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Pleasanton, CA 94566 USA
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ACCREDITED

TEST CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION, LISTINGS & RECOGNITION

TESTING ACCREDITATION

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

ilac-MRA

A2LA World Class Accreditation

The American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

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

Presented this 27th day of March 2012.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2013

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

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	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	RCB 210
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
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

**EU MRA – European Union Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the EU member countries.

**NB – Notified Body

PRODUCT CERTIFICATION

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

United States of America – Telecommunication Certification Body (TCB)
TCB Identifier – US0159

Industry Canada – Certification Body
CAB Identifier – US0159

Europe – Notified Body
Notified Body Identifier - 2280

Japan – Recognized Certification Body (RCB)
RCB Identifier - 210

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	14th December 2012	Initial release.

TEST RESULT CERTIFICATE

Manufacturer:	RADWIN Ltd 27 Habarzel Street Tel Aviv, 69710 Israel	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	RF Module operating in the 2.4 GHz band	Telephone:	+1 925 462 0304
Model:	AP0127450, AP0127460	Fax:	+1 925 462 0306
S/N's:	Prototype		
Test Date(s):	7th to 28th August '12	Website:	www.micomlabs.com

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

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

Notes:

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

ACCREDITED
TEST CERTIFICATE #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

1. REFERENCES AND MEASUREMENT UNCERTAINTY

1.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
i.	FCC 47 CFR Part 15, Subpart C	2012	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 License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment
iii.	FCC OET KDB 662911	4th April 2011	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
iv.	DA 00-705	2000	FCC DA 00-705 "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems" released March 30, 2000
v.	RSS-GEN	2010	Radio Standards Specification-Gen, Issue 3, General Requirements and Information for the Certification of Radiocommunication Equipment
vi.	FCC 47 CFR Part 15B	2010	47 CFR Part 15, SubPart B; Unintentional Radiators
vii.	ICES-003	2004	Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard Digital Apparatus; Issue 4
viii.	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
ix.	CISPR 22/ EN 55022	2008 2006+A1:2007	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
x.	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
xi.	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
xii.	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
xiii.	A2LA	July 2012	Reference to A2LA Accreditation Status – A2LA Advertising Policy

1.2. 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.

2. PRODUCT DETAILS AND TEST CONFIGURATIONS

2.1. Technical Details

Details	Description
Purpose:	Test of the AP0127450, AP0127460 to FCC Part 15.247 and Industry Canada RSS-210 regulations.
Applicant:	RADWIN Ltd 27 Habarzel Street Tel Aviv, 69710 Israel
Manufacturer:	As applicant.
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	RDWN14-U6 Rev A
Date EUT received:	7th August 2012
Standard(s) applied:	FCC 47 CFR Part 15.247 & IC RSS-210
Dates of test (from - to):	7th to 28th August '12
No of Units Tested:	One
Type of Equipment:	2.4 GHz 2x2 and 3x3 MIMO RF module
Manufacturers Trade Name:	RADWIN Ltd
Model(s):	RADWIN AP0127450, AP0127460
Location for use:	Inside outdoor enclosure
Declared Frequency Range(s):	2400 - 2483.5 MHz
Software Release	Prototype
Type of Modulation:	Per 802.11n – BPSK, QPSK, 16QAM, 64QAM, OFDM
Declared Nominal Average Output Power:	5 MHz (2x2): 29.62 dBm 10 MHz (2x2): 29.58 dBm 20 MHz (2x2): 29.73 dBm, (3x3): 29.31 dBm 40 MHz (2x2): 29.18 dBm, (3x3): 29.29 dBm
EUT Modes of Operation:	5, 10, 20, 40 MHz
Transmit/Receive Operation:	Time Division Duplex
System Beam Forming:	RADWIN AP0127450, AP0127460 has no capability for antenna beam forming
Rated Input Voltage and Current:	POE 48 Vdc 0.625 A
Operating Temperature Range:	Declared range -35 to +60ºC
ITU Emission Designator:	RW 5 MHz 5M00W7W RW 10 MHz 10M00W7W RW 20 MHz 20M00W7W RW 40 MHz 40M00W7W
Equipment Dimensions:	1.9 x 2 x 0.3 inches
Weight:	0.042 lb (19 g)
Primary function of equipment:	2.4 GHz 2x2 and 3x3 MIMO RF module

2.2. Scope of Test Program

AP0127450, AP0127450 RF Module Testing
The scope of the test program was to test the AP0127450, AP0127450 2.4 GHz 2x2 and 3x3 MIMO RF module configurations in the frequency range 2400 – 2483.5 MHz for compliance against FCC 47 CFR Part 15.247 and Industry Canada RSS-210 specifications.

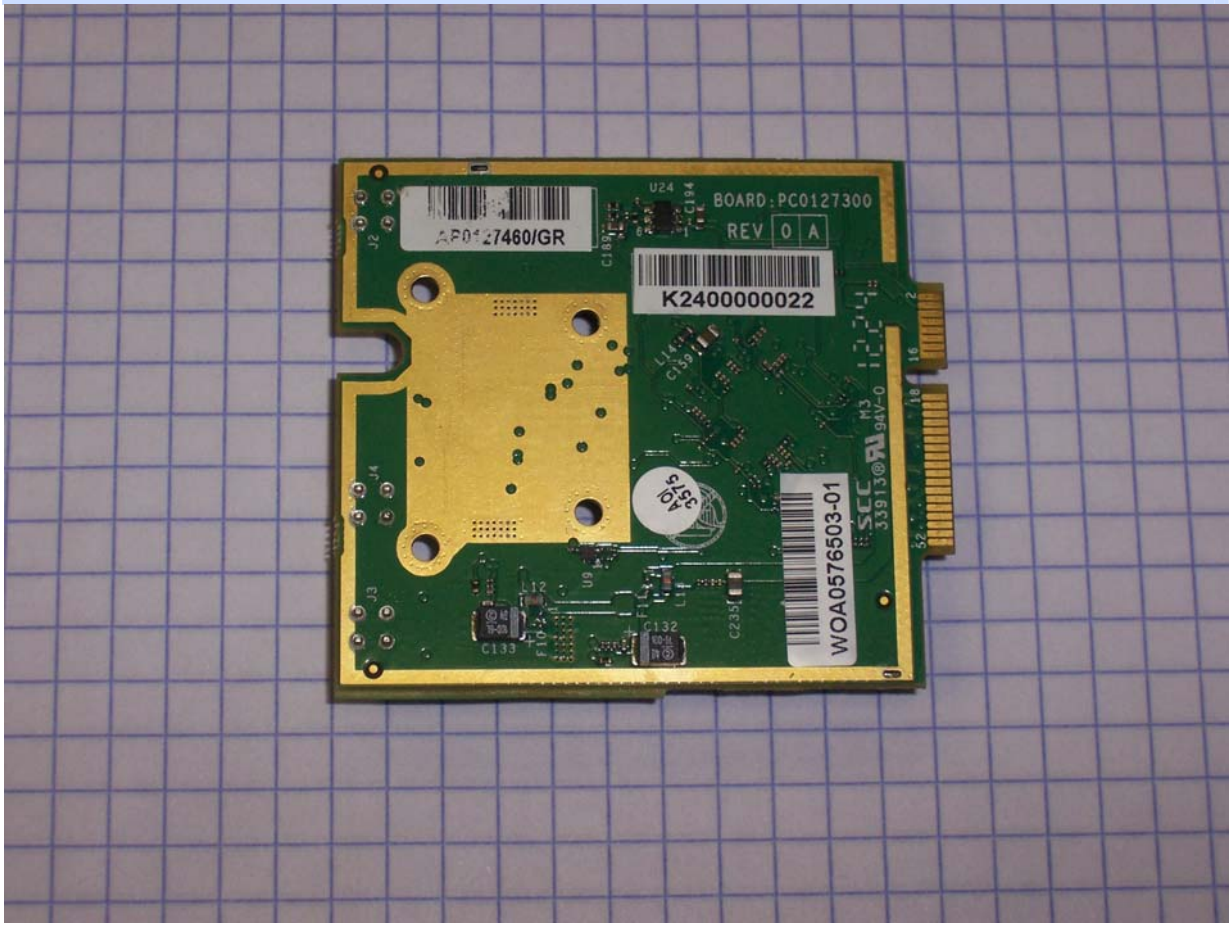
FCC OET KDB Implementation
This test program implements the following FCC KDB – 662911
Emissions Testing of Transmitters with Multiple Outputs in the Same Band

The KDB document provides guidance for measurements of conducted output emissions of devices that employ a single transmitter with multiple outputs in the same band, with the outputs occupying the same or overlapping frequency ranges. It applies to EMC compliance measurements on devices that transmit on multiple antennas simultaneously in the same or overlapping frequency ranges through a coordinated process. Examples include, but are not limited to, devices employing beam forming or multiple-input and multiple-output (MIMO.) This guidance applies to both licensed and unlicensed devices wherever the FCC rules call for conducted output measurements. Guidance is provided for in-band, out-of-band and spurious emission measurements.

This guidance does not apply to the multiple transmitters included in a composite device, such as a device that combines an 802.11 modem with a cell phone in one enclosure with each driving its own antenna.

AP0127450, AP0127460 Wireless Access Point

AP0127450, AP0127460 Wireless Access Point Label (Rear)



AP0127450, AP0127460 Wireless Access Point Label

2.3. Equipment Model(s) and Serial Number(s)

Equipment Type	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	RF module operating in the 2.4 GHz band	RADWIN Ltd.	AP0127450, AP0127460	None
Support	Laptop PC	IBM	Thinkpad	None

2.4. Antenna Details

Antenna Type	Manufacturer	Model Number	Antenna Gain (dBi) 2.4 GHz
Flat Panel Dual Pole Cross Polarized External	RADWIN Ltd.	RW-9612-2427	20
Flat Panel Dual Pole Cross Polarized Integrated	RADWIN Ltd.	MT0073320	17.5
Sector Dual Pole Cross Polarized 80 Deg	RADWIN Ltd.	RW-9462-0827	9
Omni Directional Antenna	RADWIN Ltd.	MT0129070	8
Omni Directional Antenna	RADWIN Ltd.	RW-9463-0825	6.3
Omni Directional Antenna	RADWIN Ltd.	RW-9461-0827	4

2.5. Cabling and I/O Ports

Number and type of I/O ports

1. 1 x 10/100/1000 Ethernet (includes POE +48 Vdc)

2.6. Test Configurations

Testing was performed to determine the highest power level versus bit rate. The variant with the highest power was used to exercise the product.

Channel Bandwidth (MHz)	Data Rate with Highest Power	Frequencies (MHz)
5	6.5 (MCS 0)	2,412
10	6.5 (MCS 0)	2,437
20	6.5 (MCS 0)	2,462
40	13.5 (MCS 0)	2,422 2,437 2,452

Results for the above configurations are provided in this report.
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Antenna Test Configurations for Radiated Emissions

Results for the following configurations are provided in this report.

2,400 – 2483.5 MHz

15.247	
5 MHz	SE 2412
	SE 2437
	SE 2462
	BE 2390
	BE 2483.5
10 MHz	SE 2412
	SE 2437
	SE 2462
	BE 2390
	BE 2483.5
20 MHz	SE 2412
	SE 2437
	SE 2462
	BE 2390
	BE 2483.5
40 MHz	SE 2422
	SE 2437
	SE 2452
	BE 2390
	BE 2483.5

KEY;-

SE – Spurious Emission
BE – Band-Edge

2.7. Equipment Modifications

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

1. NONE

2.8. Deviations from the Test Standard

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

1. NONE

3. TEST EQUIPMENT CONFIGURATION(S)

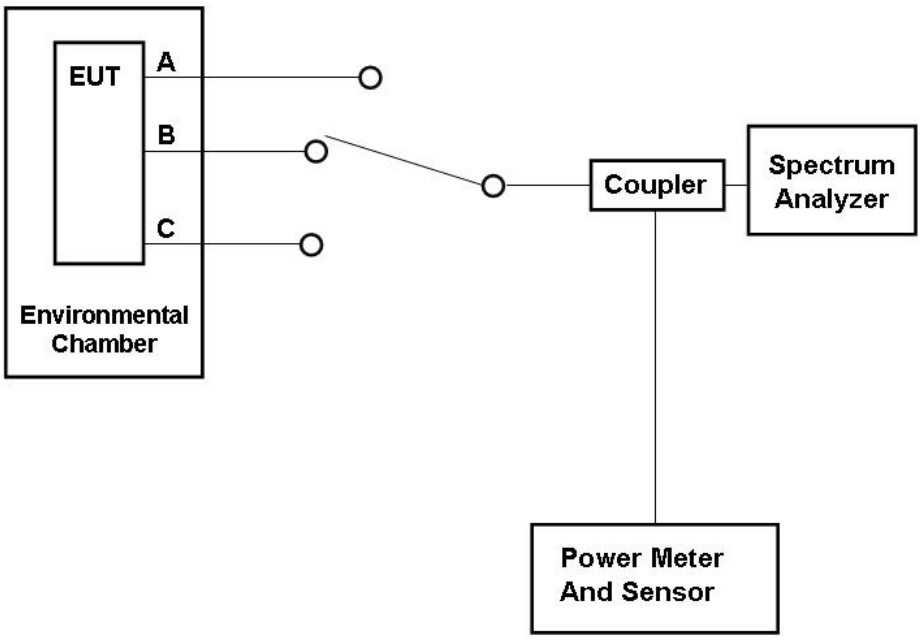
3.1. Conducted RF Emission Test Set-up

The following tests were performed using the conducted test set-up shown in the diagram below. The test setup applies to testing of both 3x3 and 2x2 configuration of the product.

1. Section 6.1.1.1. 6 dB and 99% Bandwidth
2. Section 6.1.1.2. Peak Output Power
3. Section 6.1.1.3. Power Spectral Density
4. Section 6.1.1.4. Conducted Spurious Emissions

Conducted Test Set-Up Pictorial Representation

3 - Port Test Configuration

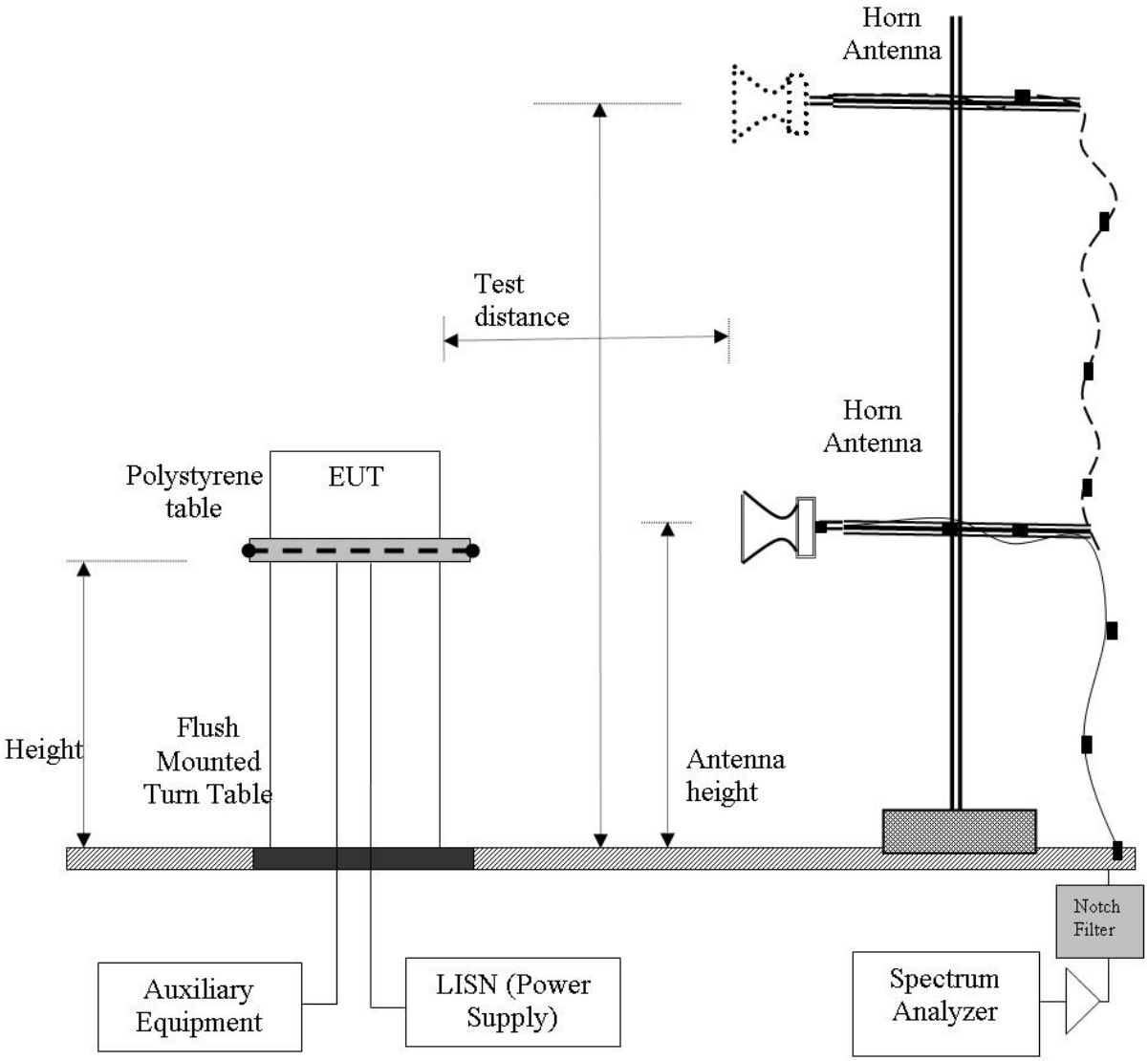


3.2. Radiated Spurious Emission Test Set-up > 1 GHz

The following tests were performed using the radiated test set-up shown in the diagram below.

1. Section 6.1.2. Radiated Emissions testing

Radiated Emission Measurement Setup – Above 1 GHz

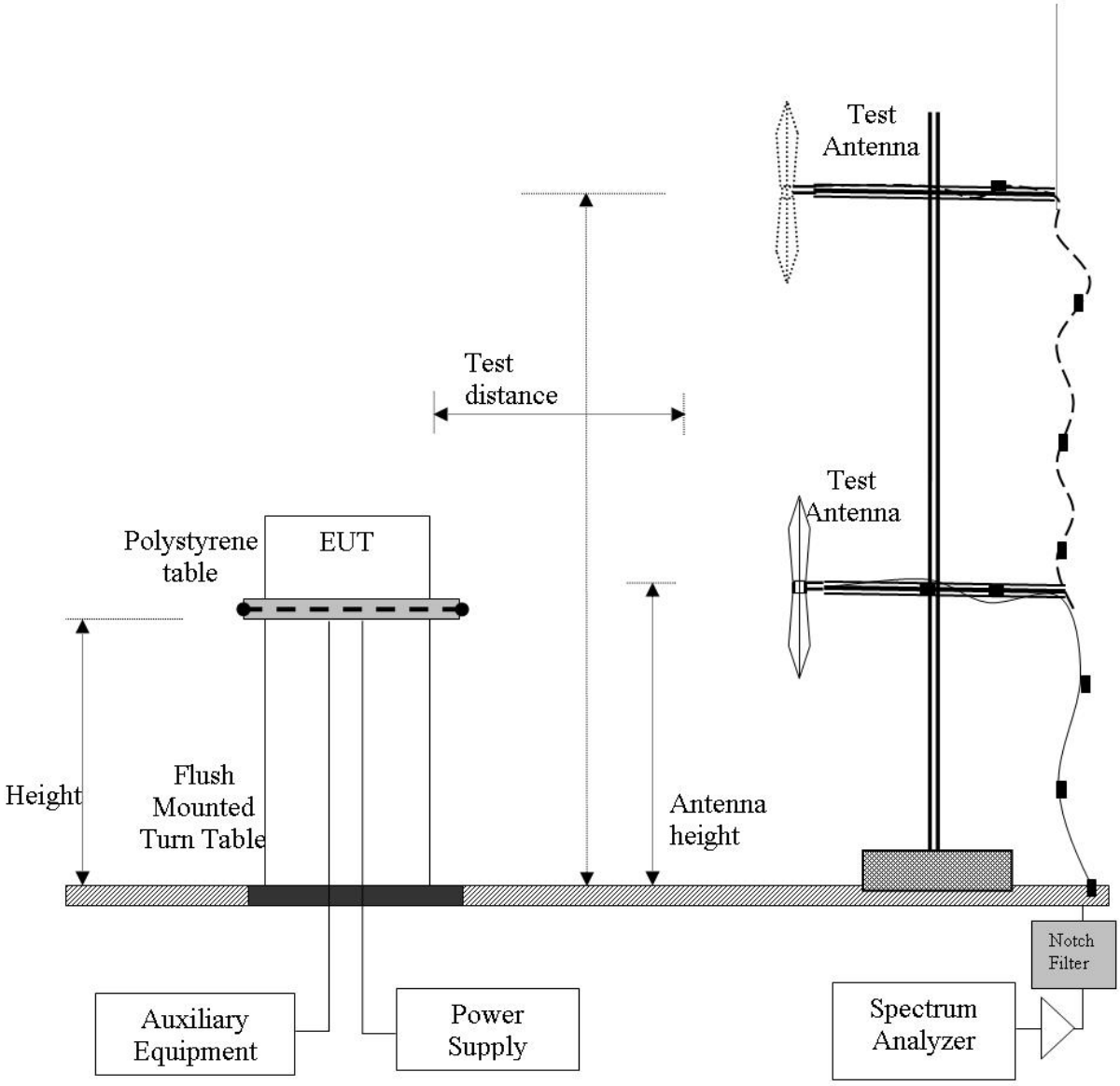


3.3. Digital Emissions Test Set-up (0.03 – 1 GHz)

The following tests were performed using the radiated test set-up shown in the diagram below.

1. Section 6.1.2.7.

Digital Emission Measurement Setup – Below 1 GHz



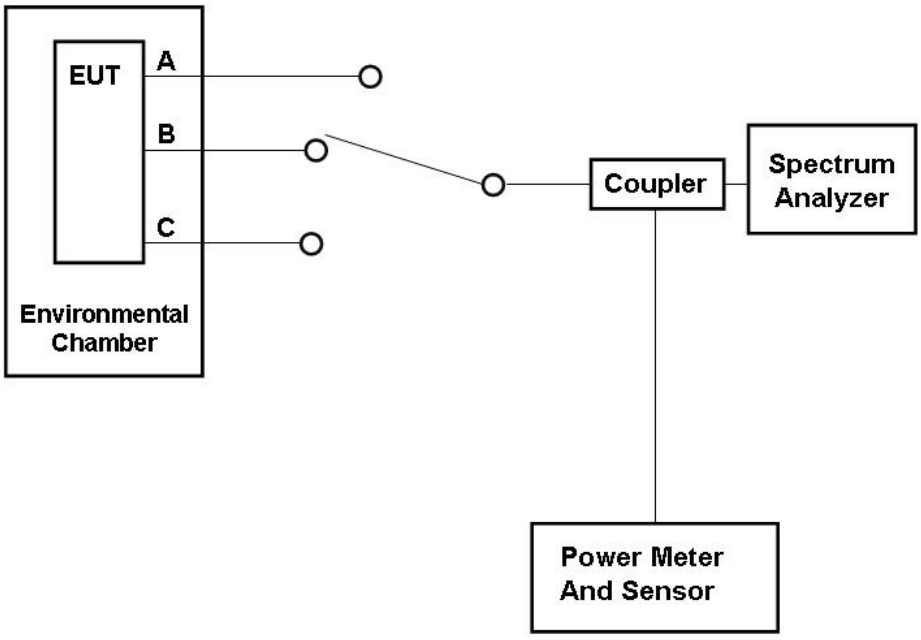
3.4. ac Wireline Emission Test Set-up

The following tests were performed using the conducted test set-up shown in the diagram below.

1. Section 6.1.3 ac Wireline Conducted Emissions

Conducted Test Set-Up Pictorial Representation

3 - Port Test Configuration



4. TEST SUMMARY

List of Measurements

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

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(a)(2) **A8.2(1)** **4.4**	6 dB and 99 % Bandwidths	≥500 kHz	Conducted	Complies	5.1.1
15.247(b)(3) **15.31(e)** **A8.4(4)**	Peak Output Power Voltage Variation	Shall not exceed 1W Variation of supply voltage 85 % -115 %	Conducted	Complies	5.1.2
15.247(e) **A8.2**	Peak Power Spectral Density	Shall not be greater than +8 dBm in any 3 kHz band	Conducted	Complies	5.1.3
15.247(i) **5.5**	Maximum Permissible Exposure	Exposure to radio frequency energy levels	Conducted	Complies	5.1.4
15.247(d) **15.205 /** **15.209** **A8.5** **2.2** **4.7**	Spurious Emissions (30MHz - 26 GHz b/g and 30 MHz – 40 GHz a)	The radiated emission in any 100 kHz of out-band shall be at least 20 dB below the highest in-band spectral density	Conducted	Complies	5.1.5

List of Measurements (continued)

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

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(d) **15.205 /** **15.209** **A8.5** **2.2** **2.6** **4.7**	Radiated Emissions	Restricted Bands	Radiated	Complies	5.1.6
	Transmitter Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.6.1*
	Radiated Band Edge	Band-edge results Peak Emissions		Complies	*5.1.6.2.*
15.205 / **15.209** **2.2**	Radiated Spurious Emissions	Emissions <1 GHz (30M-1 GHz)	Radiated	Complies	*5.1.6.3*
15.207 **7.2.2**	AC Wireline Conducted Emissions 150 kHz–30 MHz	Conducted Emissions	Conducted	N/A EUT is POE powered - not shipped with equipment	*5.1.6*

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

5. TEST RESULTS - Device Characteristics

5.1. Conducted Testing

5.1.1. 6 dB and 99 % Bandwidth

Conducted Test Conditions for 6 dB and 99% Bandwidth			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	6 dB and 99 % Bandwidth	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(2)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	KDB 558074 - D01 DTS Measurement Guidance v01: Section 5.1 Emission Bandwidth		

Test Procedure for 6 dB and 99% Bandwidth Measurement
The bandwidth at 6 dB and 99 % was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate centre frequency.

2x2 5MHz

Equipment Configuration for 6 dB 99%								
Variant:	5 MHz				**Duty Cycle (%):**		100	
Data Rate:	6.5 MBit/s				**Antenna Gain (dBi):**		0	
Modulation:	OFDM				**Beam Forming Gain (Y):**		N/A	
TPC:	Max Power							
Engineering Test Notes:								

Test Measurement Results

Test Frequency	**Measured 6 dB Bandwidth (MHz)**				**6 dB Bandwidth (MHz)**		**Limit**	**Lowest Margin**
	Port(s)							
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**	**MHz**	**MHz**
2412.0	4.489	4.469			4.489	4.469	0.5	-3.97
2437.0	4.489	4.489			4.489	4.489	0.5	-3.99
2462.0	4.469	4.489			4.489	4.469	0.5	-3.97

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Test Frequency	**Measured 99% Bandwidth (MHz)**				**Maximum 99% Bandwidth (MHz)**		
	Port(s)						
MHz	**a**	**b**	**c**	**d**			
2412.0	4.549	4.549			4.549		
2437.0	4.549	4.549			4.549		
2462.0	4.549	4.549			4.549		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB

2x2 10MHz

Equipment Configuration for 6 dB 99%									
Variant:	10 MHz					**Duty Cycle (%):**	100		
Data Rate:	6.5 MBit/s					**Antenna Gain (dBi):**	0		
Modulation:	OFDM					**Beam Forming Gain (Y):**	N/A		
TPC:	Max Power								
Engineering Test Notes:									

Test Measurement Results

Test Frequency	**Measured 6 dB Bandwidth (MHz)**				**6 dB Bandwidth (MHz)**		**Limit**	**Lowest Margin**
	Port(s)							
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**	**MHz**	**MHz**
2412.0	8.858	8.858			8.858	8.858	0.5	-8.36
2437.0	8.858	8.858			8.858	8.858	0.5	-8.36
2462.0	8.858	8.858			8.858	8.858	0.5	-8.36

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Test Frequency	**Measured 99% Bandwidth (MHz)**				**Maximum 99% Bandwidth (MHz)**		
	Port(s)						
MHz	**a**	**b**	**c**	**d**			
2412.0	8.858	8.858			8.858		
2437.0	8.858	8.858			8.858		
2462.0	8.858	8.858			8.858		

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB

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2x2 20MHz

Equipment Configuration for 6 dB 99%									
Variant:	20 MHz					**Duty Cycle (%):**	100		
Data Rate:	6.5 MBit/s					**Antenna Gain (dBi):**	0		
Modulation:	OFDM					**Beam Forming Gain (Y):**	N/A		
TPC:	Max Power								
Engineering Test Notes:									

Test Measurement Results

Test Frequency	**Measured 6 dB Bandwidth (MHz)**				**6 dB Bandwidth (MHz)**		**Limit**	**Lowest Margin**
	Port(s)							
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**	**MHz**	**MHz**
2412.0	17.796	17.796			17.796	17.796	0.5	-17.30
2437.0	17.796	17.796			17.796	17.796	0.5	-17.30
2462.0	17.876	17.796			17.876	17.796	0.5	-17.30

-

Test Frequency	**Measured 99% Bandwidth (MHz)**				**Maximum 99% Bandwidth (MHz)**		
	Port(s)						
MHz	**a**	**b**	**c**	**d**			
2412.0	17.715	17.715			17.715		
2437.0	17.796	17.715			17.796		
2462.0	17.796	17.715			17.796		

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB

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2x2 40MHz

Equipment Configuration for 6 dB 99%									
Variant:	40 MHz				**Duty Cycle (%):**		100		
Data Rate:	13.5 MBit/s				**Antenna Gain (dBi):**		0		
Modulation:	OFDM				**Beam Forming Gain (Y):**		N/A		
TPC:	Max Power								
Engineering Test Notes:									

Test Measurement Results

Test Frequency	**Measured 6 dB Bandwidth (MHz)**				**6 dB Bandwidth (MHz)**		**Limit**	**Lowest Margin**
	Port(s)							
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**	**MHz**	**MHz**
2422.0	36.874	36.713			36.874	36.713	0.5	-36.21
2437.0	36.713	36.553			36.713	36.553	0.5	-36.05
2452.0	36.553	36.713			36.713	36.553	0.5	-36.05

-

Test Frequency	**Measured 99% Bandwidth (MHz)**				**Maximum 99% Bandwidth (MHz)**		
	Port(s)						
MHz	**a**	**b**	**c**	**d**			
2422.0	36.393	36.393			36.393		
2437.0	36.393	36.393			36.393		
2452.0	36.393	36.393			36.393		

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB

-

-	-	-	-	-	-	-	-	-	-

3x3 20 MHz

Equipment Configuration for 6 dB 99%			
Variant:	20 MHz	**Duty Cycle (%):**	100
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Maximum Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 6 dB Bandwidth (MHz) Port(s)				6 dB Bandwidth (MHz)		Limit	Lowest Margin
MHz	a	b	c	d	Highest	Lowest	MHz	MHz
2412.0	17.796	17.796	17.796		17.796	17.796	0.5	-17.30
2437.0	17.796	17.796	17.796		17.796	17.796	0.5	-17.30
2462.0	17.796	17.796	17.796		17.796	17.796	0.5	-17.30

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				Maximum 99% Bandwidth (MHz)		
MHz	a	b	c	d			
2412.0	17.715	17.715	17.715		17.715		
2437.0	17.715	17.715	17.715		17.715		
2462.0	17.715	17.715	17.715		17.715		

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB

3x3 40 MHz

Equipment Configuration for 6 dB 99%			
Variant:	40 MHz	**Duty Cycle (%):**	100
Data Rate:	13.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Maximum Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 6 dB Bandwidth (MHz) Port(s)				6 dB Bandwidth (MHz)		Limit	Lowest Margin
MHz	a	b	c	d	Highest	Lowest	MHz	MHz
2422.0	36.713	36.553	36.553		36.713	36.553	0.5	-36.05
2437.0	36.713	36.553	36.553		36.713	36.553	0.5	-36.05
2452.0	36.713	36.553	36.553		36.713	36.553	0.5	-36.05

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				Maximum 99% Bandwidth (MHz)		
MHz	a	b	c	d			
2422.0	36.393	36.393	36.393		36.393		
2437.0	36.393	36.393	36.393		36.393		
2452.0	36.393	36.393	36.393		36.393		

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB

Specification

Limits

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

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

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

Traceability

Test Equipment Used
0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117

5.1.2. Peak Output Power

Conducted Test Conditions for Fundamental Emission Output Power			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Emission Output Power	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(2)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	KDB 558074 - D01 DTS Measurement Guidance v01: Section 5.2 Fundamental Emission Output Power KDB 662911 was implemented for In-band power measurements. The measure and sum technique was implemented in all cases.		

Test Procedure for Fundamental Emission Output Power Measurement
The transmitter terminal of EUT was connected to the input of the spectrum analyzer set to measure peak power. The resolution filter bandwidth was set to 6 dB, peak detector selected and the analyzer built-in power function was used to integrate peak power over the 20 dB bandwidth.

Supporting Information
Calculated Power = A + G + 10 log (1/x) dBm
A = Total Power [10 Log10 ($10^{a/10}$ + $10^{b/10}$ + $10^{c/10}$ + $10^{d/10}$)], G = Antenna Gain,
x = Duty Cycle

15.247(a)(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.

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 peak 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.

(iii) Fixed, point-to-point operation, as used in paragraphs (b)(3)(i) and (b)(3)(ii) of this section, excludes the use of point-to-multipoint systems, omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

2x2 Operation
2.4 GHz Uncorrelated Operation (5, 10, 20, 40 MHz) Point to Point
The customer declared that the RW-9612-2427 and MT0073320 antennas are intended for fixed point-to –point.

Antenna Model	Gain (dBi)	Max. Allowable Conducted Peak Power (dBm)	
		Σ (dBm)	Max. Power Per Chain
RW-9612-2427 Cross Polarized	20	+25.33	22.32
MT0073320 Cross Polarized	17.5	+26.17	23.16

2x2 Operation
2.4 GHz Uncorrelated Operation (5, 10, 20, 40 MHz)

Antenna Model	Gain (dBi)	Max. Allowable Conducted Peak Power (dBm)		Maximum EIRP (dBm)
		Σ (dBm)	Max. Power Per Chain	
RW-9462-0827 Cross Polarized	9	+27.0	23.99	36
MT0129070	8	+28.0	24.99	36
RW-9463-0825	6.3	+29.7	26.69	36
RW-9461-0827	4	+30.0	26.99	36

3x3 Operation
2.4 GHz Uncorrelated Operation (5, 10, 20, 40 MHz)

Antenna (dB)	Gain (dBi)	Max. Allowable Conducted Peak Power (dBm)		Maximum EIRP (dBm)
		Uncorrelated	Max. Power Per Chain	
RW-9461-0827	4	+30.0	25.23	36
MT0129070	8	+28.0	23.23	36
RW-9463-0825	6.3	+29.7	24.93	36

2x2 5MHz

Equipment Configuration for peak output power								
Variant:	5 MHz				**Duty Cycle (%):**	100		
Data Rate:	6.5 MBit/s				**Antenna Gain (dBi):**	0		
Modulation:	OFDM				**Beam Forming Gain (Y):**	N/A		
TPC:	Maximum Power							
Engineering Test Notes:								
Test Measurement Results								
Test Frequency	**Measured Output Power (dBm) Port(s)**				**Calculated Total Power (dBm)**	**Limit**	**Margin**	**EUT Power Setting**
MHz	**a**	**b**	**c**	**d**	**Σ**	**dBm**	**dBm**	
2412.0	27.148	26.004			29.624	30.000	-0.38	
2437.0	26.646	25.942			29.319	30.000	-0.68	
2462.0	26.410	25.983			29.212	30.000	-0.79	
Traceability to Industry Recognized Test Methodologies								
Work Instruction:	WI-01 Measuring RF Output Power							
Measurement Uncertainty:	±1.33 dB							
-								

2x2 10MHz

Equipment Configuration for peak output power								
Variant:	10 MHz				**Duty Cycle (%):**	100		
Data Rate:	6.5 MBit/s				**Antenna Gain (dBi):**	0		
Modulation:	OFDM				**Beam Forming Gain (Y):**	N/A		
TPC:	Maximum Power							
Engineering Test Notes:								
Test Measurement Results								
Test Frequency	**Measured Output Power (dBm) Port(s)**				**Calculated Total Power (dBm)**	**Limit**	**Margin**	**EUT Power Setting**
MHz	**a**	**b**	**c**	**d**	**Σ**	**dBm**	**dBm**	
2412.0	26.862	25.821			29.383	30.000	-0.62	
2437.0	26.750	25.690			29.263	30.000	-0.74	
2462.0	26.907	26.214			29.585	30.000	-0.42	
Traceability to Industry Recognized Test Methodologies								
Work Instruction:	WI-01 Measuring RF Output Power							
Measurement Uncertainty:	±1.33 dB							
-								

Note: click the link in the above results matrix to view the plot

2x2 20MHz

Equipment Configuration for peak output power			
Variant:	20 MHz	**Duty Cycle (%):**	100
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Maximum Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power (dBm)	Limit	Margin	EUT Power Setting
MHz	**a**	**b**	**c**	**d**	**Σ**	**dBm**	**dBm**	
2412.0	26.650	26.138			29.412	30.000	-0.59	
2437.0	26.993	26.438			29.735	30.000	-0.27	
2462.0	26.825	26.576			29.713	30.000	-0.29	

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 Measuring RF Output Power
Measurement Uncertainty:	±1.33 dB
-	

2x2 40MHz

Equipment Configuration for peak output power			
Variant:	40 MHz	**Duty Cycle (%):**	100
Data Rate:	13.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Maximum Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power (dBm)	Limit	Margin	EUT Power Setting
MHz	**a**	**b**	**c**	**d**	**Σ**	**dBm**	**dBm**	
2422.0	26.941	26.573			29.771	30.000	-0.23	
2437.0	26.660	25.613			29.178	30.000	-0.82	
2452.0	26.864	26.254			29.580	30.000	-0.42	

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 Measuring RF Output Power
Measurement Uncertainty:	±1.33 dB
-	

Note: click the link in the above results matrix to view the plot

3x3 20 MHz

Equipment Configuration for peak output power								
Variant:	20 MHz				**Duty Cycle (%):**	100		
Data Rate:	6.5 MBit/s				**Antenna Gain (dBi):**	0		
Modulation:	OFDM				**Beam Forming Gain (Y):**	N/A		
TPC:	Maximum Power							
Engineering Test Notes:								
Test Measurement Results								
Test Frequency	**Measured Output Power (dBm) Port(s)**				**Calculated Total Power (dBm)**	**Limit**	**Margin**	**EUT Power Setting**
MHz	**a**	**b**	**c**	**d**	**Σ Port(s)**	**dBm**	**dBm**	
2412.0	24.98	23.98	24.60		29.31	30.00	-0.69	
2437.0	24.99	24.11	24.33		29.26	30.00	-0.74	
2462.0	24.52	24.14	24.82		29.27	30.00	-0.73	
Traceability to Industry Recognized Test Methodologies								
Work Instruction:	WI-01 Measuring RF Output Power							
Measurement Uncertainty:	±1.33 dB							

3x3 40 MHz

Equipment Configuration for peak output power								
Variant:	40 MHz				**Duty Cycle (%):**	100		
Data Rate:	13.5 MBit/s				**Antenna Gain (dBi):**	0		
Modulation:	OFDM				**Beam Forming Gain (Y):**	N/A		
TPC:	Maximum Power							
Engineering Test Notes:								
Test Measurement Results								
Test Frequency	**Measured Output Power (dBm) Port(s)**				**Calculated Total Power (dBm)**	**Limit**	**Margin**	**EUT Power Setting**
MHz	**a**	**b**	**c**	**d**	**Σ Port(s)**	**dBm**	**dBm**	
2422.0	24.73	23.91	24.74		29.25	30.00	-0.75	
2437.0	24.50	23.84	24.72		29.14	30.00	-0.86	
2452.0	24.76	24.05	24.72		29.29	30.00	-0.71	
Traceability to Industry Recognized Test Methodologies								
Work Instruction:	WI-01 Measuring RF Output Power							
Measurement Uncertainty:	±1.33 dB							

The following matrix(s) identify the maximum allowable output power on a per antenna basis. The power levels reported take into account any power reduction as a result of Radiated Restricted Band testing.

Power Levels 4 dBi and 6.3 dBi Antennas 20 MHz 2x2 (Bold Indicates Power Levels for BE)

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	d	Combined	Calculated	dBm	dB	
2412	22.52	22.64	--	--	N/A	25.59	30.00	-4.41	**17.5**
2437	26.99	26.44	--	--	N/A	29.73	30.00	-0.27	19
2462	22.35	22.57	--	--	N/A	25.47	30.00	-4.53	**14.5**

Power Levels 4 dBi and 6.3 dBi Antenna 40 MHz 2x2 (Bold Indicates Power Levels for BE)

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	d	Combined	Calculated	dBm	dB	
2422	18.71	18.43	--	--	N/A	21.58	30.00	-8.42	**13.5**
2437	26.66	25.61	--	--	N/A	29.18	30.00	-0.82	18.5
2452	15.82	15.37	--	--	N/A	18.61	30.00	-11.39	**10.5**

Power Levels 8 dBi Antenna 20 MHz 2x2 ((Bold Indicates Power Levels for BE)

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	d	Combined	Calculated	dBm	dB	
2412	22.52	22.64	--	--	N/A	25.59	30.00	-4.41	**17.5**
2437	26.99	26.44	--	--	N/A	29.73	30.00	-0.27	19
2462	22.35	22.57	--	--	N/A	25.47	30.00	-4.53	**14.5**

Power Levels 8 dBi Antenna 40 MHz 2x2 (Bold Indicates Power Levels for BE)

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	d	Combined	Calculated	dBm	dB	
2422	18.71	18.43	--	--	N/A	21.58	30.00	-8.42	**13.5**
2437	26.66	25.61	--	--	N/A	29.18	30.00	-0.82	18.5
2452	15.82	15.37	--	--	N/A	18.61	30.00	-11.39	**10.5**

Power Levels 4 dBi and 6.3 dBi Antenna 20 MHz 3x3

Test Frequency	Measured Peak Power RF Port (dBm)			Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	Combined	Calculated	dBm	dB	
2412	24.98	23.98	24.60	N/A	29.31	30.00	-0.69	19
2437	24.99	24.11	24.33	N/A	29.26	30.00	-0.74	19
2462	24.52	24.14	24.82	N/A	29.27	30.00	-0.73	19

Power Levels 4 dBi and 6.3 dBi Antenna 40 MHz 3x3

Test Frequency	Measured Peak Power RF Port (dBm)			Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	Combined	Calculated	dBm	dB	
2422	24.73	23.91	24.74	N/A	29.25	30.00	-0.75	18.5
2437	24.50	23.84	24.72	N/A	29.14	30.00	-0.86	18.5
2452	24.76	24.04	24.72	N/A	29.29	30.00	-0.71	18.5

Power Levels 8 dBi Antenna 20 MHz 3x3 (Bold Indicates Power Levels for BE)

Test Frequency	Measured Peak Power RF Port (dBm)			Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	Combined	Calculated	dBm	dB	
2412	21.76	21.51	21.66	N/A	26.42	30.00	-3.58	**17**
2437	24.99	24.11	24.33	N/A	29.26	30.00	-0.74	19
2462	18.91	18.75	19.47	N/A	23.83	30.00	-6.17	**14.5**

Power Levels 8 dBi Antenna 40 MHz 3x3 (Bold Indicates Power Levels for BE)

Test Frequency	Measured Peak Power RF Port (dBm)			Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	Combined	Calculated	dBm	dB	
2422	18.85	18.44	18.59	N/A	23.40	30.00	-6.60	**13.5**
2437	24.50	23.84	24.72	N/A	29.14	30.00	-0.86	18.5
2452	15.24	14.81	15.30	N/A	19.89	30.00	-10.11	**10**

Power Levels 9 dBi Antenna 20 MHz 2x2 (Bold Indicates Power Levels for BE)

Test Frequency	Measured Peak Power RF Port (dBm)			Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	Combined	Calculated	dBm	dB	
2412	21.17	21.12	--	N/A	24.16	29.00	-4.84	**16.5**
2437	25.91	25.27	--	N/A	28.61	29.00	-0.39	19.5
2462	21.98	21.98	--	N/A	24.99	29.00	-4.01	**17.5**

Power Levels 9 dBi Antenna 40 MHz 2x2 ((Bold Indicates Power Levels for BE)

Test Frequency	Measured Peak Power RF Port (dBm)			Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	Combined	Calculated	dBm	dB	
2422	20.86	20.68	--	N/A	23.78	29.00	-5.22	**15.5**
2437	25.27	24.52	--	N/A	27.92	29.00	-1.08	18.5
2452	19.09	18.64	--	N/A	21.88	29.00	-7.12	**14**

Power Levels 9 dBi Antenna Radwin Mode (5 MHz) 2x2

Test Frequency	Measured Peak Power RF Port (dBm)			Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	Combined	Calculated	dBm	dB	
2412	25.45	24.69	--	N/A	28.10	29.00	-0.90	34R*
2437	25.43	24.80	--	N/A	28.14	29.00	-0.86	34R*
2462	25.27	24.72	--	N/A	28.01	29.00	-0.99	34R*

R* - indicates power level set using Radwin GUI instead of ART

Power Levels 9 dBi Antenna Radwin Mode (10 MHz) 2x2

Test Frequency	Measured Peak Power RF Port (dBm)			Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	Combined	Calculated	dBm	dB	
2412	25.40	24.70	--	N/A	28.07	29.00	-0.93	34R*
2437	25.47	24.82	--	N/A	28.17	29.00	-0.83	34R*
2462	25.30	24.87	--	N/A	28.10	29.00	-0.90	34R*

R* - indicates power level set using Radwin GUI instead of ART

Power Levels 17.5 dBi and 20 dBi Antenna Radwin Mode (5 MHz) 2x2

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	d	Combined	Calculated	dBm	dB	
2412	22.51	21.81	--	--	N/A	25.18	26.00	-0.82	28R*
2437	22.60	21.82	--	--	N/A	25.24	26.00	-0.76	28R*
2462	22.50	21.96	--	--	N/A	25.25	26.00	-0.75	28R*

R* - indicates power level set using Radwin GUI instead of ART

Power Levels 17.5 dBi and 20 dBi Antenna Radwin Mode (10 MHz) 2x2

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	d	Combined	Calculated	dBm	dB	
2412	22.28	21.80	--	--	N/A	25.06	26.00	-0.94	34R*
2437	22.33	21.70	--	--	N/A	25.04	26.00	-0.96	34R*
2462	22.21	21.76	--	--	N/A	25.00	26.00	-1.00	34R*

R* - indicates power level set using Radwin GUI instead of ART

Power Levels 17.5 dBi and 20 dBi Antenna 20 MHz 2x2 (Bold Indicates Power Levels for BE)

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	d	Combined	Calculated	dBm	dB	
2412	19.27	18.70	--	--	N/A	22.00	26.00	-4.00	**14.5**
2437	22.61	21.93	--	--	N/A	25.29	26.00	-0.71	16
2462	17.45	17.33	--	--	N/A	20.40	26.00	-5.60	**13**

Power Levels 17.5 dBi and 20 dBi Antenna 40 MHz 2x2 (Bold Indicates Power Levels for BE)

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin	Power Setting
MHz	a	b	c	d	Combined	Calculated	dBm	dB	
2422	14.54	14.46	--	--	N/A	17.51	26.00	-8.49	**9.5**
2437	22.84	22.11	--	--	N/A	25.50	26.00	-0.50	16
2452	13.33	12.78	--	--	N/A	16.07	26.00	-9.93	**8**

Specification

Limits

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

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

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

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

(1) Fixed point-to-point operation:

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

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

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

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

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117

5.1.3. Power Spectral Density

Conducted Test Conditions for Power Spectral Density			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Power Spectral Density	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (e)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	KDB 558074 - D01 DTS Measurement Guidance v01: Section 5.3 Maximum Power Spectral Density Level in the Emission Bandwidth		

Test Procedure for Power Spectral Density

The transmitter output was connected to a spectrum analyzer and the maximum level in a 3 kHz bandwidth was measured. A peak value was found over the full emission bandwidth and the frequency span reduced to obtain enhanced resolution. Sweep time ≥ span / 3 kHz with video averaging turned off. The Peak Power Spectral Density is the highest level found across the emission in a 3 kHz resolution bandwidth.

Supporting Information

Calculated Power = A + 10 log (1/x) dBm

A = Total Power Spectral Density [10 Log10 ($10^{a/10}$ + $10^{b/10}$ + $10^{c/10}$ + $10^{d/10}$)]

x = Duty Cycle

Limit Line: KDB 662911 was implemented for In-band power spectral density (PSD) measurements - Option (2) measure and subtract 10 log (N) dB from the limit for devices with multiple RF ports

2x2 5MHz

Equipment Configuration for power density			
Variant:	5 MHz	**Duty Cycle (%):**	100
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density (dBm) Port(s)				Calculated Total Power Spectral Density (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Σ Port(s)**	**Conversion to 3 kHz RBW**	**dBm**	**dB**
2412.0	-0.570	-1.300			2.091	N/A	8.0	-5.91
2437.0	-0.944	-1.117			1.981	N/A	8.0	-6.02
2462.0	-0.741	-1.827			1.760	N/A	8.0	-6.24

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB
-	

2x2 10MHz

Equipment Configuration for power density			
Variant:	10 MHz	**Duty Cycle (%):**	100
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density (dBm) Port(s)				Calculated Total Power Spectral Density (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Σ Port(s)**	**Conversion to 3 kHz RBW**	**dBm**	**dB**
2412.0	-3.784	-4.685			-1.201	N/A	8.0	-9.20
2437.0	-4.194	-4.632			-1.397	N/A	8.0	-9.40
2462.0	-2.358	-3.782			-0.002	N/A	8.0	-8.00

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB
-	

Note: click the link in the above results matrix to view the plot

2x2 20MHz

Equipment Configuration for power density			
Variant:	20 MHz	**Duty Cycle (%):**	100
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density (dBm) Port(s)				Calculated Total Power Spectral Density (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Σ Port(s)**	**Conversion to 3 kHz RBW**	**dBm**	**dB**
2412.0	-6.295	-6.482			-3.377	N/A	8.0	-11.38
2437.0	-5.805	-5.964			-2.873	N/A	8.0	-10.87
2462.0	-6.082	-6.855			-3.441	N/A	8.0	-11.44

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB
-	

2x2 40MHz

Equipment Configuration for power density			
Variant:	40 MHz	**Duty Cycle (%):**	100
Data Rate:	13.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density (dBm) Port(s)				Calculated Total Power Spectral Density (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Σ Port(s)**	**Conversion to 3 kHz RBW**	**dBm**	**dB**
2422.0	-8.972	-8.848			-5.899	N/A	8.0	-13.90
2437.0	-8.038	-8.720			-5.355	N/A	8.0	-13.36
2452.0	-9.010	-9.204			-6.096	N/A	8.0	-14.10

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB
-	

Note: click the link in the above results matrix to view the plot

3x3 20 MHz

Equipment Configuration for power density			
Variant:	20 MHz	**Duty Cycle (%):**	100
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density (dBm) Port(s)				Calculated Total Power Spectral Density (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Σ Port(s)**	**Conversion to 3 kHz RBW**	**dBm**	**dB**
2412.0	-8.357	-11.729	-6.987		-3.838	N/A	8.0	-11.84
2437.0	-8.882	-11.648	-9.444		-5.066	N/A	8.0	-13.07
2462.0	-9.553	-11.349	-8.303		-4.789	N/A	8.0	-12.79

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB

3x3 40 MHz

Equipment Configuration for power density			
Variant:	40 MHz	**Duty Cycle (%):**	100
Data Rate:	13.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density (dBm) Port(s)				Calculated Total Power Spectral Density (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Σ Port(s)**	**Conversion to 3 kHz RBW**	**dBm**	**dB**
2422.0	-12.159	-10.017	-13.678		-6.918	N/A	8.0	-14.92
2437.0	-11.233	-14.821	-10.890		-7.219	N/A	8.0	-15.22
2452.0	-14.331	-12.730	-10.564		-7.495	N/A	8.0	-15.49

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 Measuring RF Spectrum Mask
Measurement Uncertainty:	±2.81 dB

Specification
Peak Power Spectral Density Limits

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

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

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117

5.1.4. Maximum Permissible Exposure

FCC, Part 15 Subpart C §15.247(i)
Industry Canada RSS-Gen §5.6

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)

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

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

Specification

Maximum Permissible Exposure Limits

§15.247(i) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency levels in excess of the Commission's guidelines. **FCC §1.1310** Limit = 1mW / cm^2 from 1.310 Table 1 **RSS-Gen §5.6** 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

2400 – 2483.5 MHz 2x2 Operation Point to Point operation.

Antenna Model	Type	Ant Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance @ 1mW/cm^2 Limit(cm)	Power Density @ 20cm (mW/cm^2)
RW-9612-2427	Flat Panel Dual Pole Cross Polarized External	20	100.0	25.33	341.19	52.11	6.79
MT0073320	Flat Panel Dual Pole Cross Polarized Integrated	17.5	56.2	26.17	414.00	43.04	4.63

2400 – 2483.5 MHz 2x2 Operation

Antenna Model	Type	Ant Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance @ 1mW/cm^2 Limit(cm)	Power Density @ 20cm (mW/cm^2)
RW-9462-0827	Sector Dual Pole Cross Polarized 80 Deg	9	7.9	27.00	501.19	17.80	0.79
MT0129070	Omni Directional Antenna	8	6.3	28.00	630.96	17.80	0.79
RW-9463-0825	Omni Directional Antenna	6.3	4.3	29.70	933.25	17.80	0.79
RW-9461-0827	Omni Directional Antenna	4	2.5	30.00	1000.00	14.14	0.50

2400 – 2483.5 MHz 3X3 Operation

Antenna Model	Type	Ant Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance @ 1mW/cm^2 Limit(cm)	Power Density @ 20cm (mW/cm^2)
RW-9461-0827	Omni Directional Antenna	4	2.5	30.00	1000.00	14.14	0.50
MT0129070	Omni Directional Antenna	8	6.3	28.00	630.96	17.80	0.79
RW-9463-0825	Omni Directional Antenna	6.3	4.3	29.70	933.25	17.80	0.79

5.1.5. Conducted Spurious Emissions

Conducted Test Conditions for Transmitter Conducted Spurious and Band-Edge Emissions			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Max Unwanted Emission Levels	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (d)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	KDB 558074 - D01 DTS Measurement Guidance v01: Section 5.4 Maximum Unwanted Emission Levels		

Test Procedure for Transmitter Conducted Spurious and Band-Edge Emissions Measurement
Transmitter Conducted Spurious and Band-Edge 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. Measurements were made while EUT was operating in transmit mode of operation at the appropriate centre frequency closest to the band-edge. Emissions were maximized during the measurement and limits derived from the peak spectral power and drawn on each plot.

2x2 5MHz

Equipment Configuration for bandedge			
Variant:	5 MHz	Duty Cycle (%):	100
Data Rate:	6.5 MBit/s	Antenna Gain (dBi):	0
Modulation:	OFDM	Beam Forming Gain (Y):	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Frequency Range	Transmitter Spurious - Conducted Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
2412.0	30.0 - 26000.0	10.710	-9.29	9.064	-10.94				
2437.0	30.0 - 26000.0	-41.763	-10.55	-40.364	-11.00				
2462.0	30.0 - 26000.0	9.854	-10.15	8.812	-11.19				

-

SE - Maximum spurious emission found

-

Test Frequency	Band-Edge Frequency	Transmitter Spurious - Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
2412.0	2400.0	-45.061	-8.17	-47.234	-8.74				
2462.0	2483.5	-46.914	-9.12	-46.986	-8.77				

-

BE - Maximum band-edge emission found

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 Measurement of Spurious Emissions
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB

-

Note: click the link in the above results matrix to view the plot

2x2 10MHz

Equipment Configuration for bandedge			
Variant:	10 MHz	Duty Cycle (%):	100
Data Rate:	6.5 MBit/s	Antenna Gain (dBi):	0
Modulation:	OFDM	Beam Forming Gain (Y):	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Frequency Range	Transmitter Spurious - Conducted Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
2412.0	30.0 - 26000.0	-40.241	-12.86	-42.581	-12.82				
2437.0	30.0 - 26000.0	-39.511	-12.71	-41.009	-14.15				
2462.0	30.0 - 26000.0	-39.999	-11.87	-40.043	-11.18				

-

SE - Maximum spurious emission found

-

Test Frequency	Band-Edge Frequency	Transmitter Spurious - Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
2412.0	2400.0	-38.533	-10.34	-40.616	-11.30				
2462.0	2483.5	-45.873	-9.92	-45.536	-9.69				

-

BE - Maximum band-edge emission found

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 Measurement of Spurious Emissions
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB

-

Note: click the link in the above results matrix to view the plot

2x2 20MHz

Equipment Configuration for bandedge			
Variant:	20 MHz	Duty Cycle (%):	100
Data Rate:	6.5 MBit/s	Antenna Gain (dBi):	0
Modulation:	OFDM	Beam Forming Gain (Y):	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Frequency Range	Transmitter Spurious - Conducted Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
2412.0	30.0 - 26000.0	-40.677	-13.09	-42.237	-13.92				
2437.0	30.0 - 26000.0	-39.650	-13.81	-39.803	-13.93				
2462.0	30.0 - 26000.0	-40.164	-14.22	-40.378	-14.44				

-

SE - Maximum spurious emission found

-

Test Frequency	Band-Edge Frequency	Transmitter Spurious - Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
2412.0	2400.0	-22.367	-12.96	-23.858	-13.04				
2462.0	2483.5	-36.335	-12.92	-36.500	-12.65				

-

BE - Maximum band-edge emission found

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 Measurement of Spurious Emissions
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB

-

Note: click the link in the above results matrix to view the plot

2x2 40MHz

Equipment Configuration for bandedge			
Variant:	40 MHz	Duty Cycle (%):	100
Data Rate:	13.5 MBit/s	Antenna Gain (dBi):	0
Modulation:	OFDM	Beam Forming Gain (Y):	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Frequency Range	Transmitter Spurious - Conducted Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
2422.0	30.0 - 26000.0	-40.494	-15.92	-40.356	-16.86				
2437.0	30.0 - 26000.0	-40.203	-16.15	-42.518	-17.60				
2452.0	30.0 - 26000.0	-40.660	-16.78	-42.414	-17.98				

-

SE - Maximum spurious emission found

-

Test Frequency	Band-Edge Frequency	Transmitter Spurious - Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
2422.0	2400.0	-22.318	-14.92	-24.195	-14.63				
2452.0	2483.5	-34.289	-15.58	-34.269	-15.76				

-

BE - Maximum band-edge emission found

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 Measurement of Spurious Emissions
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB

-

Note: click the link in the above results matrix to view the plot

3x3 20 MHz

Equipment Configuration for Transmitter Conducted Spurious and Band-Edge Emissions			
Variant:	20 MHz	**Duty Cycle (%):**	100
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Frequency Range	Transmitter Conducted Spurious Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
2412.0	30.0 - 26000.0	-42.157	-14.60	-42.147	-15.60	-41.445	-13.94		
2437.0	30.0 - 26000.0	-40.544	-14.56	-40.764	-15.05	-43.119	-14.96		
2462.0	30.0 - 26000.0	-41.437	-15.09	-40.396	-15.42	-41.453	-14.33		

SE - Maximum spurious emission found

Test Frequency	Band-Edge Frequency	Transmitter Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
2412.0	2400.0	-24.510	-14.36	-26.325	-15.14	-24.061	-14.15		
2462.0	2483.5	-39.013	-14.66	-40.044	-14.75	-38.958	-13.82		

BE - Maximum band-edge emission found

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 Measurement of Spurious Emissions
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB

3x3 40 MHz

Equipment Configuration for Transmitter Conducted Spurious and Band-Edge Emissions			
Variant:	40 MHz	**Duty Cycle (%):**	100
Data Rate:	13.5 MBit/s	**Antenna Gain (dBi):**	0
Modulation:	OFDM	**Beam Forming Gain (Y):**	N/A
TPC:	Max Power		
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Frequency Range	Transmitter Conducted Spurious Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
2422.0	30.0 - 26000.0	-41.083	-17.55	-40.882	-17.62	-43.367	-16.87		
2437.0	30.0 - 26000.0	-40.443	-17.89	-39.994	-17.93	-43.227	-17.14		
2452.0	30.0 - 26000.0	-41.669	-17.78	-41.088	-18.42	-41.537	-17.16		

SE - Maximum spurious emission found

Test Frequency	Band-Edge Frequency	Transmitter Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
2422.0	2400.0	-24.645	-17.37	-27.197	-17.64	-26.652	-16.70		
2452.0	2483.5	-36.040	-17.35	-35.054	-17.68	-34.768	-16.85		

BE - Maximum band-edge emission found

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 Measurement of Spurious Emissions
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB

Specification

Limits Band-Edge

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

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

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

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

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

Laboratory Measurement Uncertainty for Conducted Spurious Emissions

Measurement uncertainty	±2.37 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0088, 0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117.

5.2. Radiated Emission Testing

Transmitter Radiated Spurious Emissions (above 1 GHz); Peak Field Strength Measurements; and Radiated Band Edge Measurements – Restricted Bands

FCC, Part 15 Subpart C §15.247(d) 15.205; 15.209
Industry Canada RSS-210 §A8.5, §2.2, §2.6 Industry Canada RSS-Gen §4.7

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

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

Where: 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

For 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))

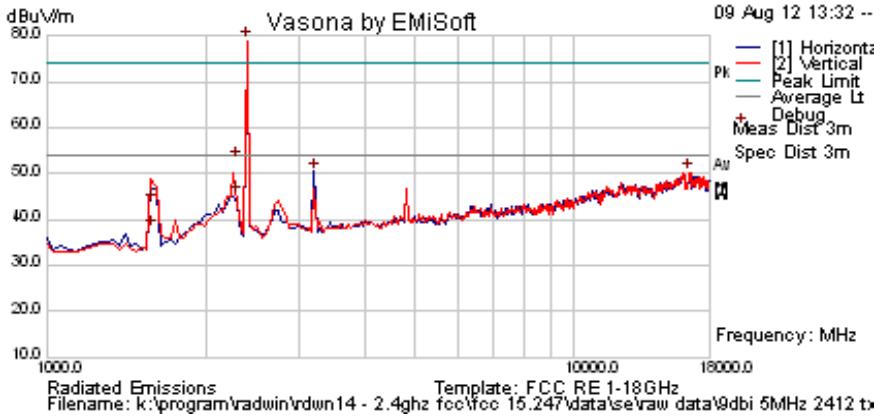
40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

NOTE: KDB 662911 was implemented for Out-of-Band measurements. Where necessary Option (2) Measure and add 10 log (N) dB was implemented

5.2.1. Antenna #1 9 dBi

2x2 5 MHz 2412 MHz

Test Freq.	2412 MHz	**Engineer**	JMH
Variant	802.11n; 5mhz	**Temp (ºC)**	26
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	39
Power Setting	34R	**Press. (mBars)**	1004
Antenna	9 dBi sector	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

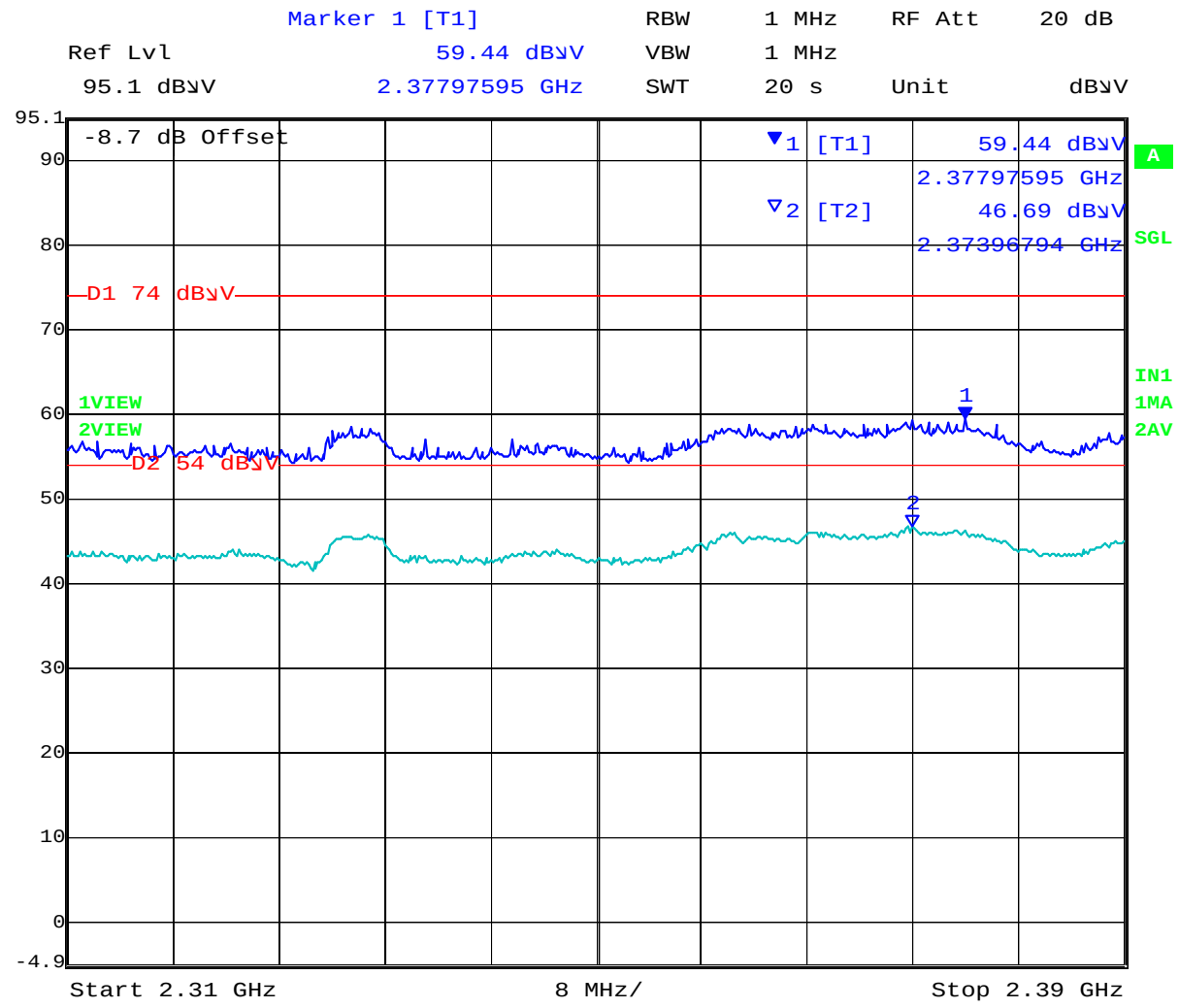


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	87.7	3.0	-11.7	79.0	Peak [Scan]	H	100	0				FUND
3215.942	58.7	3.5	-11.9	50.4	Peak [Scan]	H	100	0			Pass	NRB
16501.002	41.1	8.8	0.3	50.2	Peak [Scan]	V	100	0			Pass	NRB
2288.016	61.8	2.9	-11.9	52.8	Peak Max	V	131	21	74	-21.2	Pass	RB
1584.068	56.2	2.4	-15.2	43.4	Peak Max	V	98	13	74	-30.6	Pass	RB
2288.016	54.1	2.9	-11.9	45.1	Average Max	V	131	21	54	-8.9	Pass	RB
1584.068	50.5	2.4	-15.2	37.7	Average Max	V	98	13	54	-16.3	Pass	RB

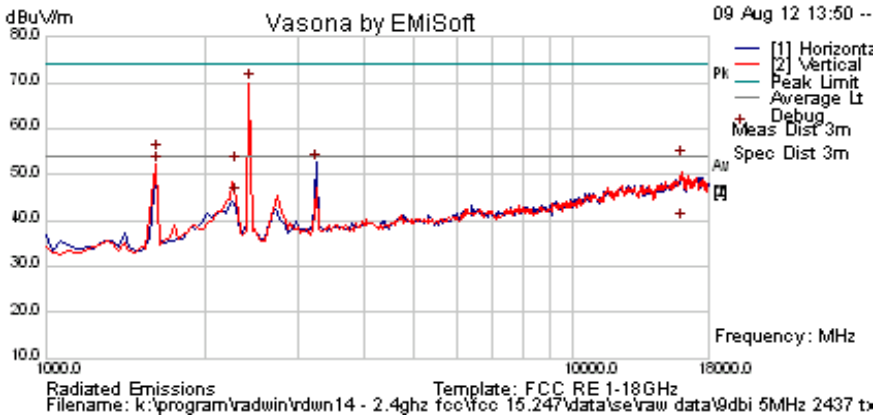
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

2x2 5 MHz 2390 MHz Band Edge



2x2 5 MHz 2437 MHz

Test Freq.	2437 MHz	**Engineer**	JMH
Variant	802.11n; 5mhz	**Temp (ºC)**	26
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	39
Power Setting	34R	**Press. (mBars)**	1004
Antenna	9 dBi sector	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



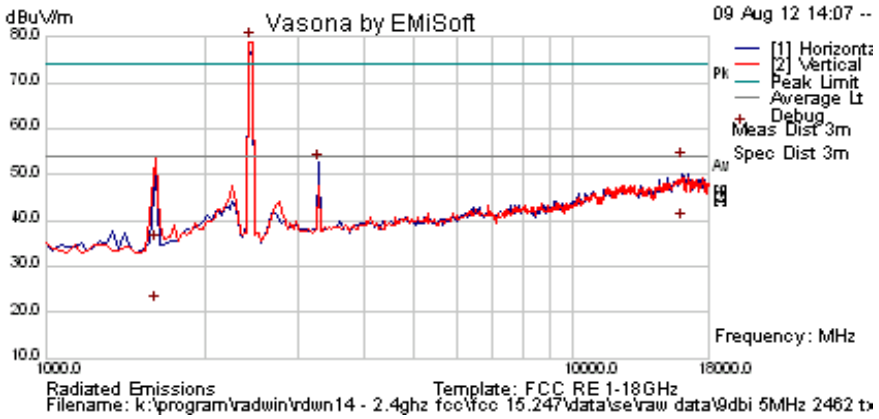
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	78.5	3.0	-11.6	69.9	Peak [Scan]	V	150	0				FUND
3249.248	61.1	3.5	-11.9	52.7	Peak [Scan]	H	100	0			Pass	NRB
1624.629	67.1	2.5	-15.0	54.6	Peak Max	V	102	50	74	-19.5	Pass	RB
15987.988	44.2	9.0	0.1	53.3	Peak Max	V	123	103	74	-20.7	Pass	RB
2287.908	61.2	2.9	-11.9	52.2	Peak Max	V	98	17	74	-21.8	Pass	RB
1624.629	64.5	2.5	-15.0	52.0	Average Max	V	102	50	54	-2.1	Pass	RB
15987.988	30.5	9.0	0.1	39.6	Average Max	V	123	103	54	-14.4	Pass	RB
2287.908	54.0	2.9	-11.9	45.0	Average Max	V	98	17	54	-9.0	Pass	RB

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

2x2 5 MHz 2462 MHz

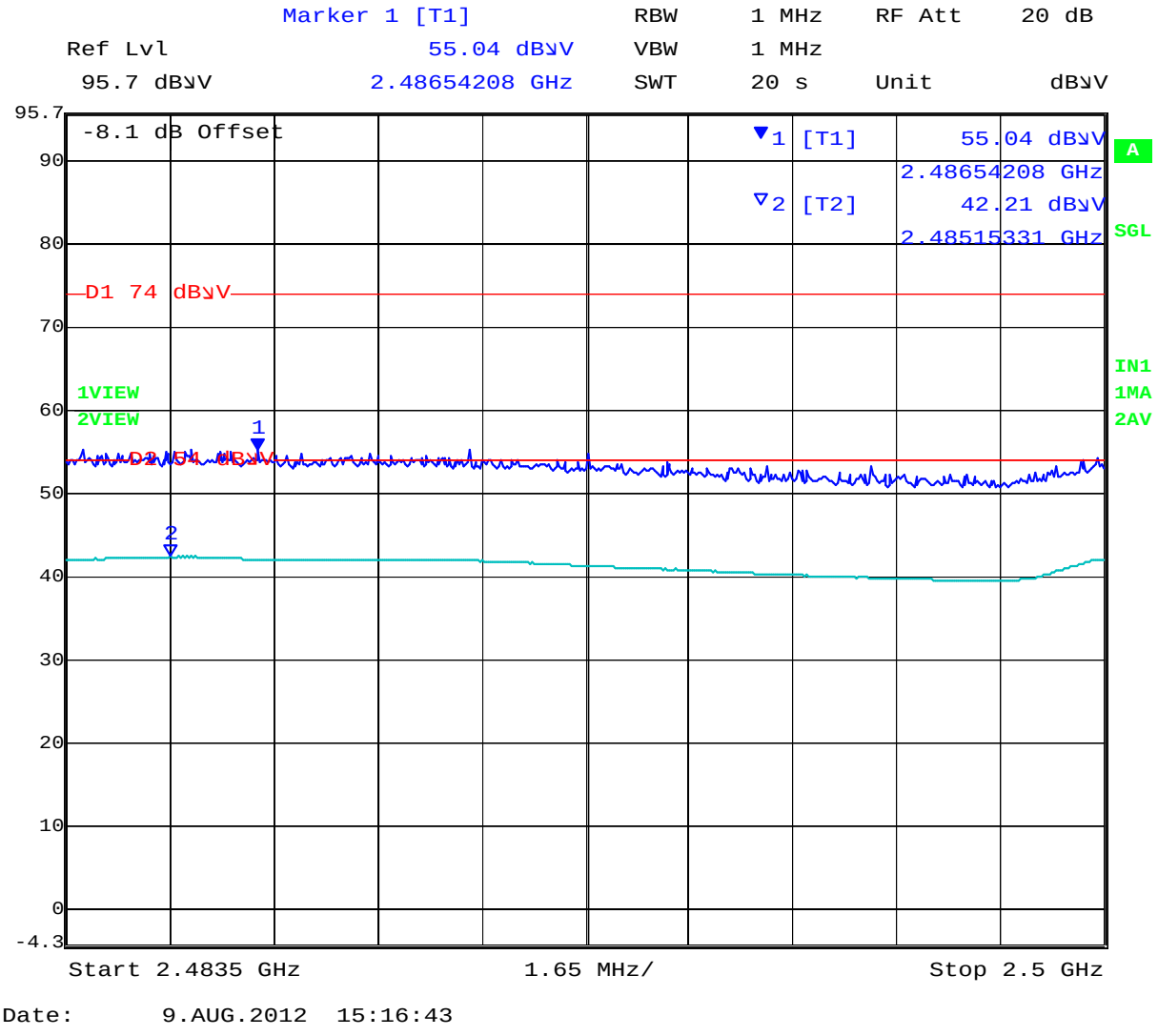
Test Freq.	2462 MHz	**Engineer**	JMH
Variant	802.11n; 5mhz	**Temp (ºC)**	26
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	39
Power Setting	34R	**Press. (mBars)**	1004
Antenna	9 dBi sector	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

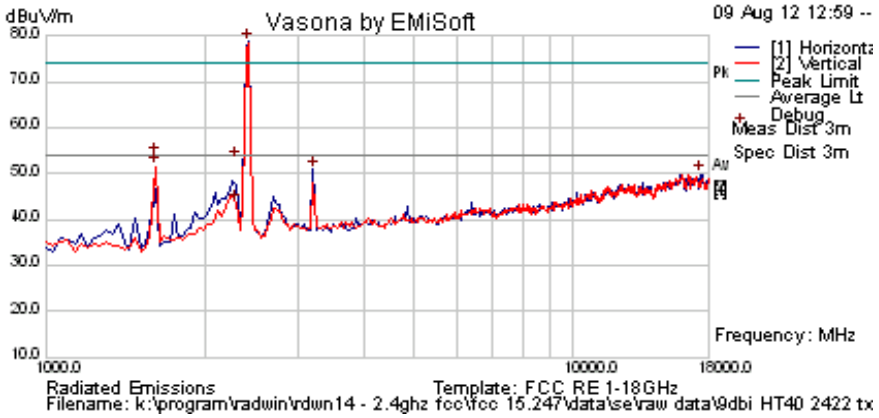
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	87.5	3.0	-11.6	78.9	Peak [Scan]	V	150	0	54.0	24.9	Fail	
3282.56513	61.0	3.5	-11.8	52.7	Peak [Scan]	H	100	0	54.0	-1.3	Pass	
1613.226	47.5	2.5	-15.1	34.9	Peak Max	V	137	57	74	-39.1	Pass	
16058.116	43.6	9.0	0.3	52.9	Peak Max	H	163	42	74	-21.1	Pass	
1613.226	34.3	2.5	-15.1	21.7	Average Max	V	137	57	54	-32.3	Pass	
16058.116	30.3	9.0	0.3	39.6	Average Max	H	163	42	54	-14.4	Pass	
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											

2x2 5 MHz 2483.5 MHz Band Edge



2x2 802.11n HT-40 2422 MHz

Test Freq.	2422 MHz	**Engineer**	JMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	26
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	39
Power Setting	18.5	**Press. (mBars)**	1004
Antenna	9 dbi antenna 2x2	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

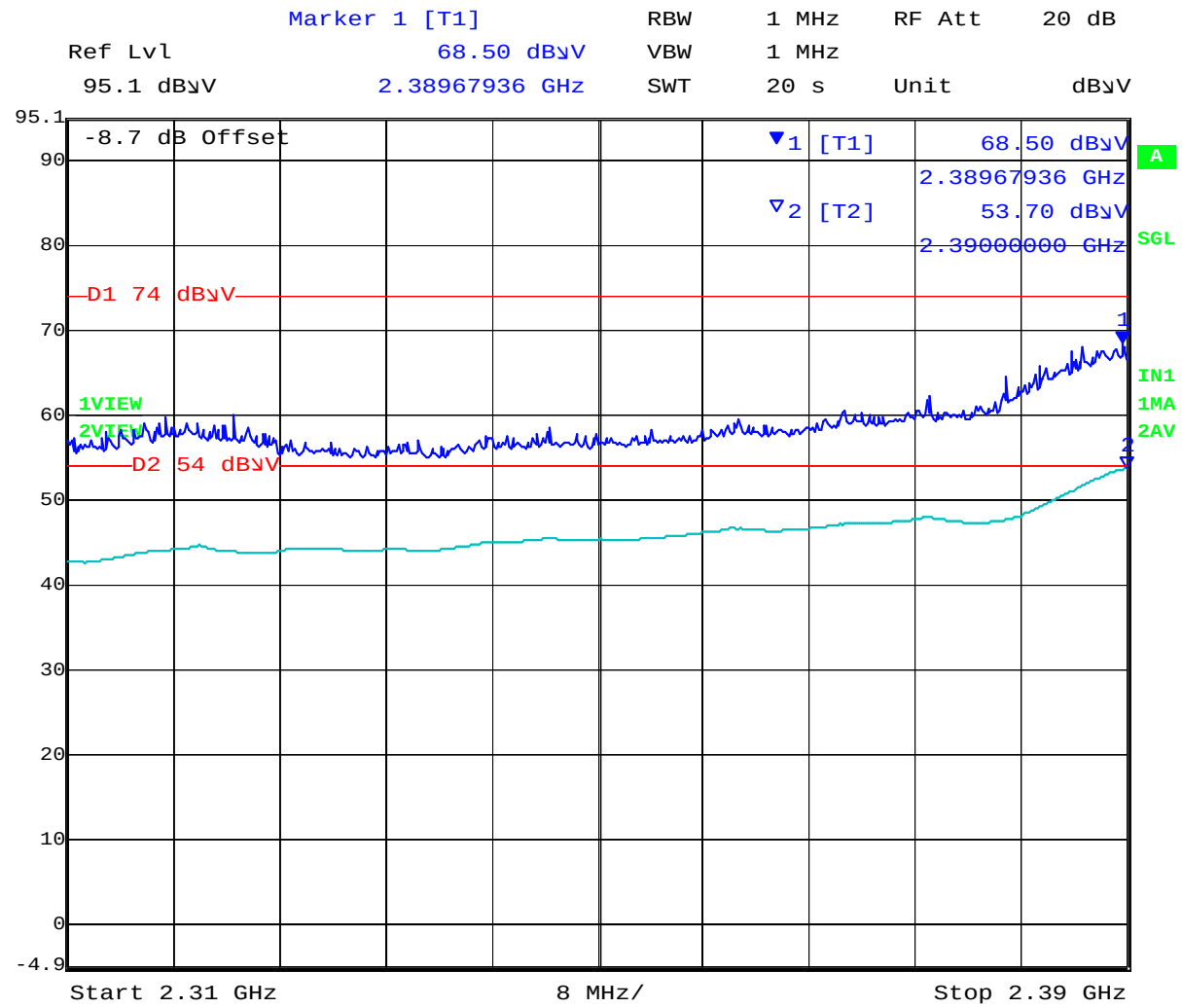


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2412.064	87.3	3.0	-11.6	78.7	Peak [Scan]	H	100	0	54.0	24.7	Fail	
3229.419	59.3	3.5	-11.9	50.9	Peak [Scan]	H	150	0	54.0	-3.1	Pass	
17420.842	39.9	8.7	1.3	49.9	Peak [Scan]	H	200	0	54	-4.1	Pass	
1614.699	66.3	2.5	-15.1	53.7	Peak Max	V	101	3	74	-20.3	Pass	
2288.257	62.1	2.9	-11.9	53.1	Peak Max	H	155	5	74	-20.9	Pass	
1614.699	64.5	2.5	-15.1	51.9	Average Max	V	101	3	54	-2.2	Pass	
2288.257	52.4	2.9	-11.9	43.4	Average Max	H	155	5	54	-10.6	Pass	

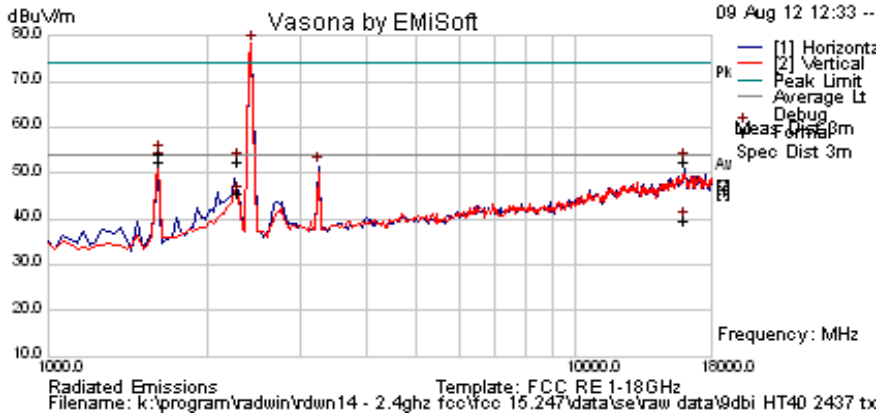
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

2x2 802.11n HT-40 2390 MHz Band Edge ART = 15.5



2x2 802.11n HT-40 2437 MHz

Test Freq.	2437 MHz	**Engineer**	JMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	26
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	39
Power Setting	18.5	**Press. (mBars)**	1004
Antenna	9 dbi antenna 2x2	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



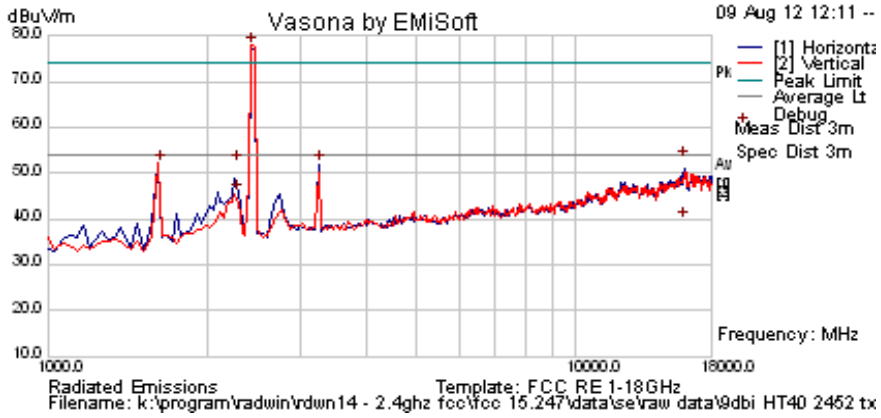
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	87.0	3.0	-11.6	78.4	Peak [Scan]	V	150	0				FUND
3249.289	59.9	3.5	-11.9	51.5	Peak [Scan]	H	150	0			Pass	NRB
1624.685	66.8	2.5	-15.0	54.3	Peak Max	V	98	23	74	-19.7	Pass	RB
16022.305	43.2	9.0	0.2	52.4	Peak Max	H	180	146	74	-21.6	Pass	RB
2288.029	61.4	2.9	-11.9	52.4	Peak Max	H	114	360	74	-21.6	Pass	RB
1624.685	65.0	2.5	-15.0	52.5	Average Max	V	98	23	54	-1.5	Pass	RB
16022.305	30.2	9.0	0.2	39.5	Average Max	H	180	146	54	-14.5	Pass	RB
2288.029	54.4	2.9	-11.9	45.4	Average Max	H	114	360	54	-8.6	Pass	EB

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

2x2 802.11n HT-40 2452 MHz

Test Freq.	2452 MHz	**Engineer**	JMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	26
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	39
Power Setting	18.5	**Press. (mBars)**	1004
Antenna	9 dbi antenna 2x2	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

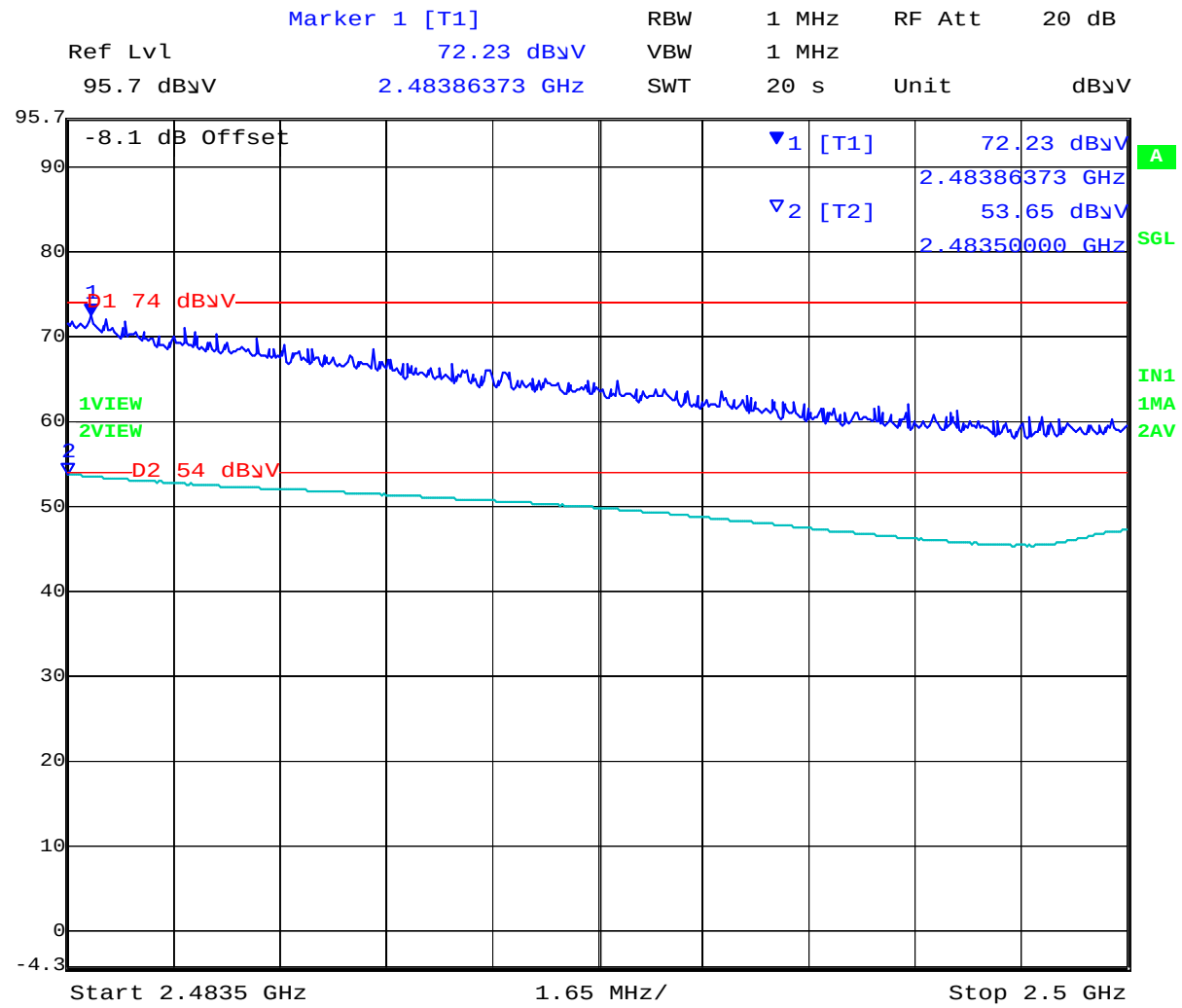


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2434.579	86.5	3.0	-11.6	78.0	Peak [Scan]	V	100	0				FUND
1634.79	64.7	2.5	-14.9	52.3	Peak [Scan]	V	100	0			Pass	NRB
3269.419	60.3	3.5	-11.8	52.0	Peak [Scan]	H	150	0			Pass	NRB
15991.234	43.8	9.0	0.1	52.9	Peak Max	H	131	290	74	-21.1	Pass	RB
2287.892	61.3	2.9	-11.9	52.3	Peak Max	H	119	4	74	-21.7	Pass	RB
15991.234	30.4	9.0	0.1	39.5	Average Max	H	131	290	54	-14.5	Pass	RB
2287.892	54.8	2.9	-11.9	45.8	Average Max	H	119	4	54	-8.2	Pass	RB

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

2x2 802.11n HT-40 2483.5 MHz Band Edge ART = 14

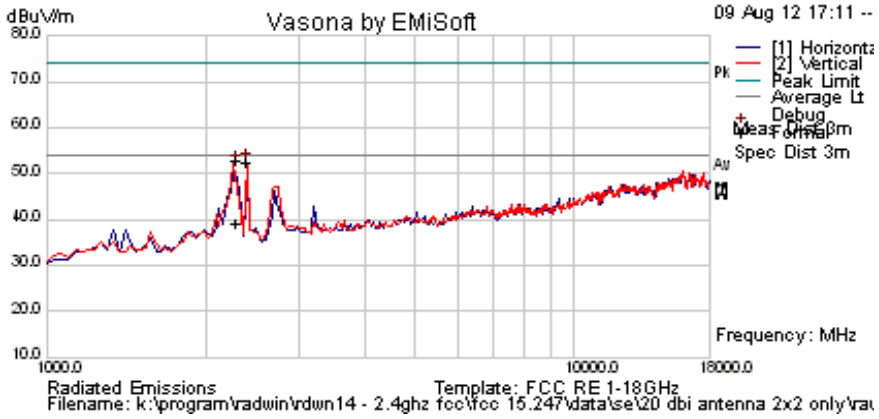


Date: 10.AUG.2012 10:51:23

5.2.2. Antenna #2 20 dBi

2x2 5 MHz 2412 MHz

Test Freq.	2412 MHz	**Engineer**	SB
Variant	802.11n; 5 MHz	**Temp (ºC)**	26.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	28R	**Press. (mBars)**	1010
Antenna	20 dBi Panel	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

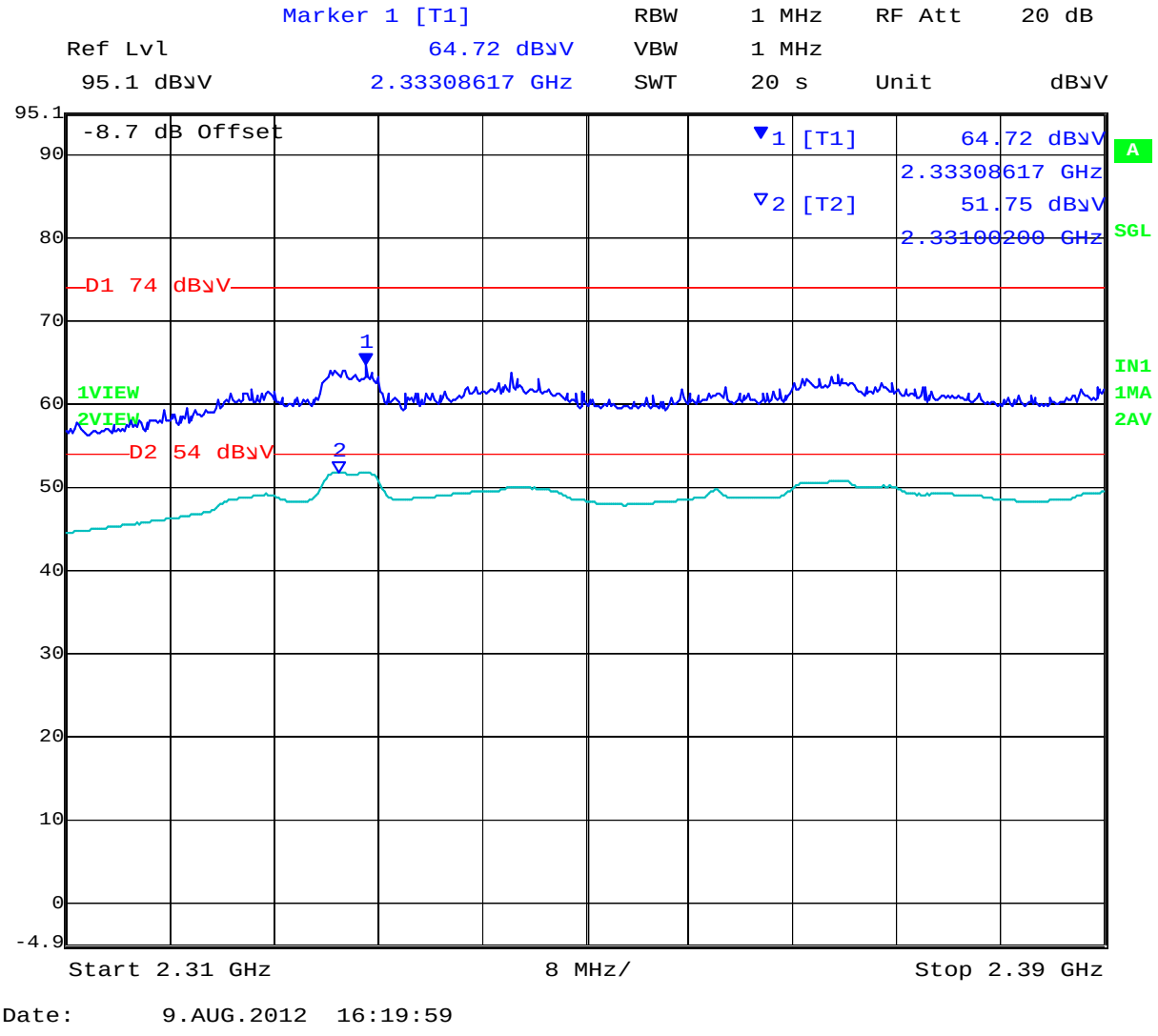


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2289.025	61.8	2.9	-11.9	52.8	Peak Max	V	98	16	74	-21.2	Pass	RB
2289.025	48.1	2.9	-11.9	39.1	Average Max	V	98	16	54	-14.9	Pass	RB
2396.794	61.1	3.0	-11.7	52.4	Peak [Scan]	V						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

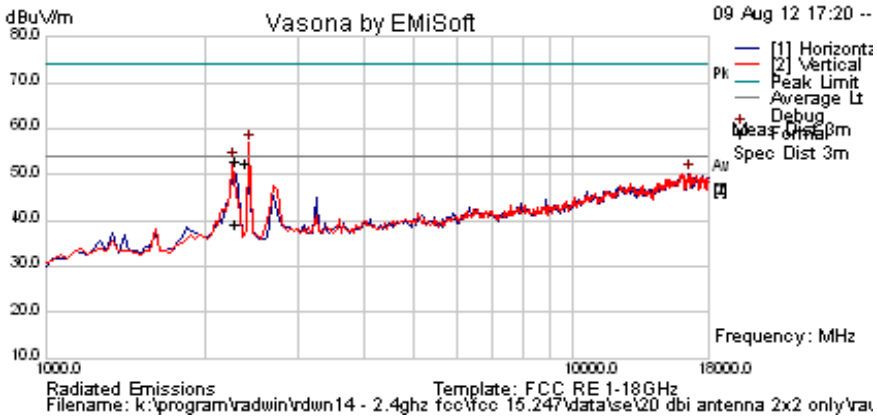
2x2 5 MHz 2390 MHz Band Edge



Date: 9.AUG.2012 16:19:59

2x2 5 MHz 2437 MHz

Test Freq.	2437 MHz	**Engineer**	SB
Variant	802.11n; 5 MHz	**Temp (ºC)**	26.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	28R	**Press. (mBars)**	1010
Antenna	20 dBi Panel	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



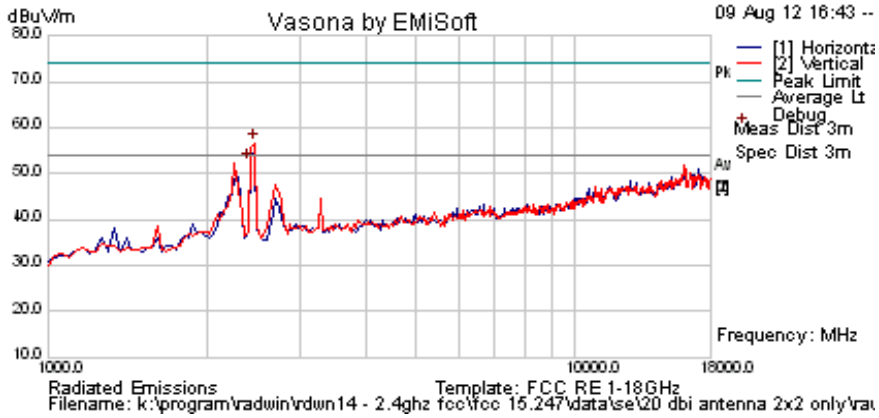
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	65.5	3.0	-11.6	56.9	Peak [Scan]	V						FUND
2260.521042	61.7	2.9	-11.8	52.8	Peak [Scan]	V					Pass	BE
16569.138	41.0	8.8	0.5	50.2	Peak [Scan]	V	150	0	54	-3.8	Pass	NOISE

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

2x2 5 MHz 2462 MHz

Test Freq.	2462 MHz	**Engineer**	SB
Variant	=G61	**Temp (ºC)**	26.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	28R	**Press. (mBars)**	1010
Antenna	20 dBi Panel	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

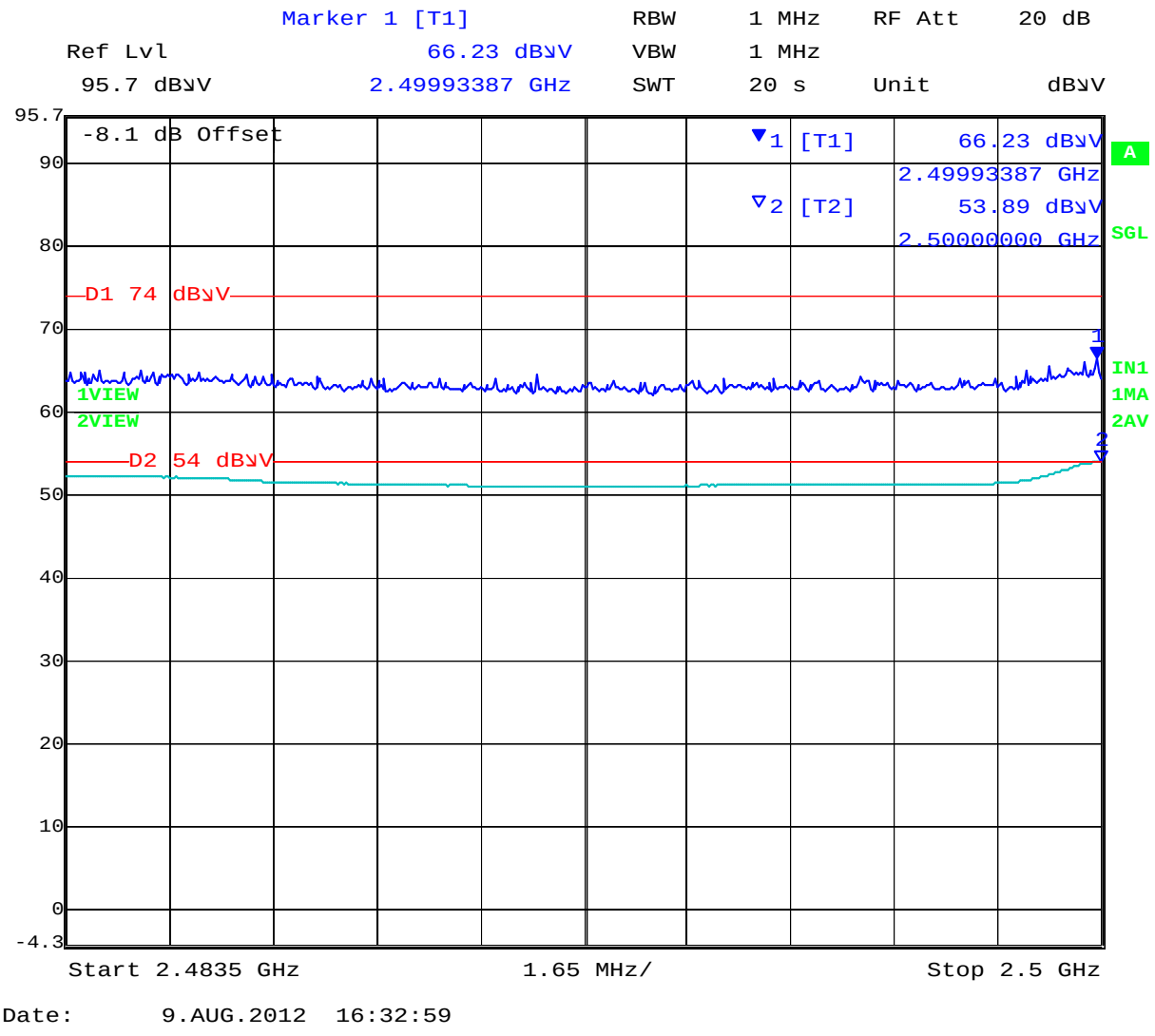


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2464.930	65.2	3.0	-11.5	56.7	Peak [Scan]	V						FUND
2390	61.2	3.0	-11.7	52.5	Peak [Scan]	V					Pass	BE

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

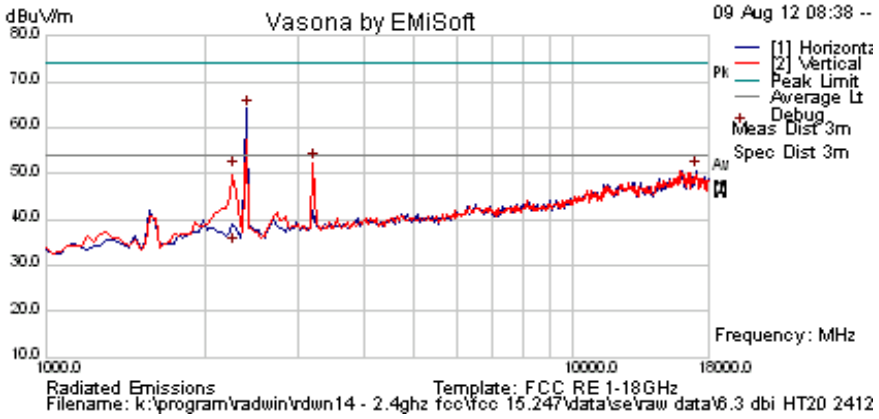
2x2 5 MHz 2483.5 MHz Band Edge



5.2.3. Antenna #3 6.3 dBi

2x2 802.11n HT-20 2412 MHz

Test Freq.	2412 MHz	**Engineer**	JMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	18.5	**Press. (mBars)**	1007
Antenna	6.3 dBi Ant x2	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

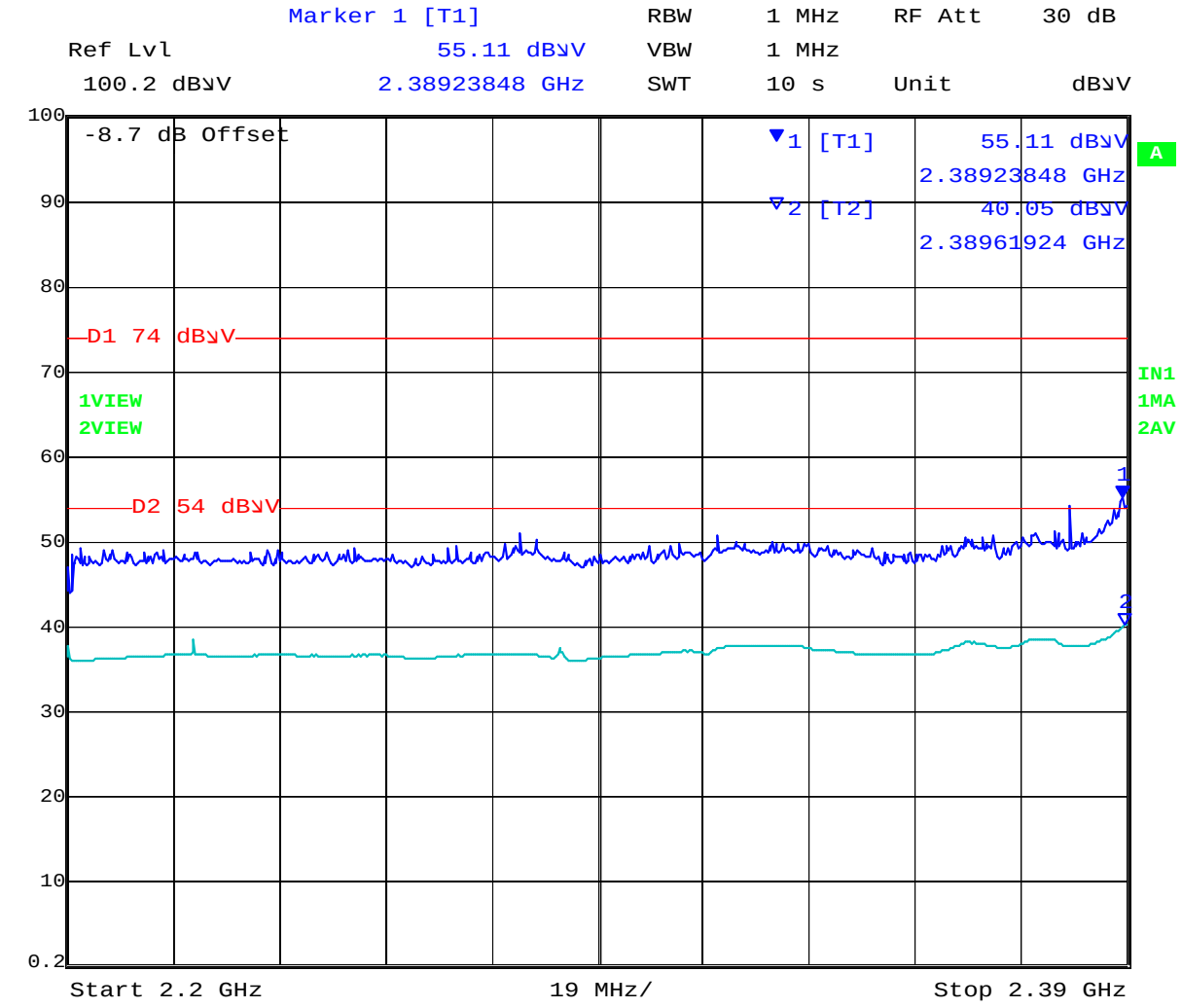


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2415.872	72.8	3.0	-11.6	64.2	Peak [Scan]	H	150	0				FUND
3215.922	60.8	3.5	-11.9	52.5	Peak [Scan]	V	100	0			Pass	NRB
17080.160	41.9	8.5	0.4	50.8	Peak [Scan]	H	150	0			Pass	NRB
2277.055	60.0	2.9	-11.9	51.0	Peak Max	V	142	256	74	-23.0	Pass	RB
2277.055	42.9	2.9	-11.9	34.0	Average Max	V	142	256	54	-20.0	Pass	RB

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

2x2 802.11n HT-20 2390 MHz Band Edge ART = 17.5



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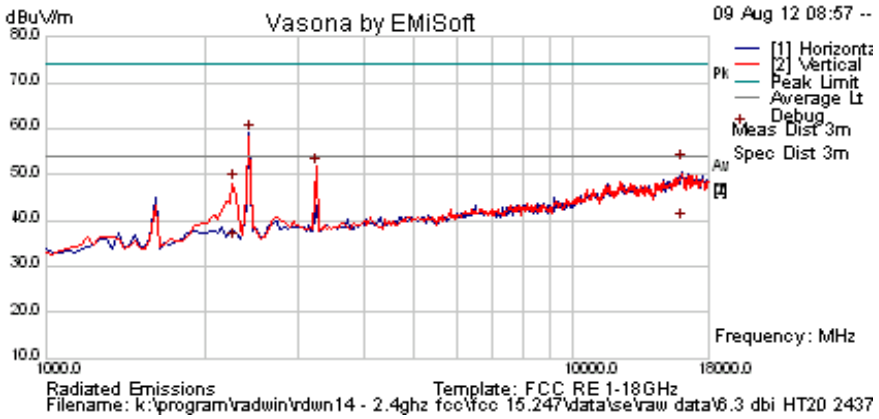
2x2 802.11n HT-20 2437 MHz

Test Freq.	2437 MHz	**Engineer**	JMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	19	**Press. (mBars)**	1007
Antenna	6.3 dBi Ant x2	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



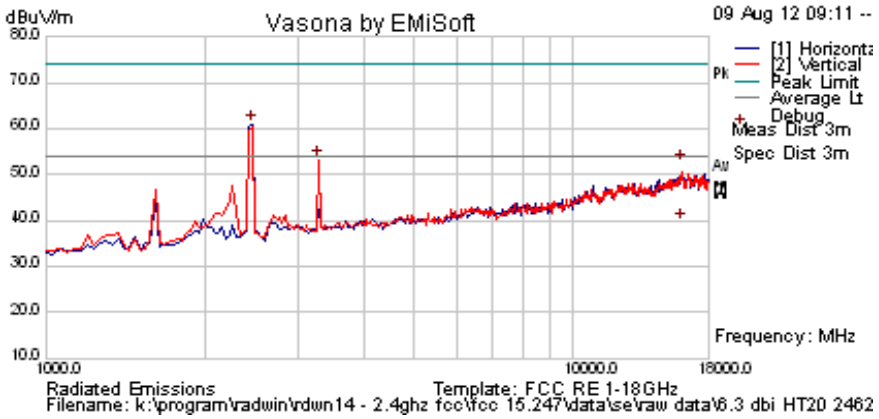
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	67.7	3.0	-11.6	59.1	Peak [Scan]	H	150	0				FUND
3249.349	60.0	3.5	-11.9	51.7	Peak [Scan]	V	100	0			Pass	NRB
16022.681	43.3	9.0	0.2	52.6	Peak Max	H	149	187	74	-21.5	Pass	RB
2278.930	57.3	2.9	-11.9	48.3	Peak Max	V	144	309	74	-25.7	Pass	RB
16022.681	30.2	9.0	0.2	39.5	Average Max	H	149	187	54	-14.5	Pass	RB
2278.930	44.1	2.9	-11.9	35.2	Average Max	V	144	309	54	-18.8	Pass	RB

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

2x2 802.11n HT-20 2462 MHz

Test Freq.	2462 MHz	**Engineer**	JMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	19	**Press. (mBars)**	1007
Antenna	6.3 dBi Ant x2	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

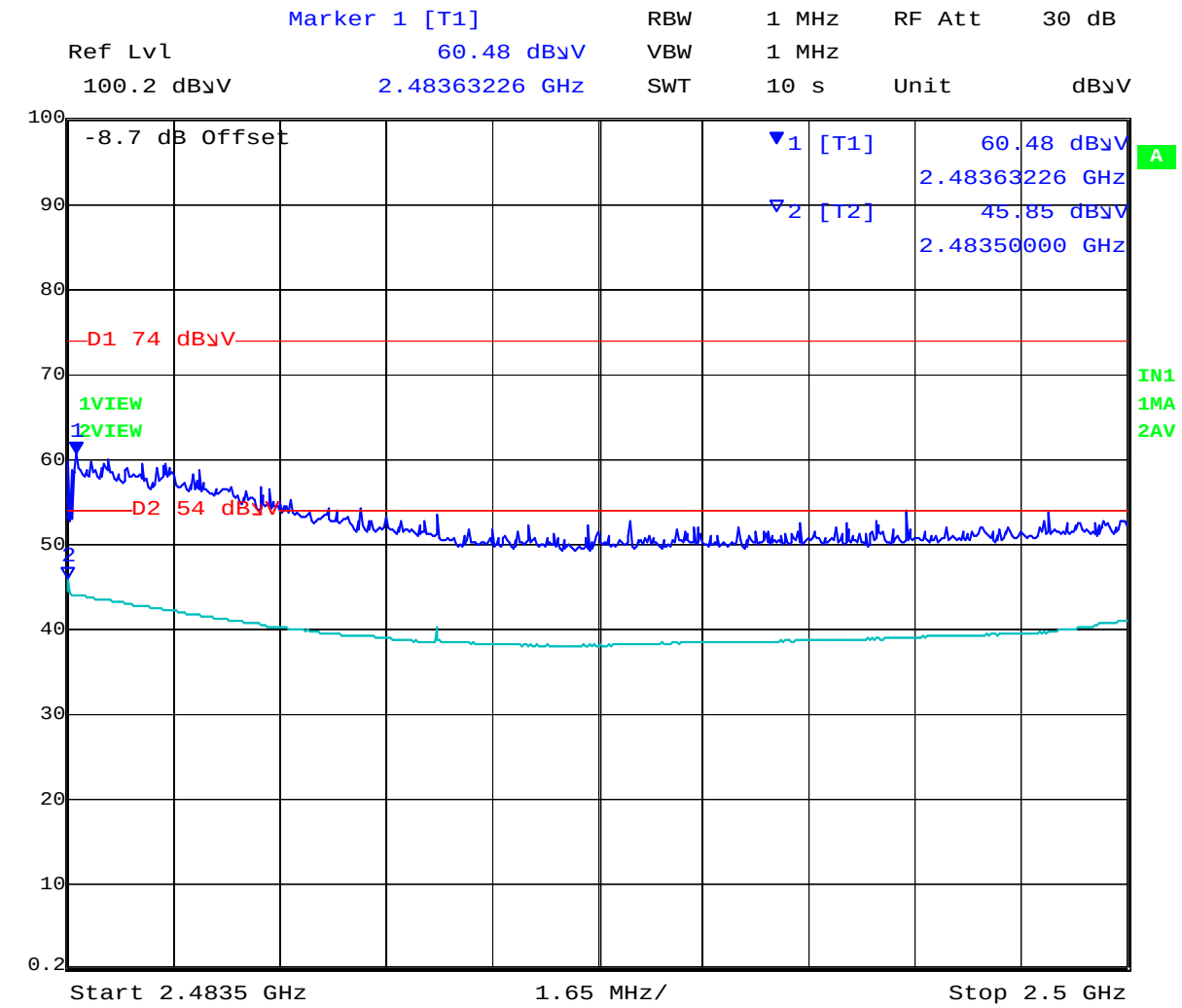


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2464.930	69.5	3.0	-11.5	61.0	Peak [Scan]	H	150	0				FUND
3282.565	61.6	3.5	-11.8	53.3	Peak [Scan]	V	100	0			Pass	NRB
15987.988	43.6	9.0	0.1	52.7	Peak Max	V	175	266	74.0	-21.3	Pass	RB
15987.988	30.6	9.0	0.1	39.7	Average Max	V	175	266	54.0	-14.3	Pass	RB

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

2x2 802.11n HT-20 2483.5 MHz Band Edge ART = 14.5



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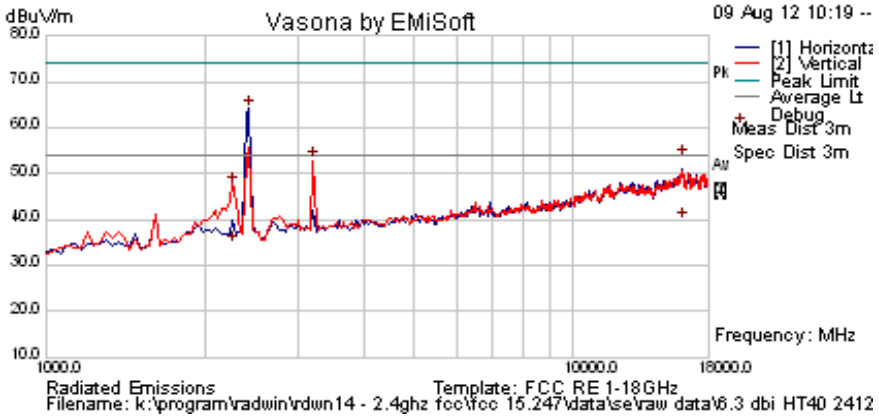
2x2 802.11n HT-40 2422 MHz

Test Freq.	2422 MHz	**Engineer**	JMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	18.5	**Press. (mBars)**	1007
Antenna	6.3 dBi x2	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

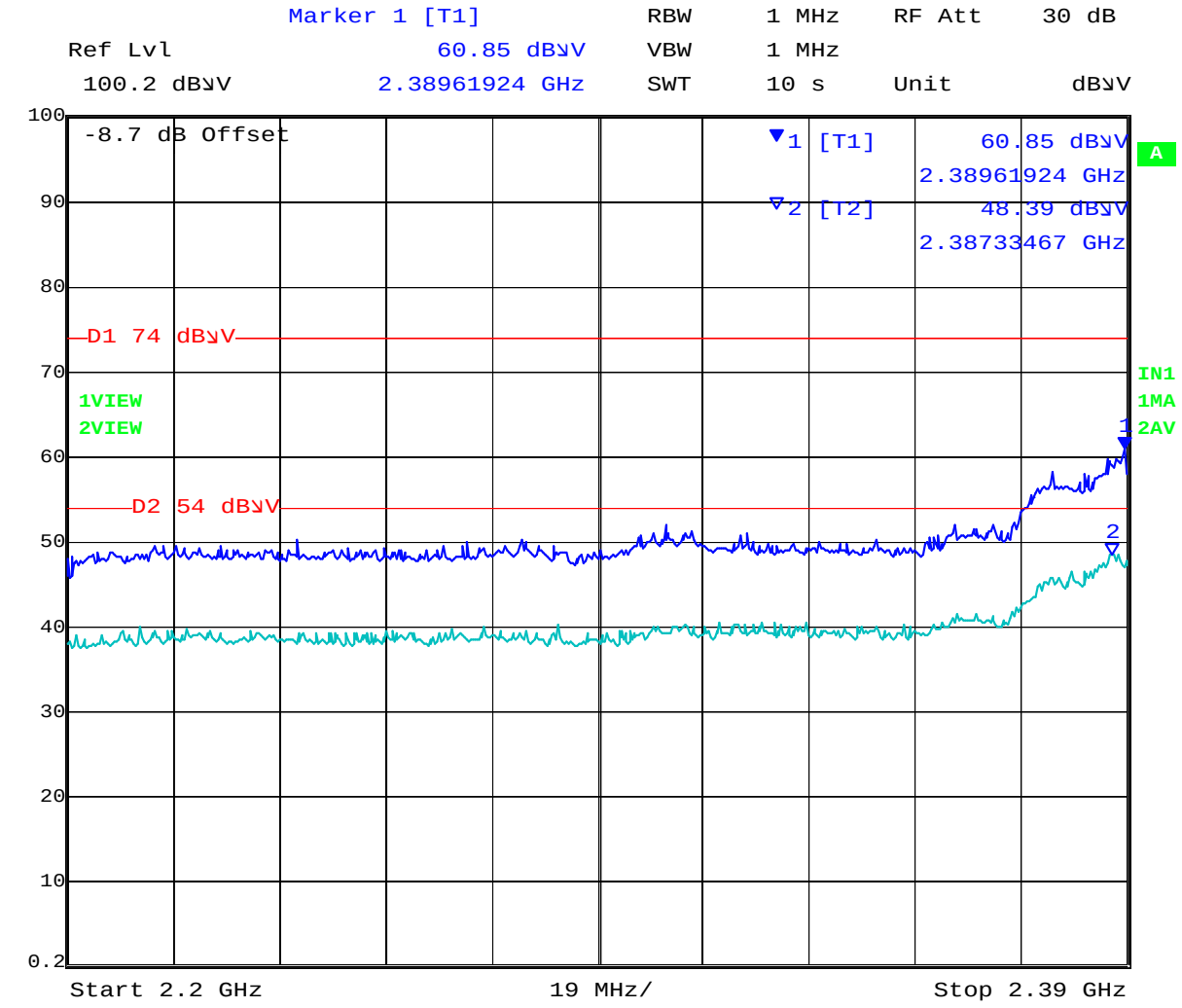


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	72.8	3.0	-11.6	64.3	Peak [Scan]	H	100	0				FUND
3229.459	61.1	3.5	-11.9	52.8	Peak [Scan]	V	100	0			Pass	NRB
16090.377	44.0	9.0	0.3	53.3	Peak Max	H	112	87	74	-20.7	Pass	RB
2260.052	56.2	2.9	-11.8	47.3	Peak Max	V	188	238	74	-26.7	Pass	RB
16090.377	30.3	9.0	0.3	39.6	Average Max	H	112	87	54	-14.4	Pass	RB
2260.052	43.2	2.9	-11.8	34.3	Average Max	V	188	238	54	-19.7	Pass	RB

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

2x2 802.11n HT-40 2390 MHz Band Edge ART = 13.5



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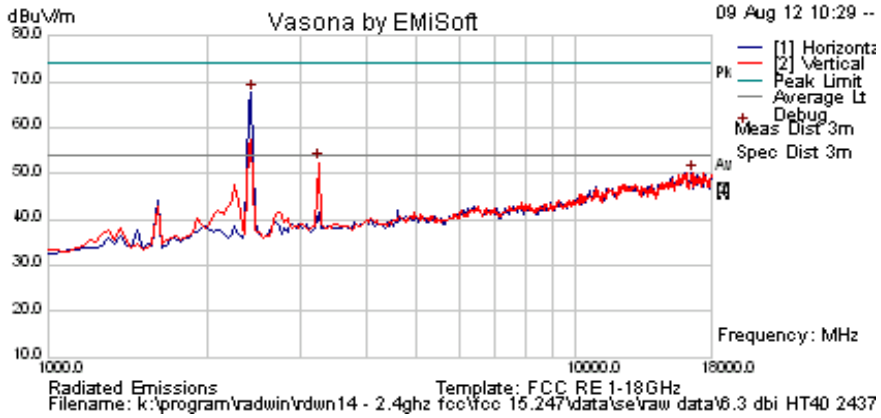
2x2 802.11n HT-40 2437 MHz

Test Freq.	2437 MHz	**Engineer**	JMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	18.5	**Press. (mBars)**	1007
Antenna	6.3 dBi x2	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



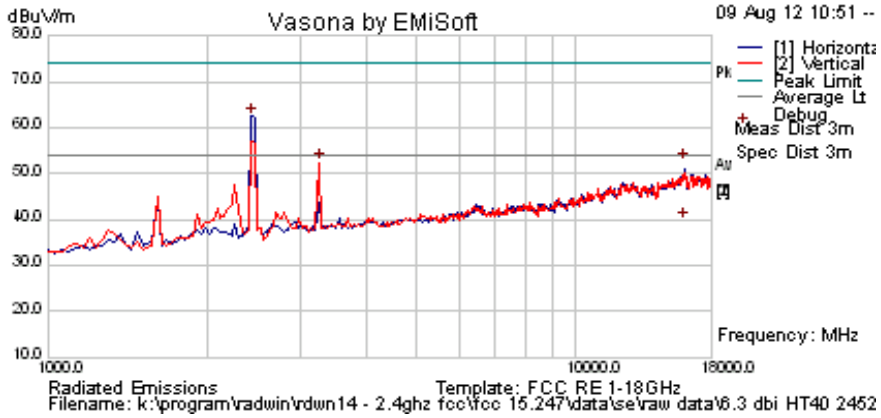
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	76.2	3.0	-11.6	67.6	Peak [Scan]	H	100	0				FUND
3249.349	60.8	3.5	-11.9	52.4	Peak [Scan]	V	100	0			Pass	NRB
16603.206	40.8	8.8	0.6	50.1	Peak [Scan]	H	100	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

2x2 802.11n HT-40 2452 MHz

Test Freq.	2452 MHz	**Engineer**	JMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	18.5	**Press. (mBars)**	1007
Antenna	6.3 dBi x2	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

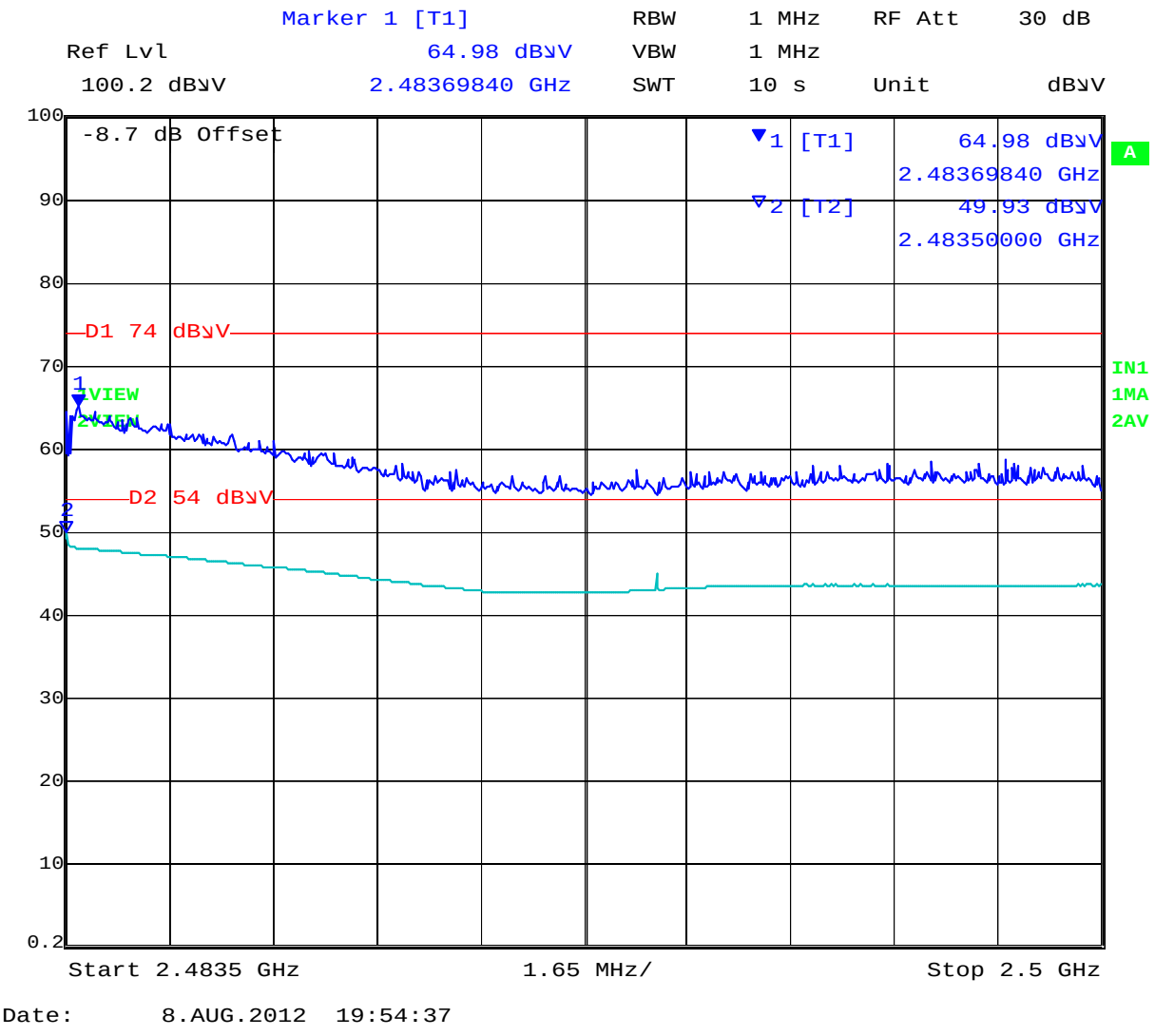


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2449.739	70.9	3.0	-11.5	62.4	Peak [Scan]	H	150	0				FUND
3269.419	60.8	3.5	-11.8	52.5	Peak [Scan]	V	100	0			Pass	NRB
16059.940	43.2	9.0	0.3	52.5	Peak Max	H	147	223	74	-21.5	Pass	RB
16059.940	30.4	9.0	0.3	39.7	Average Max	H	147	223	54	-14.4	Pass	RB

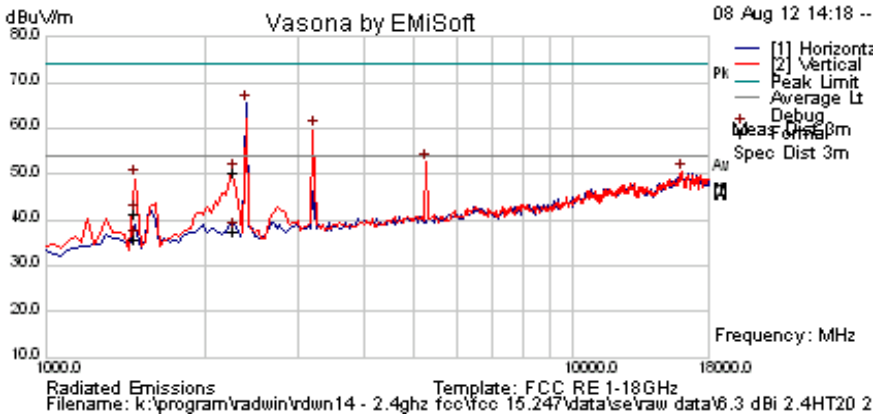
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

2x2 802.11n HT-40 2483.5 MHz Band Edge ART = 10.5



3x3 802.11n HT-20 2412 MHz

Test Freq.	2412 MHz	**Engineer**	JMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	19	**Press. (mBars)**	1007
Antenna	6.3 dBi Ant x3	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

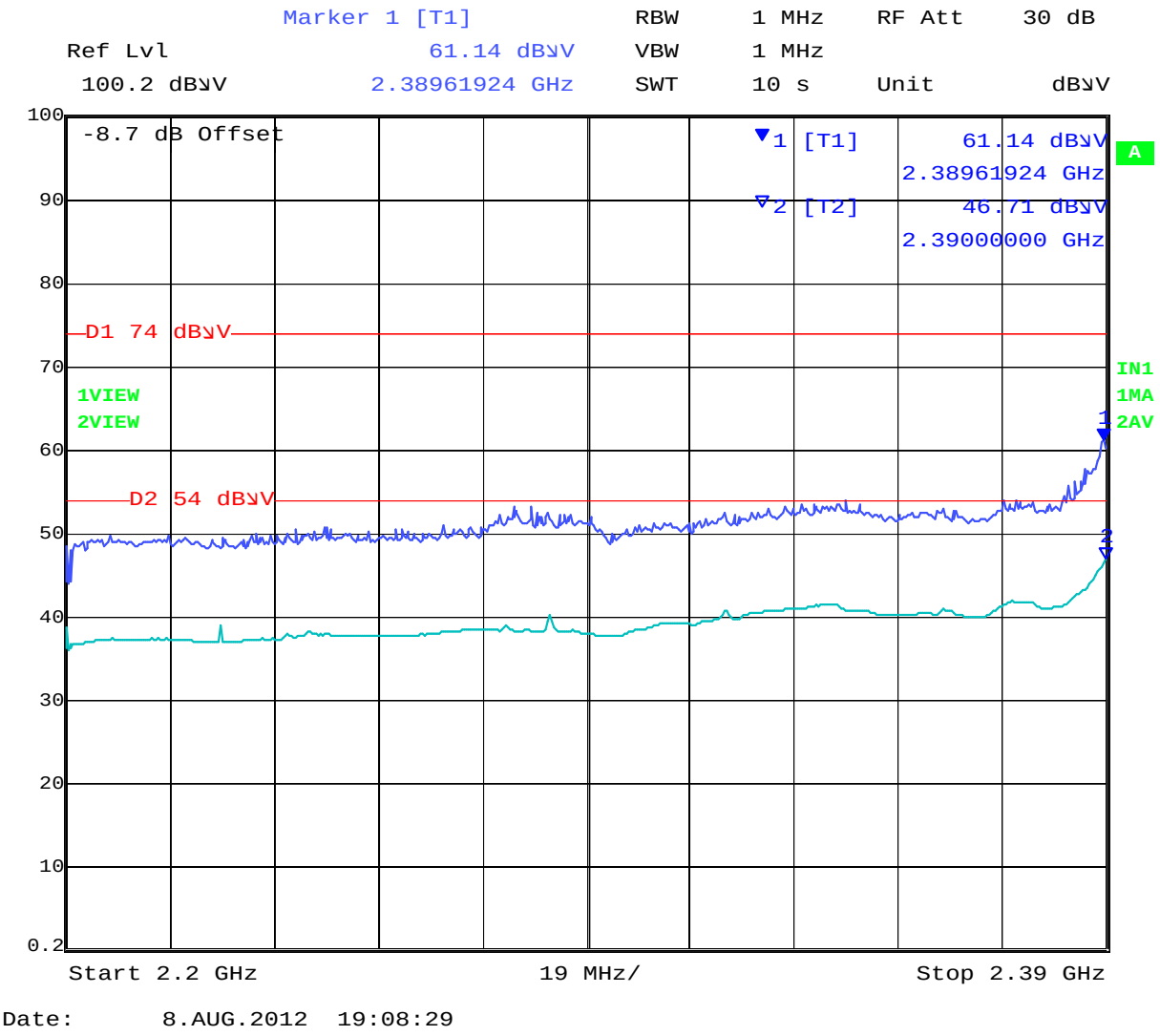


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2412.094	74.2	3.0	-11.7	65.5	Peak [Scan]	H	150	0				FUND
3216.042	68.1	3.5	-11.9	59.7	Peak [Scan]	V	100	0			Pass	NRB
5258.517	57.8	4.6	-9.7	52.7	Peak [Scan]	V	150	0			Pass	NRB
15989.980	41.3	9.0	0.1	50.4	Peak [Scan]	V	150	0	54	-3.6	Pass	Noise
2260.521	59.2	2.9	-11.8	50.3	Peak Max	V	173	137	74	-23.7	Pass	RB
1480.030	53.9	2.4	-15.0	41.3	Peak Max	V	104	51	74	-32.7	Pass	RB
2260.521	46.6	2.9	-11.8	37.7	Average Max	V	173	137	54	-16.3	Pass	RB
1480.030	48.6	2.4	-15.0	35.9	Average Max	V	104	51	54	-18.1	Pass	RB

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

3x3 802.11n HT-20 2390 MHz Band Edge ART = 19



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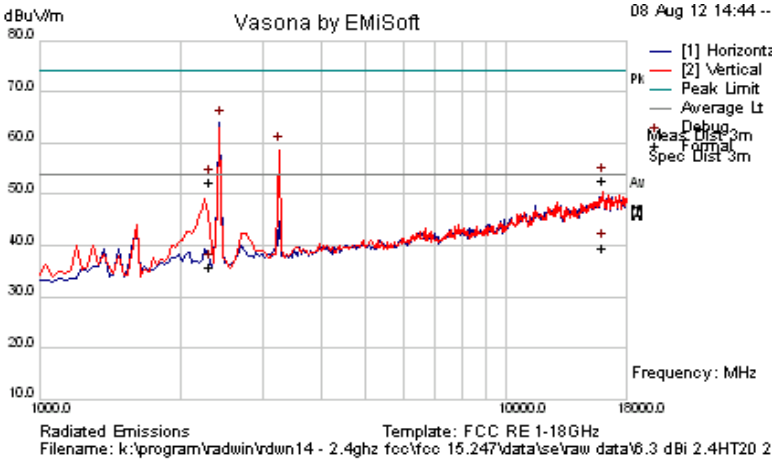
3x3 802.11n HT-20 2437 MHz

Test Freq.	2437 MHz	**Engineer**	JMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	19	**Press. (mBars)**	1007
Antenna	6.3 dBi Ant x3	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



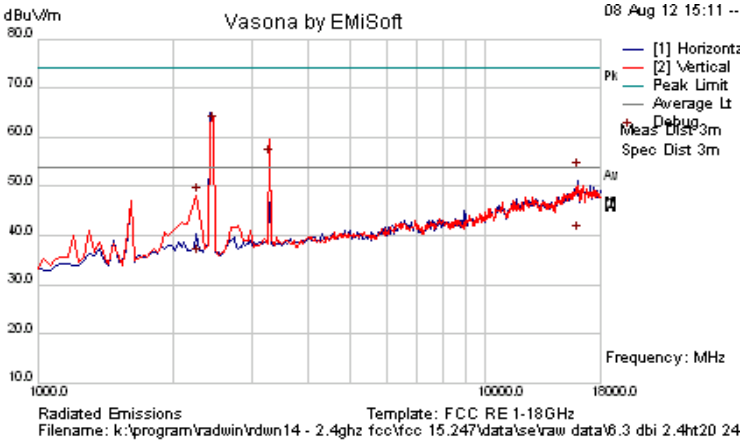
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2432.515	72.5	3.0	-11.6	63.9	Peak [Scan]	H	150	0				FUND
3248.496994	67.1	3.5	-11.9	58.7	Peak [Scan]	V	100	0			Pass	NRB
15990.922	43.6	9.0	0.1	52.8	Peak Max	V	162	44	74	-21.3	Pass	RB
2308.389	61.5	2.9	-11.9	52.5	Peak Max	V	197	155	74	-21.5	Pass	NRB
15990.922	30.6	9.0	0.1	39.7	Average Max	V	162	44	54	-14.3	Pass	RB
2308.389	44.8	2.9	-11.9	35.8	Average Max	V	197	155	54	-18.2	Pass	NRB

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

3x3 802.11n HT-20 2462 MHz

Test Freq.	2462 MHz	**Engineer**	JMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	19	**Press. (mBars)**	1007
Antenna	6.3 dBi Ant x3	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

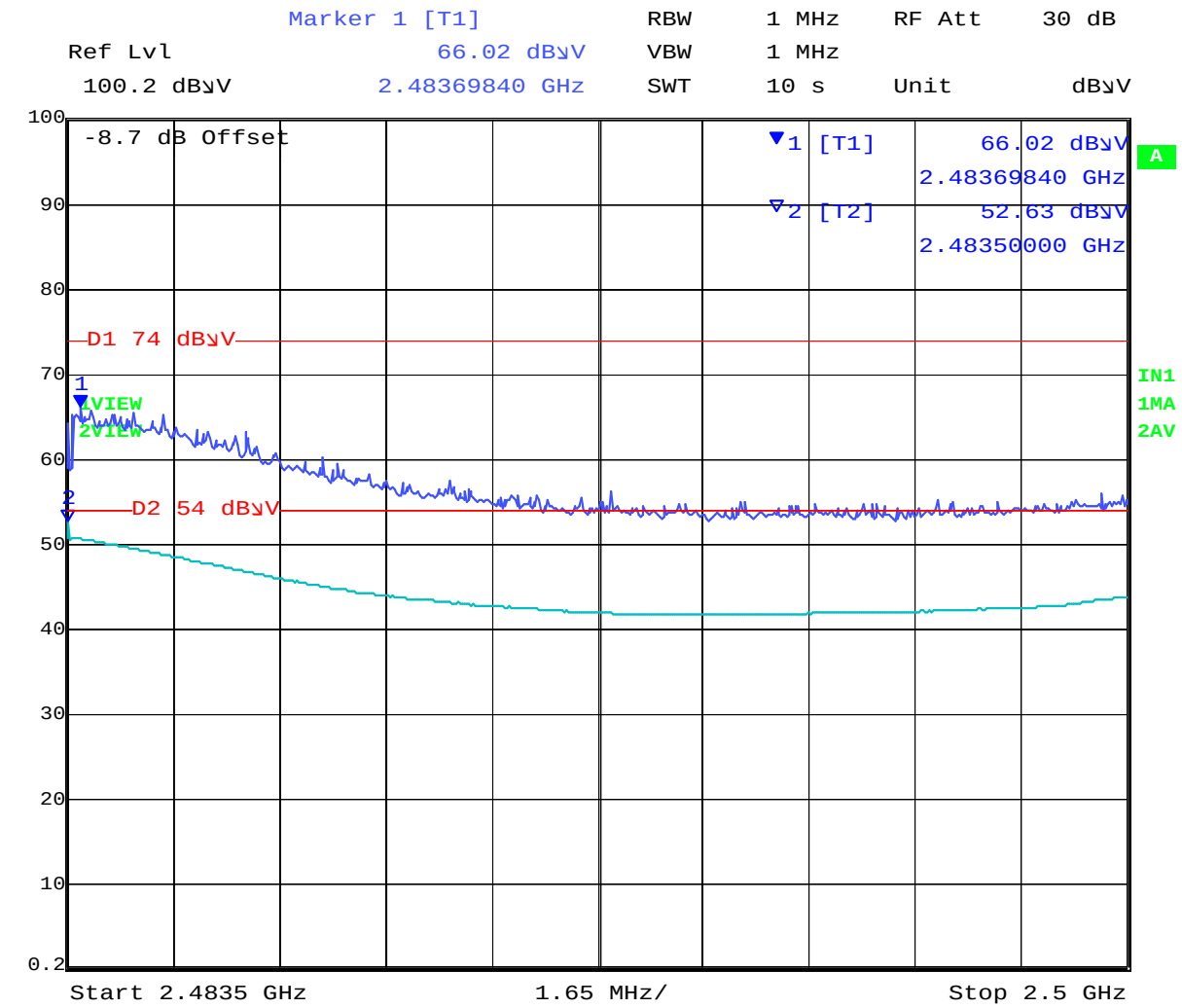


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2467.588	70.4	3.0	-11.5	61.9	Peak [Scan]	V	143	312				FUND
3282.821	63.4	3.5	-11.8	55.1	Peak [Scan]	V	143	312			Pass	NRB
16056.821	43.2	9.0	0.3	52.5	Peak Max	H	185	203	74.0	-21.5	Pass	RB
2261.847653	56.2	2.9	-11.8	47.3	Peak Max	V	143	312	74.0	-26.7	Pass	RB
16056.821	30.2	9.0	0.3	39.5	Average Max	H	185	203	54	-14.5	Pass	RB
2261.848	43.7	2.9	-11.8	34.7	Average Max	V	143	312	54	-19.3	Pass	RB

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

3x3 802.11n HT-20 2483.5 MHz Band Edge ART = 19



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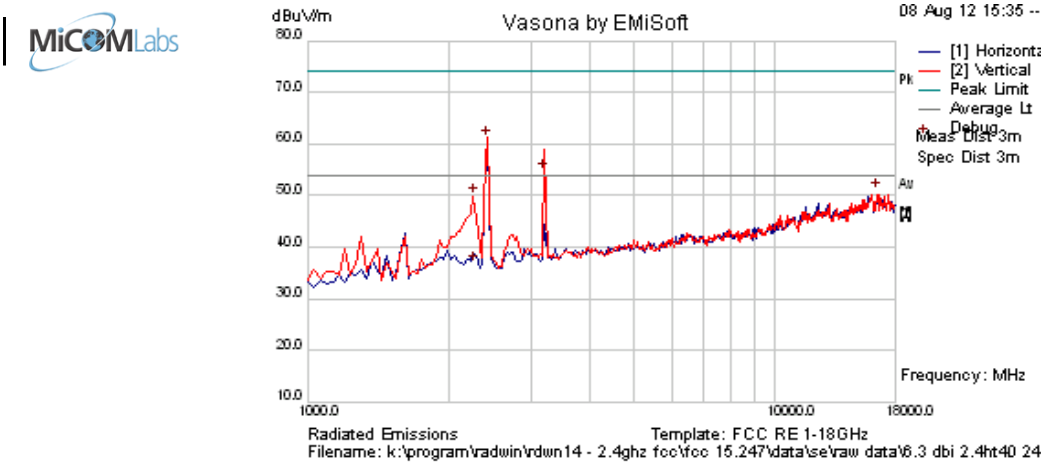
3x3 802.11n HT-40 2422 MHz

Test Freq.	2422 MHz	**Engineer**	JMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	18.5	**Press. (mBars)**	1007
Antenna	6.3 dBi x3	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

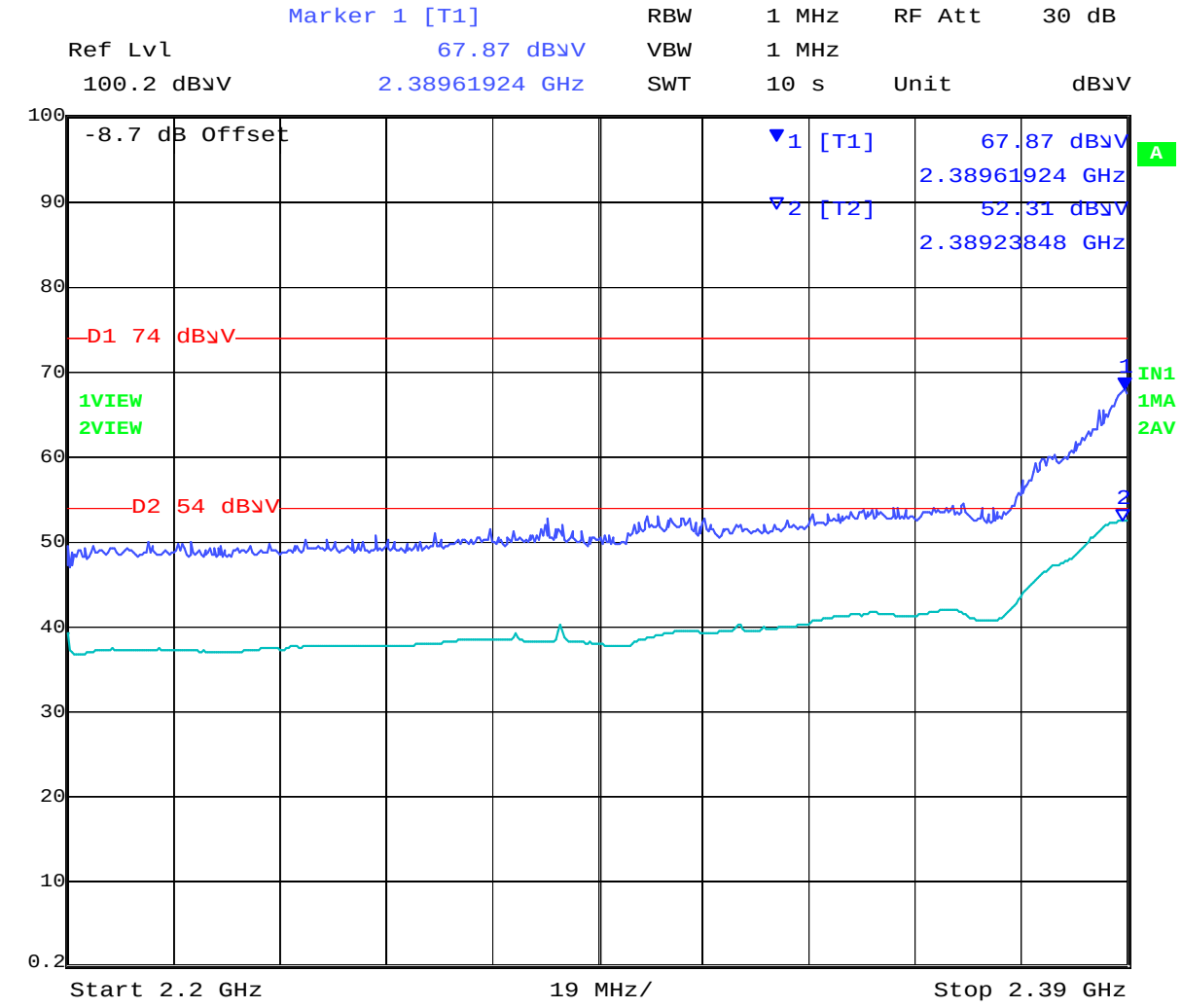


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2425.163	68.7	3.0	-11.6	60.1	Peak [Scan]	V	178	92				FUND
3205.345	61.9	3.5	-11.9	53.6	Peak [Scan]	V	178	92			Pass	NRB
16481.119	40.8	8.8	0.3	49.9	Peak [Scan]	V	178	92	54	-4.1	Pass	NRB
2262.757	44.8	2.9	-11.8	35.9	Average Max	V	178	92	54	-18.1	Pass	RB
2262.757	58.0	2.9	-11.8	49.1	Peak Max	V	178	92	74	-24.9	Pass	RB

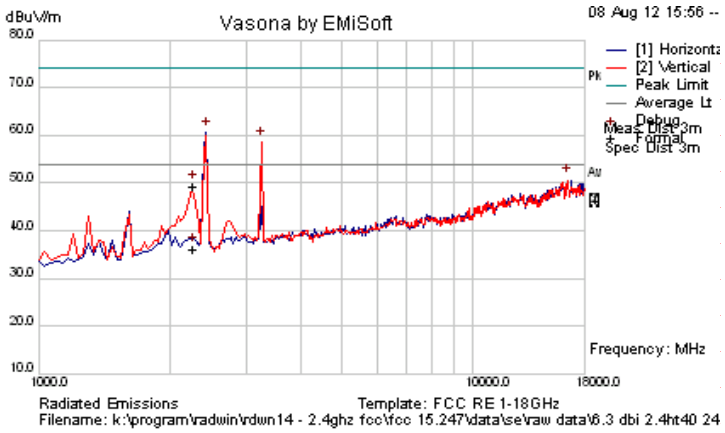
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

3x3 802.11n HT-40 2390 MHz Band Edge ART = 18.5



3x3 802.11n HT-40 2437 MHz

Test Freq.	2437 MHz	**Engineer**	JMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	18.5	**Press. (mBars)**	1007
Antenna	6.3 dBi x3	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



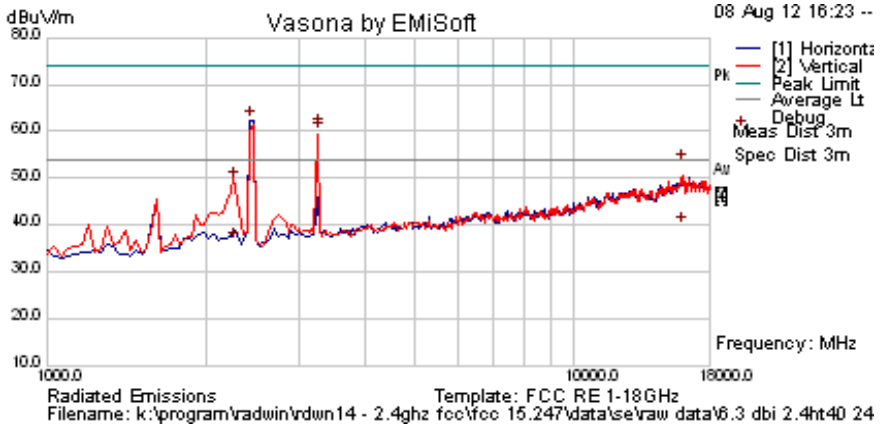
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.178	69.2	3.0	-11.6	60.6	Peak [Scan]	H	150	0				FUND
3249.309	66.8	3.5	-11.9	58.4	Peak [Scan]	V	100	0			Pass	NRB
16501.002	41.4	8.8	0.3	50.6	Peak [Scan]	V	200	0	54	-3.5	Pass	NRB
2264.609	58.3	2.9	-11.8	49.3	Peak Max	V	202	133	74	-24.7	Pass	RB
2264.609	45.1	2.9	-11.8	36.2	Average Max	V	202	133	54	-17.8	Pass	RB

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

3x3 802.11n HT-40 2452 MHz

Test Freq.	2452 MHz	**Engineer**	JMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	27
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	38
Power Setting	18.5	**Press. (mBars)**	1007
Antenna	6.3 dBi x3	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

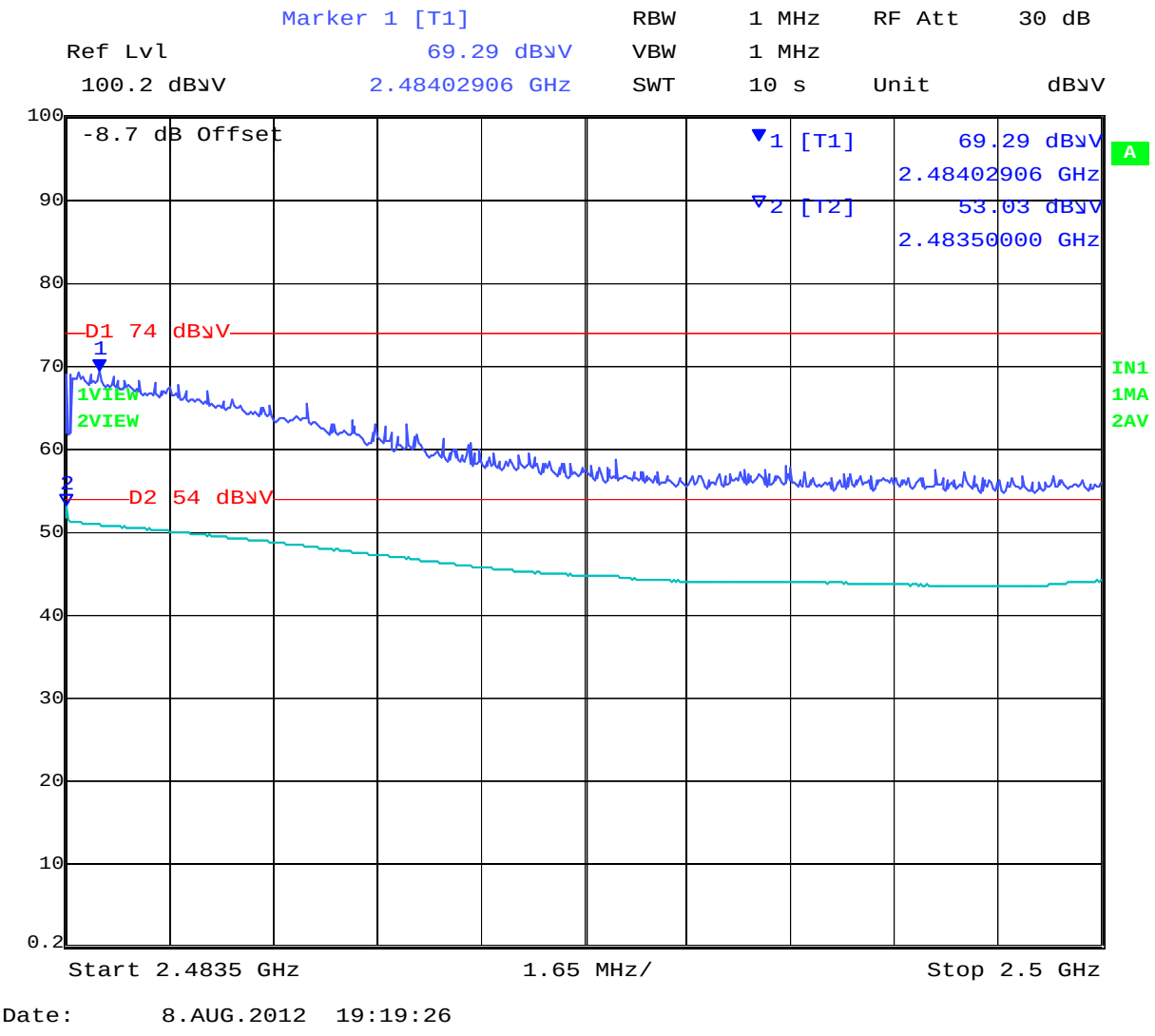


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2448.356	70.9	3.0	-11.5	62.4	Peak [Scan]	H	100	0				FUND
3269.331024	69.0	3.5	-11.8	60.7	Peak Max	V	98	281			Pass	NRB
15989.142	43.9	9.0	0.1	53.0	Peak Max	V	114	154	74	-21.0	Pass	RB
2269.928	58.5	2.9	-11.8	49.6	Peak Max	V	202	142	74	-24.4	Pass	RB
15989.142	30.6	9.0	0.1	39.8	Average Max	V	114	154	54	-14.3	Pass	RB
2269.928	45.4	2.9	-11.8	36.4	Average Max	V	202	142	54	-17.6	Pass	RB

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

3x3 802.11n HT-40 2483.5 MHz Band Edge ART = 18.5



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Specification Limits

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

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

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

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

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

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

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

§15.209 (a) Limit Matrix

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 Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

5.2.4. Receiver Radiated Spurious Emissions (above 1 GHz)

Industry Canada RSS-Gen §4.10, §6

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

All Sectors of the EUT were tested simultaneously.

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

where: 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

For 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:

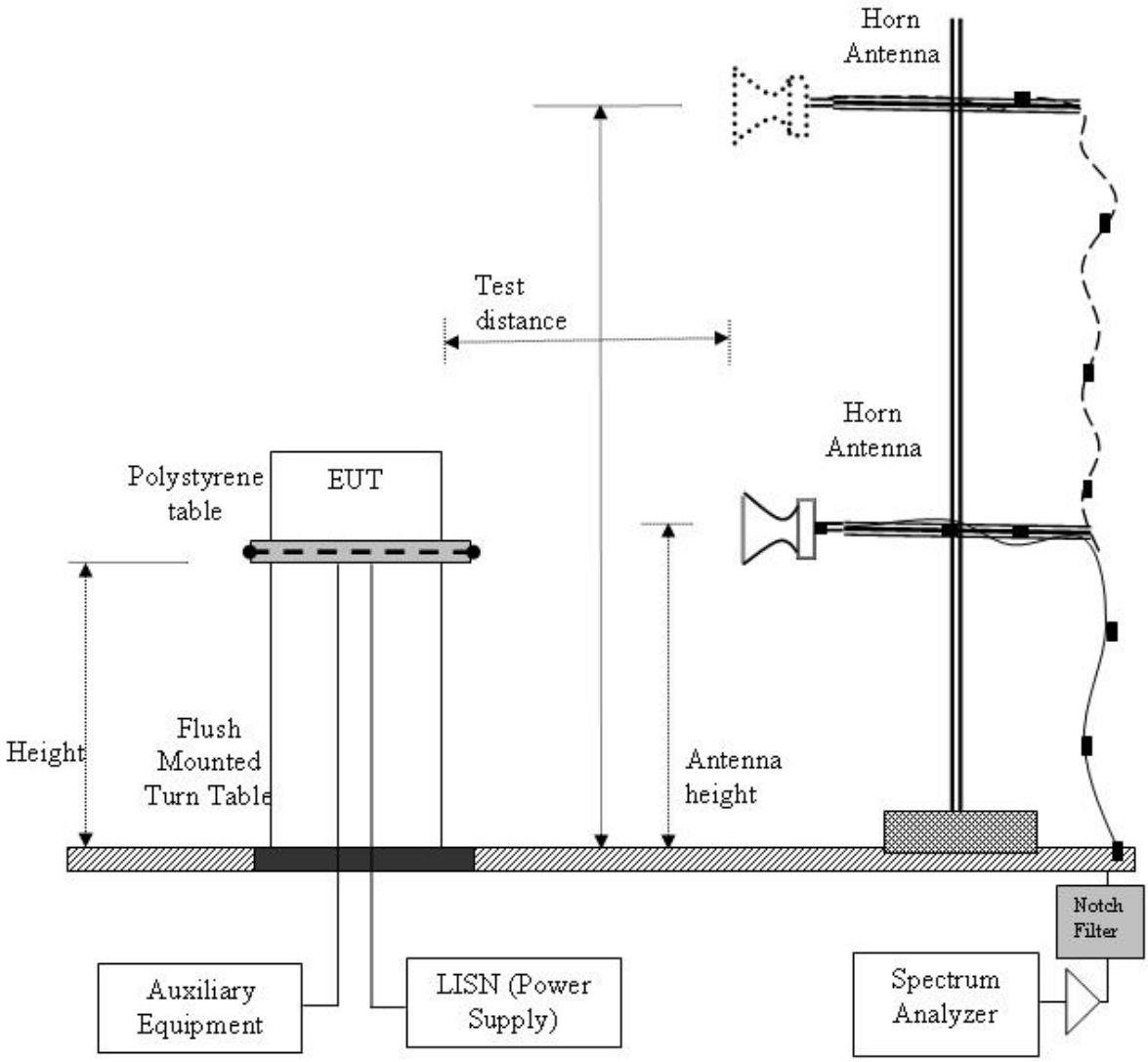
FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

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

Test Measurement Set Up > 1 GHz



Transmitter Spurious Emission measurement test configuration

Specification

Radiated Receiver Spurious Emissions

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

For emissions below 1000 MHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization as required, with an equal or greater measurement bandwidth relative to the applicable CISPR quasi-peak bandwidth.

Above 1000 MHz, measurements shall be performed using an average detector with a minimum resolution bandwidth of 1 MHz.

RSS-Gen §6 Receiver Spurious Radiated Limits
Spurious emissions from receivers shall not exceed the radiated limits shown in the table below:

RSS-Gen Spurious Emissions Limits

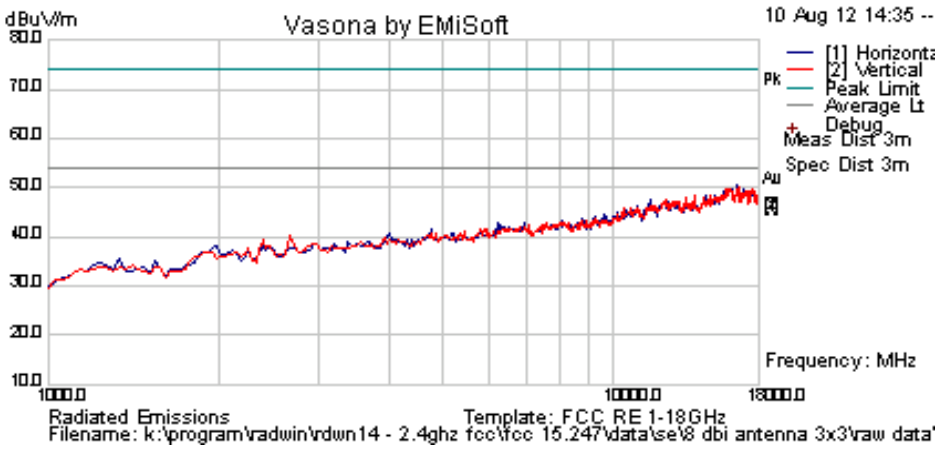
Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Traceability:

Test Equipment Used
0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

Receiver Radiated Spurious Emissions above 1 GHz

Test Freq.	N/A	**Engineer**	JMH
Variant	Receive in Test Utility	**Temp (ºC)**	25
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	Not Applicable in Receive Mode	**Press. (mBars)**	1006
Antenna	N/A	**Duty Cycle (%)**	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments

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

5.2.5. Digital Emissions (0.03-1 GHz)

FCC, Part 15 Subpart C §15.205/ §15.209
Industry Canada RSS-210 §2.2

Test Procedure

Testing 30M-1 GHz was performed in a 3-meter anechoic chamber using a CISPR compliant receiver. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. To further maximize emissions the receive antenna was varied between 1 and 4 meters. The emissions are recorded with receiver in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed. The anechoic chamber test set-up is identified in Section 6 Test Set-Up Photographs.

The EUT had two methods of powering on ac/dc converter and Power over Ethernet (POE). Both modes were tested for emissions below 1GHz.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

$$FS = R + AF + CORR$$

where:

FS = Field Strength
R = Measured Receiver Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain

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

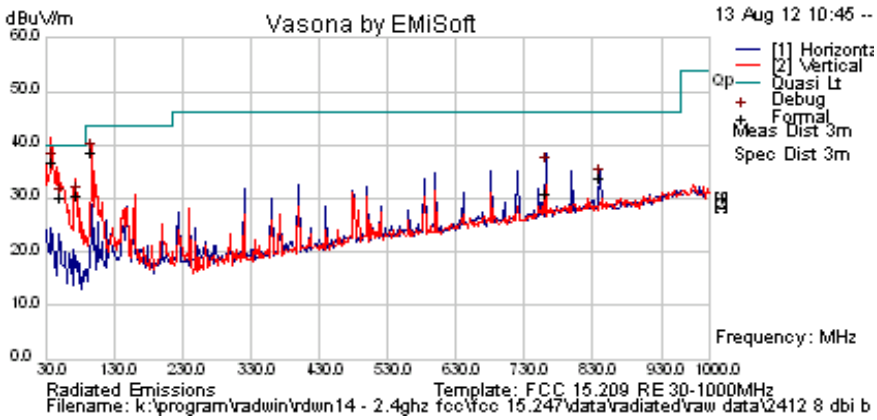
FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3dBμV/m

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

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

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

Test Freq.	2437 MHz	**Engineer**	JMH
Variant	Digital Emissions	**Temp (ºC)**	27
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	40
Power Setting	18	**Press. (mBars)**	1004
Antenna			
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
39.579	50.4	3.6	-17.2	36.8	Quasi Max	V	98	271	40	-3.2	Pass	
98.117	56.3	4.1	-21.8	38.6	Quasi Max	V	103	177	43.5	-4.9	Pass	
50.822	50.0	3.7	-23.4	30.3	Quasi Max	V	98	53	40	-9.7	Pass	
74.580	49.8	3.9	-23.1	30.6	Peak Max	V	98	0	40	-9.4	Pass	
840.014	35.6	6.9	-8.5	34.0	Peak Max	H	98	0	46	-12.0	Pass	
759.993	38.6	6.7	-9.3	36.0	Peak Max	H	98	0	46	-10.0	Pass	

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

Specification

Limits

§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.

§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.

§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.

§15.209 (a) and **RSS-Gen §2.2** Limit Matrix

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 Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

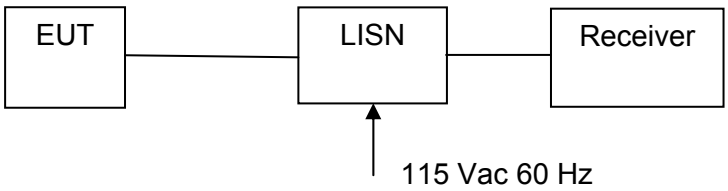
5.2.6. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

FCC, Part 15 Subpart C §15.207
Industry Canada RSS-Gen §7.2.2

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.

Test Measurement Set up

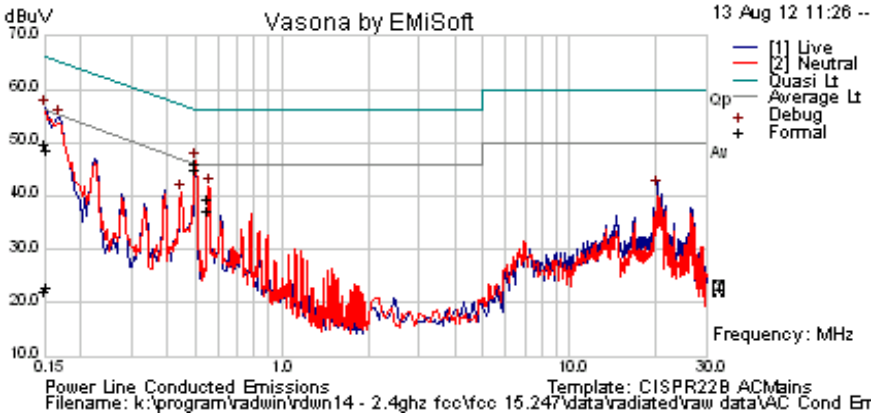


Measurement set up for AC Wireline Conducted Emissions Test

Measurement Results for AC Wireline Conducted Emissions (150 kHz – 30 MHz)

Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

Test Freq.	N/A	**Engineer**	JMH
Variant	AC Line Emissions	**Temp (ºC)**	27
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	40
Power Setting	Max	**Press. (mBars)**	1004
Antenna	N/A		
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.150	39.9	9.9	0.1	49.9	Quasi Peak	Live	66	-16.1	Pass	
0.500	36.2	9.9	0.1	46.2	Quasi Peak	Neutral	56	-9.8	Pass	
0.152	38.7	9.9	0.1	48.7	Quasi Peak	Neutral	65.9	-17.2	Pass	
0.557	29.3	9.9	0.1	39.3	Quasi Peak	Neutral	56	-16.7	Pass	
0.150	12.2	9.9	0.1	22.2	Average	Live	56	-33.8	Pass	
0.500	34.8	9.9	0.1	44.8	Average	Neutral	46	-1.2	Pass	
0.152	12.9	9.9	0.1	22.8	Average	Neutral	55.9	-33.1	Pass	
0.557	27.1	9.9	0.1	37.1	Average	Neutral	46	-8.9	Pass	

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

Specification

Limit

§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 §7.2.2
The radio frequency voltage that is conducted back into 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 tighter limit applies at the frequency range boundaries.

§15.207 (a) and **RSS-Gen §7.2.2** Limit Matrix
The lower limit applies at the boundary between frequency ranges

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

Laboratory Measurement Uncertainty for Conducted Emissions

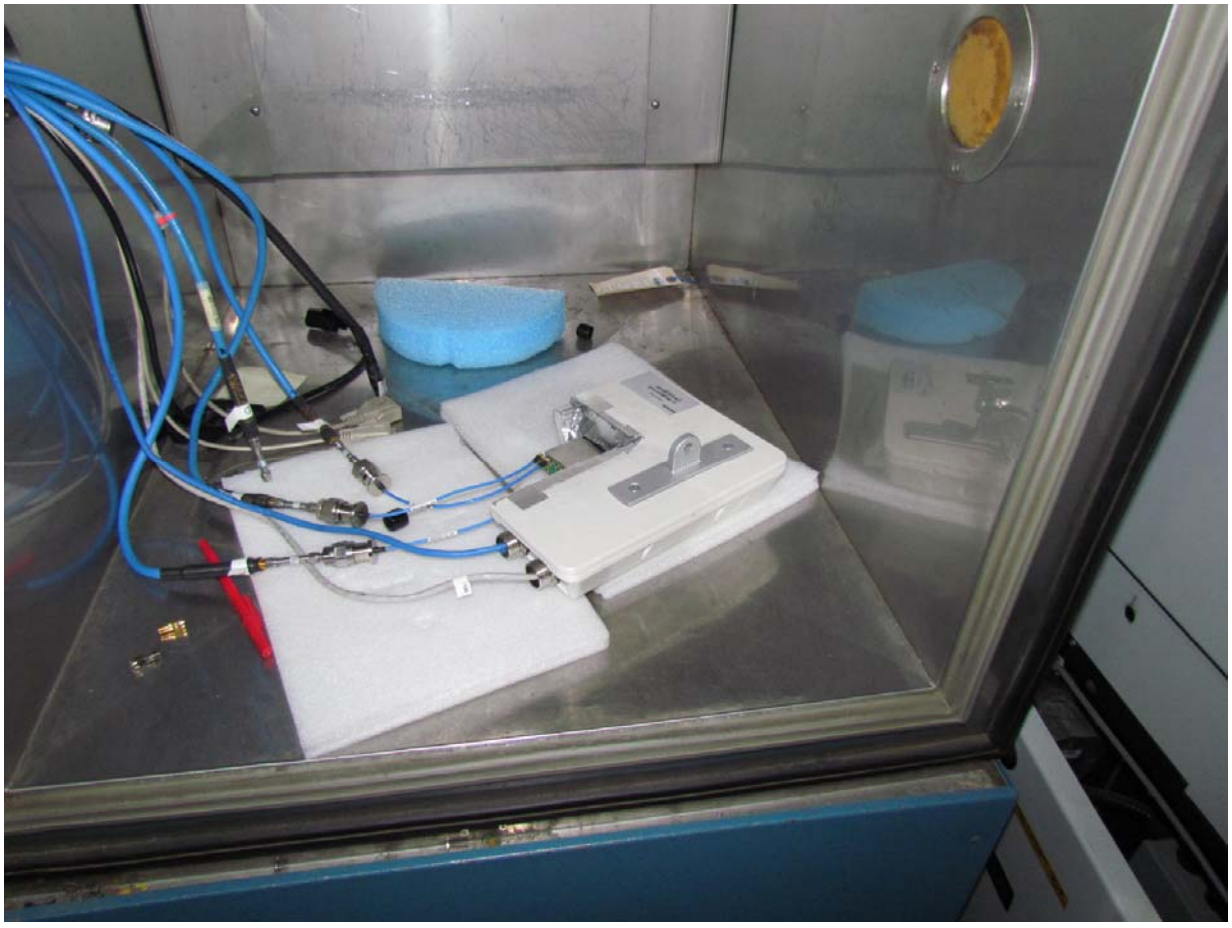
Measurement uncertainty	±2.64 dB

Traceability

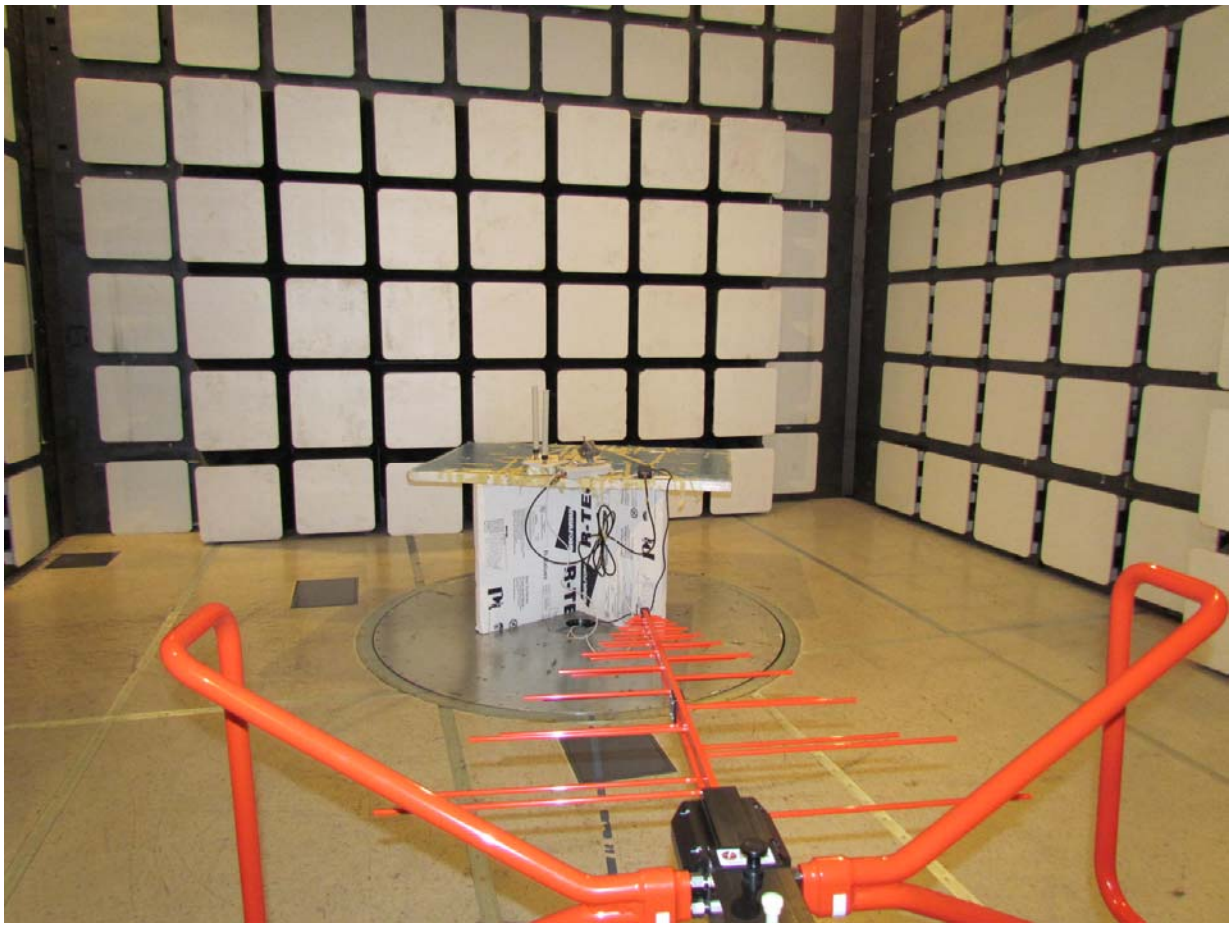
Method	Test Equipment Used
Measurements were made per work instruction WI-EMC-01 'Measurement of Conducted Emissions'	0158, 0184, 0287, 0190, 0293, 0307

6. PHOTOGRAPHS

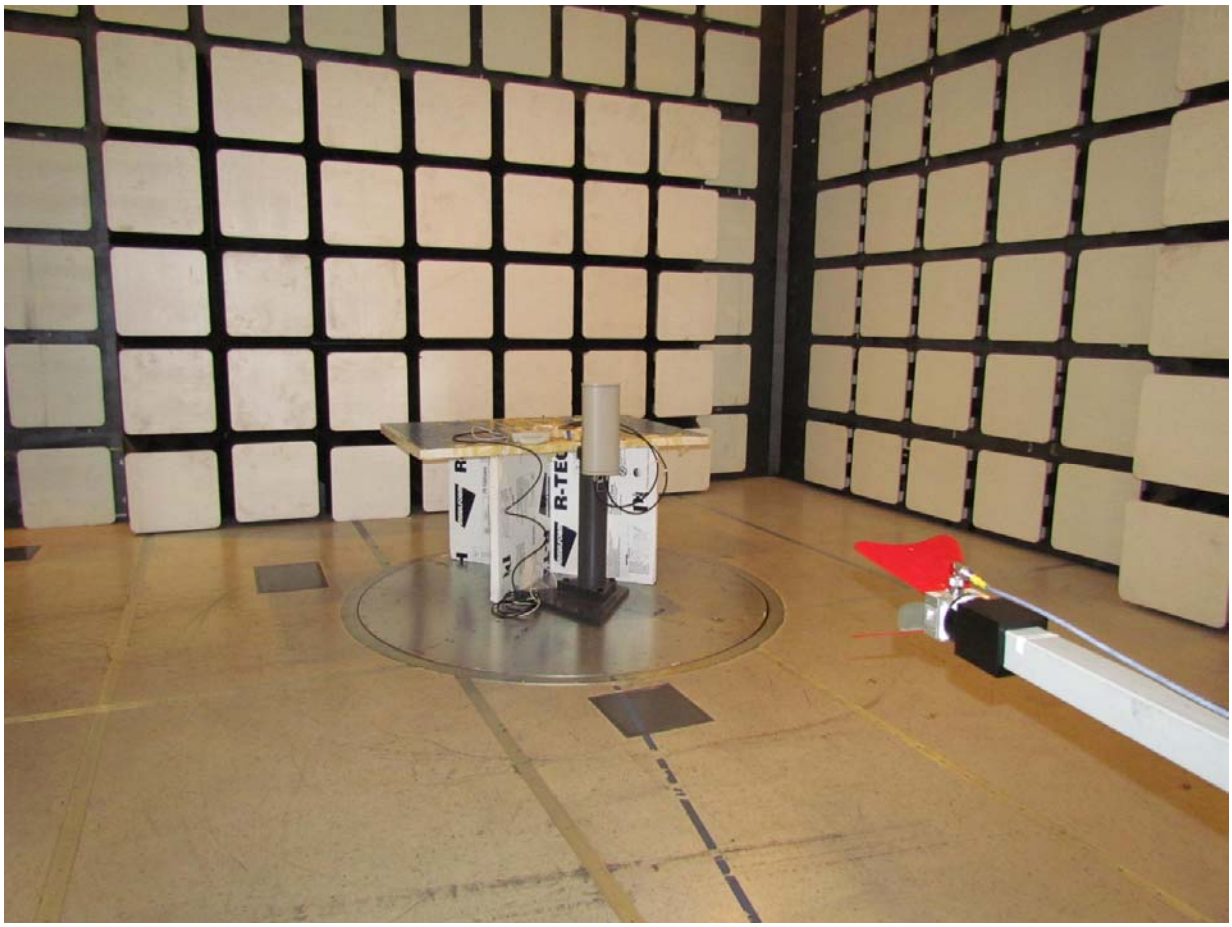
6.1. Conducted Test Setup



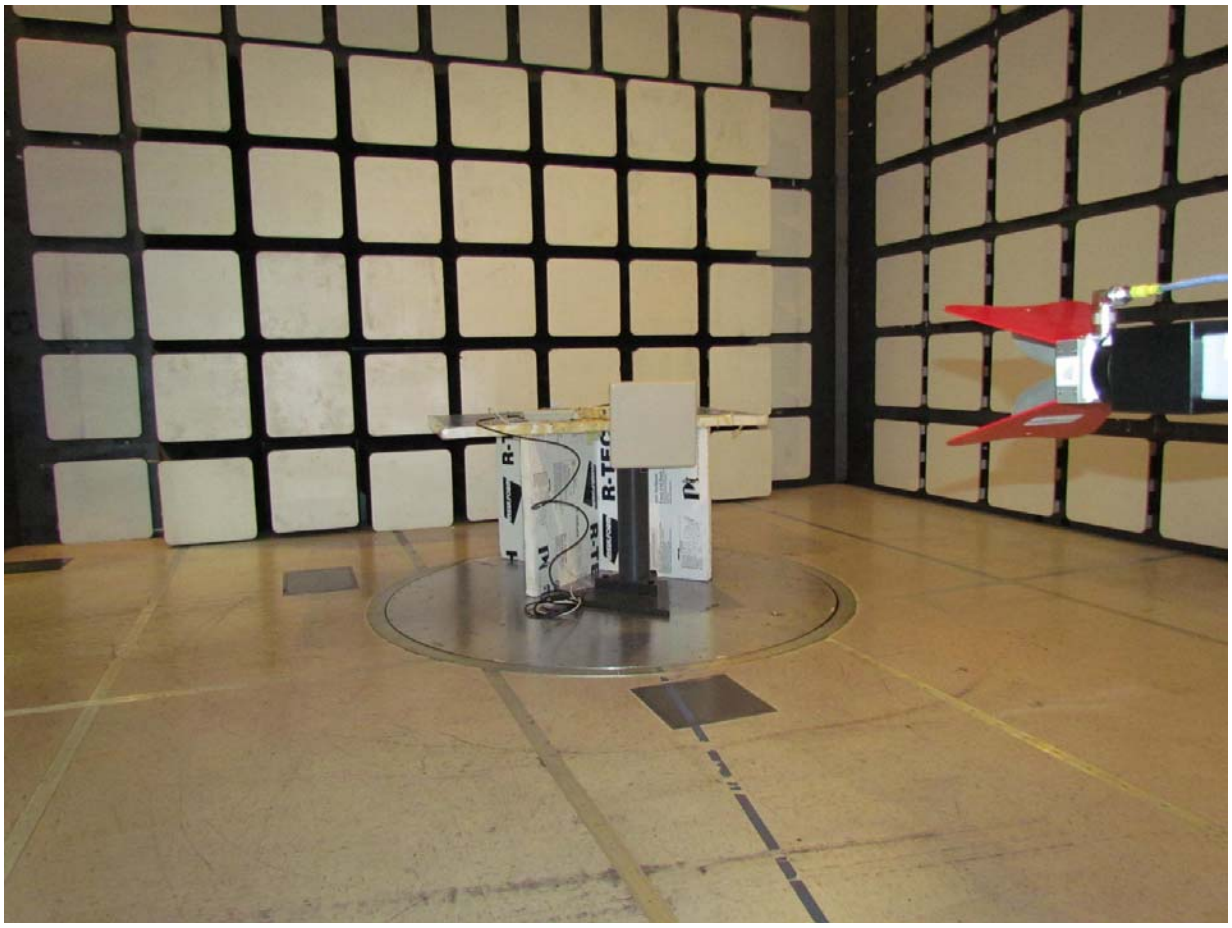
6.2. Test Setup - Digital Emissions below 1 GHz



6.3. Radiated Emissions Test Setup >1 GHz



6.4. Radiated Emissions Test Setup >1 GHz



7. TEST EQUIPMENT

Asset #	Instrument	Manufacturer	Part #	Serial #	Calibration Due Date
0070	Power Meter	Hewlett Packard	437B	3125U11552	28th Nov 13
0117	Power Sensor	Hewlett Packard	8487D	3318A00371	15th Nov 13
0223	Power Meter	Hewlett Packard	EPM-442A	US37480256	15th Nov 13
0374	Power Sensor	Hewlett Packard	8485A	3318A19694	29th Nov 13
0158	Barometer /Thermometer	Control Co.	4196	E2846	8th Dec 13
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007	2nd Dec 13
0287	EMI Receiver	Rhode & Schwartz	ESIB40	100201	16th Nov 13
0338	30 - 3000 MHz Antenna	Sunol	JB3	A052907	8th Nov 13
0335	1-18 GHz Horn Antenna	EMCO	3117	00066580	7th Nov 13
0252	SMA Cable	Megaphase	Sucoflex 104	None	N/A
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001	N/A
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002	N/A
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001	N/A
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001	N/A
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623	N/A
	EMC Test Software	EMISoft	Vasona	5.0051	N/A
	RF Conducted Test Software	National Instruments	Labview	Version 8.2	N/A
	RF Conducted Test Software	MiCOM Labs ATS		Version 1.4	N/A