

Test of AP0127450, AP0127460

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

Test Report Serial No.: RDWN14-U1 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-U1 Rev A

This report supersedes: NONE

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

Product Function: Wireless Access Point

Copy No: pdf Issue Date: 12th December 2012

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
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TEST CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory



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| | | |
|--------|---|-----|
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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>



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.

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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

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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

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DOCUMENT HISTORY

| Document History | | |
|------------------|--------------------------------|------------------|
| Revision | Date | Comments |
| Draft | | |
| Rev A | 12 th December 2012 | Initial release. |
| | | |
| | | |

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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.

Approved & Released for MiCOM Labs, Inc. by:



TEST CERTIFICATE #2381.01

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

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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 | 4 th 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 15, Subpart B | 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 |

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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.

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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-U1 Rev A |
| Date EUT received: | 7 th 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: | 802.11b/g Wireless Access Point, 2X2; 3x3 Spatial Multiplexing MIMO configuration |
| 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 802.11 –CCK, BPSK, QPSK, 16QAM, 64QAM, DSSS, OFDM |
| Declared Nominal Average Output Power: | 802.11b (2x2): 26.47 dBm, (3x3): 24.77 dBm 802.11g (2x2): 26.49 dBm, (3x3): 24.7 dBm 802.11n HT-20 (2x2): 29.73 dBm, (3x3): 29.31 dBm 802.11n HT-40 (2x2): 29.18 dBm, (3x3): 29.29 dBm |
| EUT Modes of Operation: | Legacy 802.11 b/g, 802.11n HT-20, HT-40 |
| 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 +60°C |
| ITU Emission Designator: | 802.11b 13M9G1D 802.11g 16M6D1D 802.11n – HT-20 17M8D1D 802.11n – HT-40 36M4D1D |
| Equipment Dimensions: | 1.9 x 2 x 0.3 inches |
| Weight: | 0.042 lb (19 g) |
| Primary function of equipment: | Wireless Access Point for transmitting and receiving data. |

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2.2. Scope of Test Program

RADWIN AP0127450, AP0127460 Wireless Access Point

The scope of the test program was to test the RADWIN AP0127450, AP0127460 802.11b/g/n Wireless Access Point, 2X2 and 3x3 Spatial Multiplexing MIMO configurations in the frequency ranges 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.

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AP0127450, AP0127460 Wireless Access Point



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AP0127450, AP0127460 Wireless Access Point Label (Rear)



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AP0127450, AP0127460 Wireless Access Point Label



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

| Equipment Type | Equipment Description (Including Brand name) | Mfr | Model No. | Serial No. |
|----------------|--|-------------|-------------------------|------------|
| EUT | 802.11b/g/n WAP | 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 |
|---|--------------|--------------|----------------------------|
| 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 x 10/100/1000 Ethernet (includes POE +48 Vdc)

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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.

| Operational Mode(s) (802.11b/g/n) | Variant | Data Rate with Highest Power | Frequencies (MHz) |
|--------------------------------------|---------|---------------------------------|-------------------------|
| b | Legacy | 1 MBit/s | 2,412 |
| g | Legacy | 6 MBit/s | 2,437 |
| n | HT-20 | 6.5 (MCS 0) | 2,462 |
| | HT-40 | 13.5 (MCS 0) | 2,422 2,437 2,452 |

Legacy – data rates for 802.11bg products

Results for the above configurations are provided in this report.

Radiated Emissions Test Strategy

Radiated emissions' testing was performed on all antennas in the configurations with the highest spectral density.

Results for the following configurations are provided in this report.

2,400 – 2483.5 MHz

| 15.247 | |
|---------------|-------------------|
| 802.11b | b SE 2412 |
| | b SE 2437 |
| | b SE 2462 |
| | BE b 2390 |
| | BE b 2483.5 |
| | |
| 802.11g | g SE 2412 |
| | g SE 2437 |
| | g SE 2462 |
| | BE g 2390 |
| | BE g 2483.5 |
| | |
| 802.11n HT-20 | n HT-20 SE 2412 |
| | n HT-20 SE 2437 |
| | n HT-20 SE 2462 |
| | BE n HT-20 2390 |
| | BE n HT-20 2483.5 |
| | |
| 802.11n HT-40 | n HT-40 SE 2422 |
| | n HT-40 SE 2437 |
| | n HT-40 SE 2452 |
| | BE n HT-40 2390 |
| | BE n HT-40 2483.5 |

KEY:-

SE – Spurious Emission
BE – Band-Edge

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2.7. Equipment Modifications

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

1. EIRP and Band-Edge Power Reduction.

Section 5.1.2 Peak Output Power identifies the total conducted power levels measured per antenna port and sums the powers when the device was set for transmitting maximum power to meet the EIRP limits per antenna identified in Section 2.4 "Antenna Details" along with any power reductions required in order to comply during radiated band-edge emission testing with the Restricted Band limit criteria. At 2.4 GHz the restricted bands are 2,310 – 2,390 MHz and 2,483.5 – 2,500 MHz.

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)

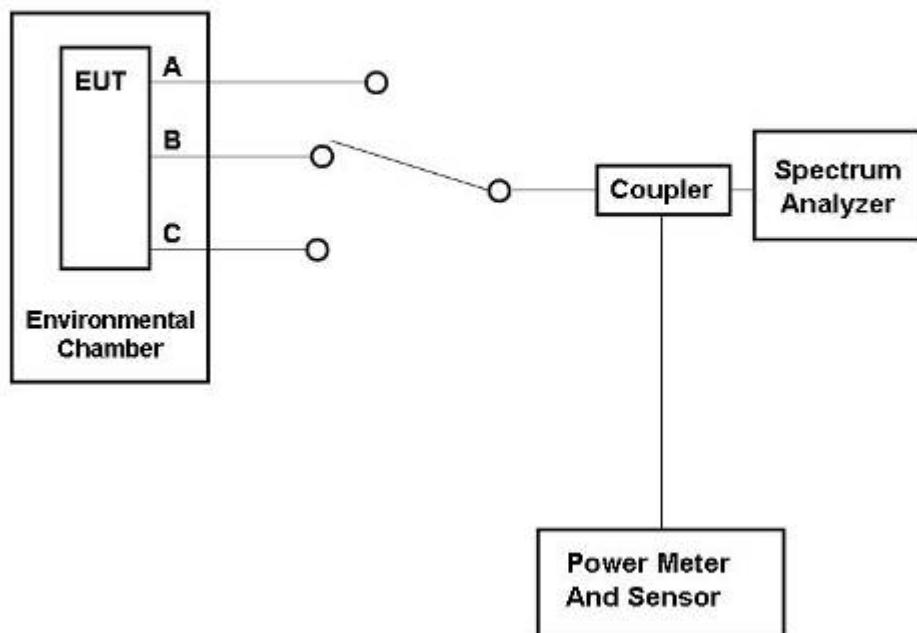
3.1. Conducted RF Emission Test Set-up

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



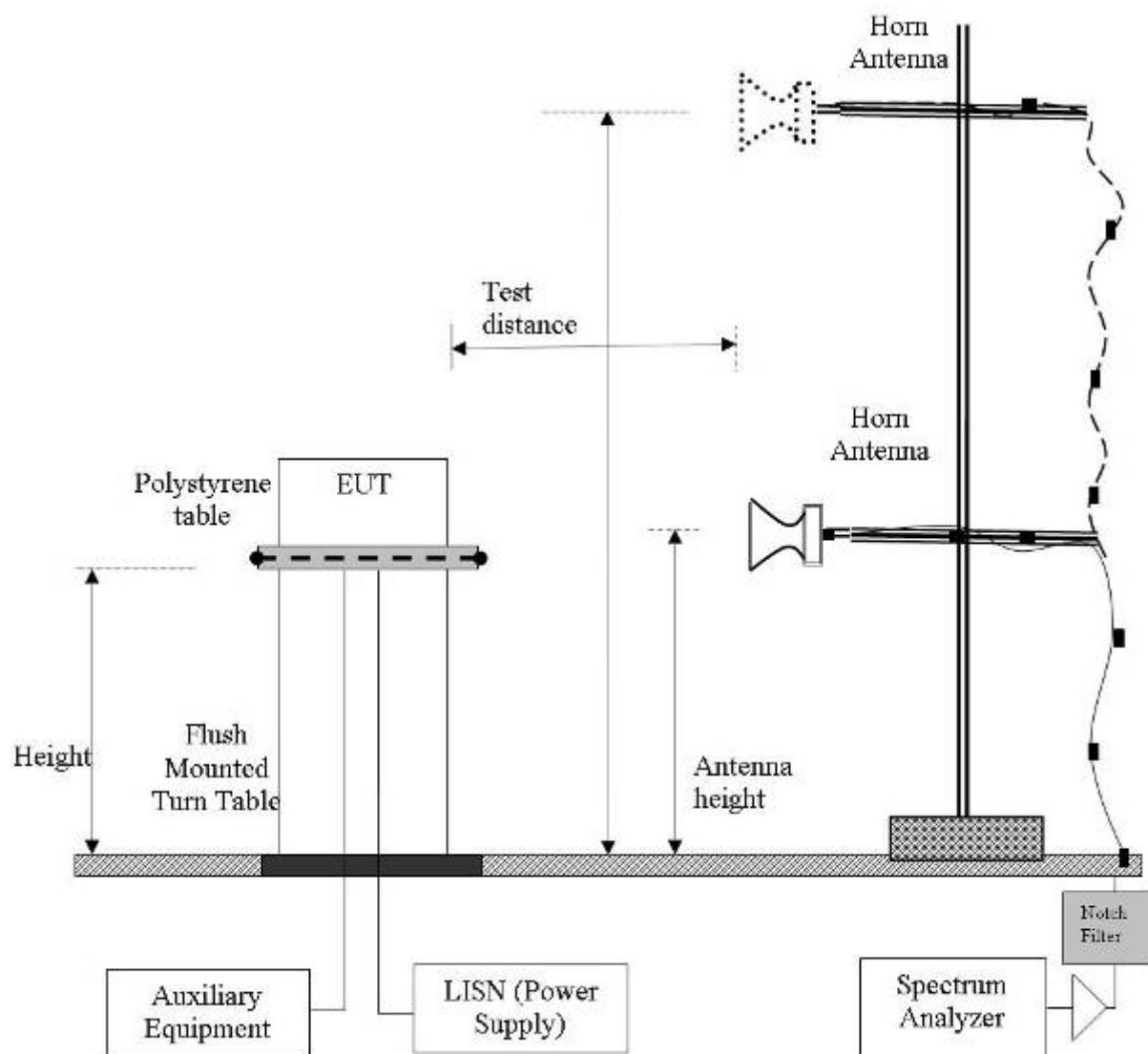
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3.2. Radiated Spurious Emission Test Set-up > 1 GHz

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



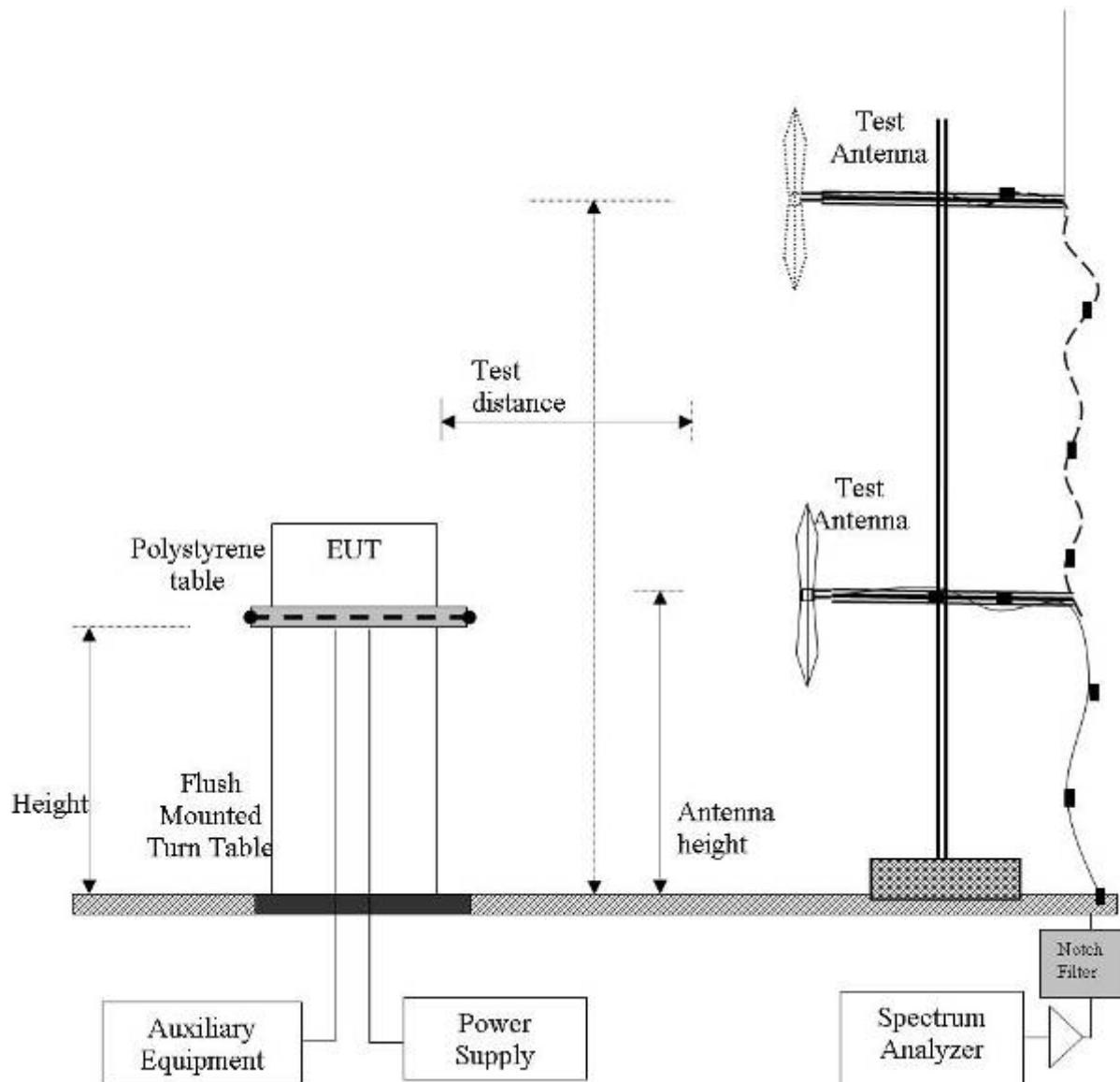
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3.3. Digital Emissions Test Set-up (0.03 – 1 GHz)

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



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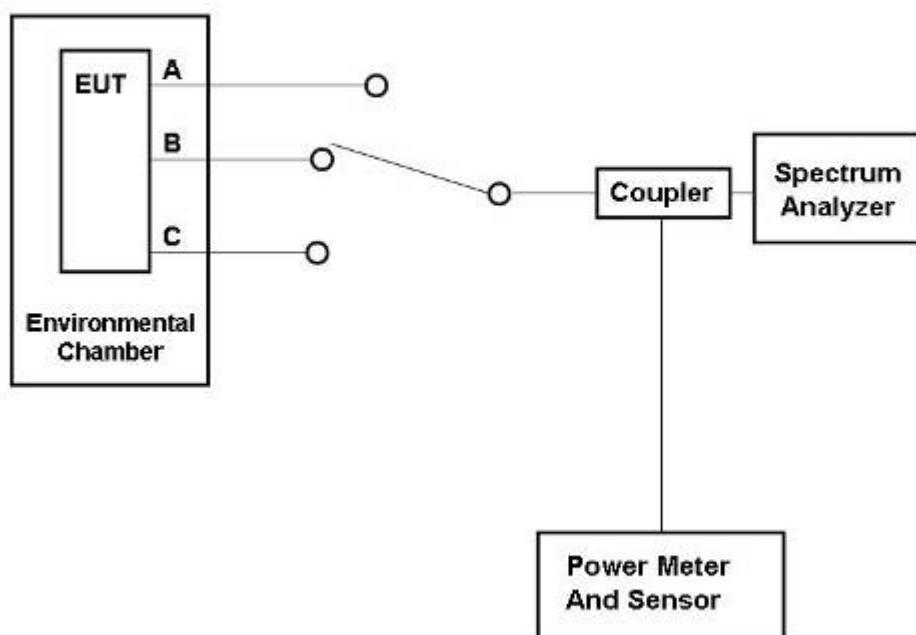
3.4. ac Wireline Emission Test Set-up

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



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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 |

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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 | 5.2 |
| | Transmitter Radiated Spurious Emissions | Emissions above 1 GHz | | Complies | 5.2 |
| | Radiated Band Edge | Band-edge results Peak Emissions | | Complies | . |
| 15.205 / 15.209 2.2 | Radiated Spurious Emissions | Emissions <1 GHz (30M-1 GHz) | Radiated | Complies | 5.2.1 |
| 15.207 7.2.2 | AC Wireline Conducted Emissions 150 kHz–30 MHz | Conducted Emissions | Conducted | Complies | 5.2.2 |

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 2.7 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. (°C): | 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. | | | |

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2x2 802.11b

| Equipment Configuration for 6 dB 99% | | | | | | | | | | | | | |
|--|----------------------------------|--------|---|------------------------|-----------------------------|--------|-------|---------------|--|--|--|--|--|
| Variant: | 802.11b | | | Duty Cycle (%): | | 100 | | | | | | | |
| Data Rate: | 1 MBit/s | | | Antenna Gain (dBi): | | 0 | | | | | | | |
| Modulation: | CCK | | | Beam Forming Gain (Y): | | N/A | | | | | | | |
| TPC: | Maximum 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 | 10.822 | 10.501 | | | 10.822 | 10.501 | 0.5 | -10.00 | | | | | |
| 2437.0 | 10.261 | 10.741 | | | 10.741 | 10.261 | 0.5 | -9.76 | | | | | |
| 2462.0 | 10.902 | 10.902 | | | 10.902 | 10.902 | 0.5 | -10.40 | | | | | |
| - | | | | | | | | | | | | | |
| Test Frequency | Measured 99% Bandwidth (MHz) | | | | Maximum 99% Bandwidth (MHz) | | | | | | | | |
| | Port(s) | | | | | | | | | | | | |
| MHz | a | b | c | d | | | | | | | | | |
| 2412.0 | 13.707 | 13.788 | | | 13.788 | | | | | | | | |
| 2437.0 | 13.788 | 13.707 | | | 13.788 | | | | | | | | |
| 2462.0 | 13.788 | 13.707 | | | 13.788 | | | | | | | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | | | |
| Work Instruction: | WI-03 Measuring RF Spectrum Mask | | | | | | | | | | | | |
| Measurement Uncertainty: | ±2.81 dB | | | | | | | | | | | | |
| - | - | - | - | - | - | - | - | | | | | | |
| - | - | - | - | - | - | - | - | | | | | | |

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2x2 802.11g

| Equipment Configuration for 6 dB 99% | | | | | | | | | | | | | |
|--|----------------------------------|--------|---|------------------------|-----------------------------|--------|-------|---------------|--|--|--|--|--|
| Variant: | 802.11g | | | Duty Cycle (%): | | 100 | | | | | | | |
| Data Rate: | 6 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) | | | | 6 dB Bandwidth (MHz) | | Limit | Lowest Margin | | | | | |
| | Port(s) | | | | | | | | | | | | |
| MHz | a | b | c | d | Highest | Lowest | MHz | MHz | | | | | |
| 2412.0 | 16.673 | 16.673 | | | 16.673 | 16.673 | 0.5 | -16.17 | | | | | |
| 2437.0 | 16.673 | 16.593 | | | 16.673 | 16.593 | 0.5 | -16.09 | | | | | |
| 2462.0 | 16.673 | 16.593 | | | 16.673 | 16.593 | 0.5 | -16.09 | | | | | |
| - | | | | | | | | | | | | | |
| Test Frequency | Measured 99% Bandwidth (MHz) | | | | Maximum 99% Bandwidth (MHz) | | | | | | | | |
| | Port(s) | | | | | | | | | | | | |
| MHz | a | b | c | d | | | | | | | | | |
| 2412.0 | 16.593 | 16.593 | | | 16.593 | | | | | | | | |
| 2437.0 | 16.593 | 16.593 | | | 16.593 | | | | | | | | |
| 2462.0 | 16.593 | 16.593 | | | 16.593 | | | | | | | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | | | |
| Work Instruction: | WI-03 Measuring RF Spectrum Mask | | | | | | | | | | | | |
| Measurement Uncertainty: | ±2.81 dB | | | | | | | | | | | | |
| - | - | - | - | - | - | - | - | | | | | | |
| - | - | - | - | - | - | - | - | | | | | | |

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2x2 802.11n HT-20

| Equipment Configuration for 6 dB 99% | | | | | | | | | | | | | | | | |
|--|----------------------------------|--------|---|------------------------|-----------------------------|--------|-------|---------------|--|--|--|--|--|--|--|--|
| Variant: | 802.11 HT-20 | | | 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) | | | | Highest | Lowest | | | | | | | | | | |
| MHz | a | b | c | d | 17.796 | 17.796 | 0.5 | -17.30 | | | | | | | | |
| 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 802.11n HT-40

| Equipment Configuration for 6 dB 99% | | | | | | | | | | | | | |
|--|----------------------------------|--------|---|------------------------|-----------------------------|--------|-------|--|--|--|--|--|--|
| Variant: | 802.11n HT-40 | | | 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 | | | | | | |
| | Port(s) | | | | | | | | | | | | |
| MHz | a | b | c | d | Highest | Lowest | MHz | | | | | | |
| 2422.0 | 36.874 | 36.713 | | | 36.874 | 36.713 | 0.5 | | | | | | |
| 2437.0 | 36.713 | 36.553 | | | 36.713 | 36.553 | 0.5 | | | | | | |
| 2452.0 | 36.553 | 36.713 | | | 36.713 | 36.553 | 0.5 | | | | | | |
| - | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | |
| - | - | - | - | - | - | - | - | | | | | | |
| - | - | - | - | - | - | - | - | | | | | | |

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3x3 802.11b

| Equipment Configuration for 6 dB 99% | | | | | | | | | | | |
|--|----------------------------------|--------|--------|------------------------|-----------------------------|--------|-------|--|--|--|--|
| Variant: | 802.11b | | | Duty Cycle (%): | | 100 | | | | | |
| Data Rate: | 1 MBit/s | | | Antenna Gain (dBi): | | 0 | | | | | |
| Modulation: | CCK | | | Beam Forming Gain (Y): | | N/A | | | | | |
| TPC: | Maximum Power | | | | | | | | | | |
| Engineering Test Notes: | | | | | | | | | | | |
| SPLITTABLE! Test Measurement Results | | | | | | | | | | | |
| Test Frequency | Measured 6 dB Bandwidth (MHz) | | | | 6 dB Bandwidth (MHz) | | Limit | | | | |
| | Port(s) | | | | | | | | | | |
| MHz | a | b | c | d | Highest | Lowest | MHz | | | | |
| 2412.0 | 10.581 | 10.100 | 10.180 | | 10.581 | 10.100 | 0.5 | | | | |
| 2437.0 | 10.261 | 10.100 | 10.261 | | 10.261 | 10.100 | 0.5 | | | | |
| 2462.0 | 10.261 | 10.180 | 10.261 | | 10.261 | 10.180 | 0.5 | | | | |
| - | | | | | | | | | | | |
| Test Frequency | Measured 99% Bandwidth (MHz) | | | | Maximum 99% Bandwidth (MHz) | | | | | | |
| | Port(s) | | | | | | | | | | |
| MHz | a | b | c | d | | | | | | | |
| 2412.0 | 13.868 | 13.868 | 13.788 | | 13.868 | | | | | | |
| 2437.0 | 13.788 | 13.868 | 13.788 | | 13.868 | | | | | | |
| 2462.0 | 13.868 | 13.788 | 13.868 | | 13.868 | | | | | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | |
| Work Instruction: | WI-03 Measuring RF Spectrum Mask | | | | | | | | | | |
| Measurement Uncertainty: | ±2.81 dB | | | | | | | | | | |
| - | | | | | | | | | | | |

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3x3 802.11g

| Equipment Configuration for 6 dB 99% | | | | | | | | | | | |
|--|-------------------------------|----------------------------------|--------|------------------------|-----------------------------|--------|-------|--|--|--|--|
| Variant: | 802.11g | | | Duty Cycle (%): | | 100 | | | | | |
| Data Rate: | 6 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) | | | | 6 dB Bandwidth (MHz) | | Limit | | | | |
| | Port(s) | | | | | | | | | | |
| MHz | a | b | c | d | Highest | Lowest | MHz | | | | |
| 2412.0 | 16.593 | 16.513 | 16.513 | | 16.593 | 16.513 | 0.5 | | | | |
| 2437.0 | 16.593 | 16.513 | 16.593 | | 16.593 | 16.513 | 0.5 | | | | |
| 2462.0 | 16.673 | 16.593 | 16.513 | | 16.673 | 16.513 | 0.5 | | | | |
| - | | | | | | | | | | | |
| Test Frequency | Measured 99% Bandwidth (MHz) | | | | Maximum 99% Bandwidth (MHz) | | | | | | |
| | Port(s) | | | | | | | | | | |
| MHz | a | b | c | d | | | | | | | |
| 2412.0 | 16.593 | 16.513 | 16.513 | | 16.593 | | | | | | |
| 2437.0 | 16.593 | 16.513 | 16.513 | | 16.593 | | | | | | |
| 2462.0 | 16.593 | 16.593 | 16.593 | | 16.593 | | | | | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | |
| Work Instruction: | | WI-03 Measuring RF Spectrum Mask | | | | | | | | | |
| Measurement Uncertainty: | | ±2.81 dB | | | | | | | | | |
| - | | | | | | | | | | | |

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3x3 802.11n HT-20

| Equipment Configuration for 6 dB 99% | | | | | | | | | | | |
|--|----------------------------------|--------|--------|------------------------|-----------------------------|--------|-------|--|--|--|--|
| Variant: | 802.11n HT-20 | | | 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) | | | | 6 dB Bandwidth (MHz) | | Limit | | | | |
| | Port(s) | | | | | | | | | | |
| MHz | a | b | c | d | Highest | Lowest | MHz | | | | |
| 2412.0 | 17.796 | 17.796 | 17.796 | | 17.796 | 17.796 | 0.5 | | | | |
| 2437.0 | 17.796 | 17.796 | 17.796 | | 17.796 | 17.796 | 0.5 | | | | |
| 2462.0 | 17.796 | 17.796 | 17.796 | | 17.796 | 17.796 | 0.5 | | | | |
| 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 | | 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 | | | | | | | | | | |

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3x3 802.11n HT-40

| Equipment Configuration for 6 dB 99% | | | | | | | | | | | |
|--|----------------------------------|--------|--------|------------------------|-----------------------------|--------|-------|--|--|--|--|
| Variant: | 802.11n HT-40 | | | 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) | | | | 6 dB Bandwidth (MHz) | | Limit | | | | |
| | Port(s) | | | | | | | | | | |
| MHz | a | b | c | d | Highest | Lowest | MHz | | | | |
| 2422.0 | 36.713 | 36.553 | 36.553 | | 36.713 | 36.553 | 0.5 | | | | |
| 2437.0 | 36.713 | 36.553 | 36.553 | | 36.713 | 36.553 | 0.5 | | | | |
| 2452.0 | 36.713 | 36.553 | 36.553 | | 36.713 | 36.553 | 0.5 | | | | |
| 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 | | 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 | | | | | | | | | | |

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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



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5.1.2. Peak Output Power

| Conducted Test Conditions for Fundamental Emission Output Power | | | |
|---|--|----------------------------|-------------|
| Standard: | FCC CFR 47:15.247 | Ambient Temp. (°C): | 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
 $A = \text{Total Power} [10 \log_{10} (10^{a/10} + 10^{b/10} + 10^{c/10} + 10^{d/10})]$, G = Antenna Gain,
x = Duty Cycle

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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.



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2x2 Operation

2.4 GHz Uncorrelated Operation (802.11n HT-20, HT-40)

| 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 | 34 |

2.4 GHz Correlated Operation (802.11 b/g Legacy)

| Antenna Model | Gain (dBi) | Antenna Gain Increase V's No. Antenna Ports | | Total Gain (dBi) | Max. Allowable Conducted Peak Power | | Maximum EIRP (dBm) |
|-----------------------------------|---------------|---|------|------------------------|---|-----------------------|--------------------------|
| | | Ports | (dB) | | Σ (dBm) | Per Chain (dBm) | |
| RW-9462-0827 (cross polarized) | 9 | 2 | 3.01 | 12.01 | 23.99 | 20.98 | 36 |
| MT0129070 | 8 | 2 | 3.01 | 11.01 | 24.99 | 21.98 | 36 |
| RW-9463-0825 | 6.3 | 2 | 3.01 | 9.31 | 26.69 | 23.68 | 36 |
| RW-9461-0827 | 4 | 2 | 3.01 | 7.01 | 28.99 | 25.68 | 34 |

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3x3 Operation

2.4 GHz Uncorrelated Operation (802.11n HT-20, HT-40)

| Antenna Model | Gain (dBi) | Max. Allowable Conducted Peak Power (dBm) | | Maximum EIRP (dBm) |
|---------------|---------------|--|-------------------------|--------------------------|
| | | Σ (dBm) | Max. Power Per Chain | |
| MT0129070 | 8 | +28.0 | 23.23 | 36 |
| RW-9463-0825 | 6.3 | +29.7 | 24.93 | 36 |
| RW-9461-0827 | 4 | +30.0 | 25.23 | 34 |

2.4 GHz Correlated Operation (802.11 b/g Legacy)

| Antenna Model | Gain | Antenna Gain Increase V's No. Antenna Ports | | Total Gain | Max. Allowable Conducted Peak Power | Maximum EIRP (dBm) |
|------------------|-------|---|------|---------------|---|--------------------------|
| | (dBi) | Ports | (dB) | | | |
| MT0129070 | 8 | 3 | 4.77 | 12.77 | 23.23 | 18.46 |
| RW-9463-0825 | 6.3 | 3 | 4.77 | 11.07 | 24.93 | 20.16 |
| RW-9461-0827 | 4 | 3 | 4.77 | 8.77 | 27.23 | 22.45 |

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2x2 802.11b

| Equipment Configuration for peak output power | | | | | | | | | | | | | |
|--|---------------------------------|--------|---|---|-------------------------------|--------|--------|--|--|--|--|--|--|
| Variant: | 802.11b | | | | Duty Cycle (%): | 100 | | | | | | | |
| Data Rate: | 1 MBit/s | | | | Antenna Gain (dBi): | 0 | | | | | | | |
| Modulation: | CCK | | | | Beam Forming Gain (Y): | N/A | | | | | | | |
| TPC: | Maximum Power | | | | | | | | | | | | |
| Engineering Test Notes: | | | | | | | | | | | | | |
| Test Measurement Results | | | | | | | | | | | | | |
| Test Frequency | Measured Output Power (dBm) | | | | Calculated Total Power (dBm) | Limit | Margin | | | | | | |
| | Port(s) | | | | | | | | | | | | |
| MHz | a | b | c | d | Σ | dBm | dBm | | | | | | |
| 2412.0 | 26.232 | 26.236 | | | 29.244 | 30.000 | -0.76 | | | | | | |
| 2437.0 | 26.281 | 26.232 | | | 29.267 | 30.000 | -0.73 | | | | | | |
| 2462.0 | 26.315 | 26.424 | | | 29.380 | 30.000 | -0.62 | | | | | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | | | |
| Work Instruction: | WI-01 Measuring RF Output Power | | | | | | | | | | | | |
| Measurement Uncertainty: | ± 1.33 dB | | | | | | | | | | | | |
| - | | | | | | | | | | | | | |

2x2 802.11g

| Equipment Configuration for peak output power | | | | | | | | | |
|--|---------------------------------|--------|---|---|-------------------------------|--------|--------|--|--|
| Variant: | 802.11g | | | | Duty Cycle (%): | 100 | | | |
| Data Rate: | 6 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) | | | | Calculated Total Power (dBm) | Limit | Margin | | |
| | Port(s) | | | | | | | | |
| MHz | a | b | c | d | Σ | dBm | dBm | | |
| 2412.0 | 26.360 | 26.616 | | | 29.500 | 30.000 | -0.50 | | |
| 2437.0 | 25.708 | 26.491 | | | 29.127 | 30.000 | -0.87 | | |
| 2462.0 | 26.096 | 27.024 | | | 29.595 | 30.000 | -0.40 | | |
| 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

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2x2 802.11n HT-20

| Equipment Configuration for peak output power | | | | | | | | | | | | | |
|--|---------------------------------|--------|---|---|-------------------------------|--------|--------|--|--|--|--|--|--|
| Variant: | 802.11n HT-20 | | | | 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) | | | | Calculated Total Power (dBm) | Limit | Margin | | | | | | |
| | Port(s) | | | | | | | | | | | | |
| 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 802.11n HT-40

| Equipment Configuration for peak output power | | | | | | | | | |
|--|---------------------------------|--------|---|---|-------------------------------|--------|--------|--|--|
| Variant: | 802.11n HT-40 | | | | 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) | | | | Calculated Total Power (dBm) | Limit | Margin | | |
| | Port(s) | | | | | | | | |
| 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

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3x3 802.11b

| Equipment Configuration for peak output power | | | | | | | | | |
|--|---------------------------------|-------|-------|---|-------------------------------|-------|--------|--|--|
| Variant: | 802.11b | | | | Duty Cycle (%): | 100 | | | |
| Data Rate: | 1 MBit/s | | | | Antenna Gain (dBi): | 0 | | | |
| Modulation: | CCK | | | | Beam Forming Gain (Y): | N/A | | | |
| TPC: | Maximum Power | | | | | | | | |
| Engineering Test Notes: | | | | | | | | | |
| Test Measurement Results | | | | | | | | | |
| Test Frequency | Measured Output Power (dBm) | | | | Calculated Total Power (dBm) | Limit | Margin | | |
| | Port(s) | | | | | | | | |
| MHz | a | b | c | d | Σ Port(s) | dBm | dBm | | |
| 2412.0 | 24.79 | 23.68 | 24.37 | | 29.08 | 30.00 | -0.92 | | |
| 2437.0 | 24.82 | 23.99 | 24.19 | | 29.12 | 30.00 | -0.88 | | |
| 2462.0 | 24.66 | 24.15 | 24.64 | | 29.26 | 30.00 | -0.74 | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | |
| Work Instruction: | WI-01 Measuring RF Output Power | | | | | | | | |
| Measurement Uncertainty: | ± 1.33 dB | | | | | | | | |
| - | | | | | | | | | |

3x3 802.11g

| Equipment Configuration for peak output power | | | | | | | | | |
|--|---------------------------------|-------|-------|---|-------------------------------|-------|--------|--|--|
| Variant: | 802.11g | | | | Duty Cycle (%): | 100 | | | |
| Data Rate: | 6 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) | | | | Calculated Total Power (dBm) | Limit | Margin | | |
| | Port(s) | | | | | | | | |
| MHz | a | b | c | d | Σ Port(s) | dBm | dBm | | |
| 2412.0 | 24.71 | 23.71 | 24.37 | | 29.05 | 30.00 | -0.95 | | |
| 2437.0 | 24.66 | 23.87 | 24.21 | | 29.03 | 30.00 | -0.97 | | |
| 2462.0 | 24.37 | 23.92 | 24.56 | | 29.06 | 30.00 | -0.94 | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | |
| Work Instruction: | WI-01 Measuring RF Output Power | | | | | | | | |
| Measurement Uncertainty: | ± 1.33 dB | | | | | | | | |
| - | | | | | | | | | |

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3x3 802.11n HT-20

| Equipment Configuration for peak output power | | | | | | | | | |
|---|------------------------------------|---------------------------------|-------|---|-------------------------------------|--------------|---------------|--|--|
| Variant: | 802.11n HT-20 | | | | 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) | | | | Calculated Total Power (dBm) | Limit | Margin | | |
| | Port(s) | | | | | | | | |
| 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 802.11n HT-40

| Equipment Configuration for peak output power | | | | | | | | | |
|---|------------------------------------|---------------------------------|-------|---|-------------------------------------|--------------|---------------|--|--|
| Variant: | 802.11n HT-40 | | | | 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) | | | | Calculated Total Power (dBm) | Limit | Margin | | |
| | Port(s) | | | | | | | | |
| 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 | | | | | | | |

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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 6.3 dBi and 4 dBi Antenna Mode B 2x2 (Coherent Limits)

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2412 | 23.65 | 22.81 | -- | -- | N/A | 26.26 | 26.69 | -0.43 | 20.5 |
| 2437 | 23.73 | 23.18 | -- | -- | N/A | 26.47 | 26.69 | -0.22 | 20.5 |
| 2462 | 23.59 | 23.33 | -- | -- | N/A | 26.47 | 26.69 | -0.22 | 20.5 |

Power Level 6.3 dBi and 4 dBi Antenna G 2x2 Coherent (Bold Indicates Power Levels for BE)

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2412 | 23.80 | 22.86 | -- | -- | N/A | 26.37 | 26.69 | -0.32 | 17.5 |
| 2437 | 23.83 | 23.10 | -- | -- | N/A | 26.49 | 26.69 | -0.2 | 17.5 |
| 2462 | 20.34 | 20.18 | -- | -- | N/A | 23.27 | 26.69 | -3.42 | 15 |

Power Levels 6.3 dBi and 4 dBi Antenna HT 20 2x2 (mimo)(Bold Indicates Power Levels for BE)

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2412 | 22.52 | 22.64 | -- | -- | N/A | 25.59 | 29.7 | -4.11 | 17.5 |
| 2437 | 26.49 | 25.94 | -- | -- | N/A | 29.23 | 29.7 | -0.47 | 18.5 |
| 2462 | 22.35 | 22.57 | -- | -- | N/A | 25.47 | 29.7 | -4.23 | 14.5 |

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

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2422 | 18.71 | 18.43 | -- | -- | N/A | 21.58 | 29.7 | -8.12 | 13.5 |
| 2437 | 26.66 | 25.61 | -- | -- | N/A | 29.18 | 29.7 | -0.52 | 18.5 |
| 2452 | 15.82 | 15.37 | -- | -- | N/A | 18.61 | 29.7 | -11.09 | 10.5 |



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Power Levels 8 dBi Antenna Mode B 2x2

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2412 | 22.15 | 21.31 | -- | -- | N/A | 24.76 | 24.99 | -0.23 | 19 |
| 2437 | 22.23 | 21.68 | -- | -- | N/A | 24.97 | 24.99 | -0.02 | 19 |
| 2462 | 22.09 | 21.83 | -- | -- | N/A | 24.97 | 24.99 | -0.02 | 19 |

Power Levels 8 dBi Antenna Mode G 2x2 (Bold Indicates Power Levels for BE)

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2412 | 22.3 | 21.36 | -- | -- | N/A | 24.87 | 24.99 | -0.12 | 16 |
| 2437 | 22.33 | 21.5 | -- | -- | N/A | 24.95 | 24.99 | -0.04 | 16 |
| 2462 | 20.34 | 20.18 | -- | -- | N/A | 23.27 | 24.99 | -1.72 | 15 |

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

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2412 | 22.52 | 22.64 | -- | -- | N/A | 25.59 | 28.00 | -2.41 | 17.5 |
| 2437 | 24.99 | 24.44 | -- | -- | N/A | 27.73 | 28.00 | -0.27 | 17 |
| 2462 | 22.35 | 22.57 | -- | -- | N/A | 25.47 | 28.00 | -2.53 | 14.5 |

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

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2422 | 18.71 | 18.43 | -- | -- | N/A | 21.58 | 28.00 | -6.42 | 13.5 |
| 2437 | 25.16 | 24.11 | -- | -- | N/A | 27.68 | 28.00 | -0.32 | 16.5 |
| 2452 | 15.82 | 15.37 | -- | -- | N/A | 18.61 | 28.00 | -9.39 | 10.5 |

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Power Levels 6.3 dBi and 4 dBi Antenna Mode B 3x3 (Coherent Limits)

| Test Frequency | Measured Peak Power | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|-------|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | |
| MHz | a | b | c | Combined | Calculated | dBm | dB | |
| 2412 | 20.73 | 19.24 | 19.77 | N/A | 24.73 | 24.93 | -0.20 | 17 |
| 2437 | 20.70 | 19.41 | 19.67 | N/A | 24.73 | 24.93 | -0.20 | 17 |
| 2462 | 20.23 | 19.60 | 20.14 | N/A | 24.77 | 24.93 | -0.16 | 17 |

Power Levels 6.3 dBi and 4 dBi Antenna Mode G 3x3 (Coherent Limits)

| Test Frequency | Measured Peak Power | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|-------|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | |
| MHz | a | b | c | Combined | Calculated | dBm | dB | |
| 2412 | 20.56 | 19.13 | 19.65 | N/A | 24.59 | 24.93 | -0.34 | 14 |
| 2437 | 20.60 | 19.30 | 19.62 | N/A | 24.65 | 24.93 | -0.28 | 14 |
| 2462 | 20.11 | 19.47 | 20.16 | N/A | 24.70 | 24.93 | -0.23 | 14 |

Power Levels 6.3 dBi and 4 dBi Antenna HT 20 3x3 (Mimo Limits)

| Test Frequency | Measured Peak Power | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|-------|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | |
| MHz | a | b | c | Combined | Calculated | dBm | dB | |
| 2412 | 24.98 | 23.98 | 24.60 | N/A | 29.31 | 29.7 | -0.39 | 19 |
| 2437 | 24.99 | 24.11 | 24.33 | N/A | 29.26 | 29.7 | -0.44 | 19 |
| 2462 | 24.52 | 24.14 | 24.82 | N/A | 29.27 | 29.7 | -0.43 | 19 |

Power Levels 6.3 dBi and 4 dBi Antenna HT 40 3x3(Mimo Limits)

| Test Frequency | Measured Peak Power | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|-------|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | |
| MHz | a | b | c | Combined | Calculated | dBm | dB | |
| 2422 | 24.73 | 23.91 | 24.74 | N/A | 29.25 | 29.7 | -0.45 | 18.5 |
| 2437 | 24.50 | 23.84 | 24.72 | N/A | 29.14 | 29.7 | -0.56 | 18.5 |
| 2452 | 24.76 | 24.04 | 24.72 | N/A | 29.29 | 29.7 | -0.41 | 18.5 |

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Power Levels 8 dBi Antenna Mode B 3x3 (Coherent Limits)

| Test Frequency | Measured Peak Power | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|-------|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | |
| MHz | a | b | c | Combined | Calculated | dBm | dB | |
| 2412 | 18.73 | 17.24 | 17.77 | N/A | 22.73 | 23.23 | -0.50 | 16.5 |
| 2437 | 18.7 | 17.41 | 17.67 | N/A | 22.73 | 23.23 | -0.50 | 16.5 |
| 2462 | 18.63 | 18.1 | 18.54 | N/A | 23.20 | 23.23 | -0.03 | 17 |

Power Levels 8 dBi Antenna Mode G 3x3 (Coherent Limits)

| Test Frequency | Measured Peak Power | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|-------|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | |
| MHz | a | b | c | Combined | Calculated | dBm | dB | |
| 2412 | 19.06 | 17.63 | 18.15 | N/A | 23.09 | 23.23 | -0.14 | 14 |
| 2437 | 19.1 | 17.8 | 18.12 | N/A | 23.15 | 23.23 | -0.08 | 14 |
| 2462 | 18.61 | 17.97 | 18.66 | N/A | 23.20 | 23.23 | -0.03 | 14 |

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

| Test Frequency | Measured Peak Power | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|-------|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | |
| MHz | a | b | c | Combined | Calculated | dBm | dB | |
| 2412 | 21.76 | 21.51 | 21.66 | N/A | 26.42 | 28 | -1.58 | 17 |
| 2437 | 23.49 | 22.61 | 22.83 | N/A | 27.76 | 28 | -0.24 | 17.5 |
| 2462 | 18.91 | 18.75 | 19.47 | N/A | 23.83 | 28 | -4.17 | 14.5 |

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

| Test Frequency | Measured Peak Power | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|-------|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | |
| MHz | a | b | c | Combined | Calculated | dBm | dB | |
| 2422 | 18.85 | 18.44 | 18.59 | N/A | 23.40 | 28 | -4.60 | 13.5 |
| 2437 | 23 | 22.34 | 23.24 | N/A | 27.65 | 28 | -0.35 | 17.0 |
| 2452 | 15.24 | 14.81 | 15.30 | N/A | 19.89 | 28 | -8.11 | 10 |

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Power Levels 9 dBi Antenna Mode B 2x2(Coherent Limits)

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2412 | 21.29 | 20.54 | -- | -- | N/A | 23.94 | 23.99 | -0.05 | 18 |
| 2437 | 20.92 | 20.26 | -- | -- | N/A | 23.61 | 23.99 | -0.38 | 17.5 |
| 2462 | 20.8 | 20.45 | -- | -- | N/A | 23.64 | 23.99 | -0.35 | 17.5 |

Power Levels 9 dBi Antenna Mode G 2x2(Coherent Limits)

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2412 | 20.88 | 20.08 | -- | -- | N/A | 23.51 | 23.99 | -0.48 | 14.5 |
| 2437 | 20.96 | 20.32 | -- | -- | N/A | 23.66 | 23.99 | -0.33 | 14.5 |
| 2462 | 20.77 | 20.36 | -- | -- | N/A | 23.58 | 23.99 | -0.41 | 14.5 |

Power Levels 9 dBi Antenna HT20 2x2 (Mimo)(Bold Indicates Power Levels for BE)

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2412 | 21.17 | 21.12 | -- | -- | N/A | 24.16 | 27 | -2.84 | 16.5 |
| 2437 | 23.91 | 23.27 | -- | -- | N/A | 26.61 | 27 | -0.39 | 17.5 |
| 2462 | 21.98 | 21.98 | -- | -- | N/A | 24.99 | 27 | -2.01 | 17.5 |

Power Levels 9 dBi Antenna HT40 2x2 (Mimo)((Bold Indicates Power Levels for BE)

| Test Frequency | Measured Peak Power | | | | Total Power (dBm) | | Limit | Margin | Power Setting |
|----------------|---------------------|-------|----|----|-------------------|------------|-------|--------|---------------|
| | RF Port (dBm) | | | | | | | | |
| MHz | a | b | c | d | Combined | Calculated | dBm | dB | |
| 2422 | 20.86 | 20.68 | -- | -- | N/A | 23.78 | 27 | -3.22 | 15.5 |
| 2437 | 24.27 | 23.52 | -- | -- | N/A | 26.92 | 27 | -0.08 | 17.5 |
| 2452 | 19.09 | 18.64 | -- | -- | N/A | 21.88 | 27 | -5.12 | 14 |

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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 |



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5.1.3. Power Spectral Density

| Conducted Test Conditions for Power Spectral Density | | | | | | |
|--|---|----------------------------|-------------|--|--|--|
| Standard: | FCC CFR 47:15.247 | Ambient Temp. (°C): | 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 \geq 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 | | | | | | |
| $A = \text{Total Power Spectral Density} [10 \log_{10} (10^{a/10} + 10^{b/10} + 10^{c/10} + 10^{d/10})]$ | | | | | | |
| $x = \text{Duty Cycle}$ | | | | | | |
| 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 | | | | | | |

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2x2 802.11b

| Equipment Configuration for power density | | | | | | | | | | | | | | | |
|--|---------------------------------------|----------------------------------|---|---|---|-------------------------|-------|--------|--|--|--|--|--|--|--|
| Variant: | | 802.11b | | | Duty Cycle (%): | | 100 | | | | | | | | |
| Data Rate: | | 1 MBit/s | | | Antenna Gain (dBi): | | 0 | | | | | | | | |
| Modulation: | | CCK | | | Beam Forming Gain (Y): | | N/A | | | | | | | | |
| TPC: | | Maximum Power | | | | | | | | | | | | | |
| Engineering Test Notes: | | | | | | | | | | | | | | | |
| Test Measurement Results | | | | | | | | | | | | | | | |
| Test Frequency | Measured Power Spectral Density (dBm) | | | | Calculated Total Power Spectral Density (dBm) | | Limit | Margin | | | | | | | |
| | Port(s) | | | | | | | | | | | | | | |
| MHz | a | b | c | d | Σ Port(s) | Conversion to 3 kHz RBW | dBm | dB | | | | | | | |
| 2412.0 | -1.142 | -0.890 | | | 1.996 | N/A | 8.0 | -6.00 | | | | | | | |
| 2437.0 | -0.664 | -1.103 | | | 2.132 | N/A | 8.0 | -5.87 | | | | | | | |
| 2462.0 | -0.568 | 0.046 | | | 2.760 | N/A | 8.0 | -5.24 | | | | | | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | | | | | |
| Work Instruction: | | WI-03 Measuring RF Spectrum Mask | | | | | | | | | | | | | |
| Measurement Uncertainty: | | ±2.81 dB | | | | | | | | | | | | | |
| - | | | | | | | | | | | | | | | |

2x2 802.11g

| Equipment Configuration for power density | | | | | | | | | | | | | | | |
|--|---------------------------------------|----------------------------------|---|---|---|-------------------------|-------|--------|--|--|--|--|--|--|--|
| Variant: | | 802.11g | | | Duty Cycle (%): | | 100 | | | | | | | | |
| Data Rate: | | 6 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 Power Spectral Density (dBm) | | | | Calculated Total Power Spectral Density (dBm) | | Limit | Margin | | | | | | | |
| | Port(s) | | | | | | | | | | | | | | |
| MHz | a | b | c | d | Σ Port(s) | Conversion to 3 kHz RBW | dBm | dB | | | | | | | |
| 2412.0 | -4.609 | -4.971 | | | -1.776 | N/A | 8.0 | -9.78 | | | | | | | |
| 2437.0 | -6.787 | -4.583 | | | -2.536 | N/A | 8.0 | -10.54 | | | | | | | |
| 2462.0 | -5.024 | -5.128 | | | -2.065 | N/A | 8.0 | -10.07 | | | | | | | |
| 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

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2x2 802.11n HT-20

| Equipment Configuration for power density | | | | | | | | | | | |
|--|---------------------------------------|---------------|---|---|---|-------------------------|-------|--------|--|--|--|
| Variant: | | 802.11n HT-20 | | | 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) | | | | Calculated Total Power Spectral Density (dBm) | | Limit | Margin | | | |
| | Port(s) | | | | | | | | | | |
| 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 802.11n HT-40

| Equipment Configuration for power density | | | | | | | | | | | |
|--|---------------------------------------|---------------|---|---|---|-------------------------|-------|--------|--|--|--|
| Variant: | | 802.11n HT-40 | | | 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) | | | | Calculated Total Power Spectral Density (dBm) | | Limit | Margin | | | |
| | Port(s) | | | | | | | | | | |
| 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

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3x3 802.11b

| Equipment Configuration for power density | | | | | | | | | | | | |
|---|---------------------------------------|----------------------------------|--------|---|---|-------------------------|-------|--------|--|--|--|--|
| Variant: | | 802.11b | | | Duty Cycle (%): | | 100 | | | | | |
| Data Rate: | | 1 MBit/s | | | Antenna Gain (dBi): | | 0 | | | | | |
| Modulation: | | CCK | | | Beam Forming Gain (Y): | | N/A | | | | | |
| TPC: | | Maximum Power | | | | | | | | | | |
| Engineering Test Notes: | | | | | | | | | | | | |
| SPLITTABLE!Test Measurement Results | | | | | | | | | | | | |
| Test Frequency | Measured Power Spectral Density (dBm) | | | | Calculated Total Power Spectral Density (dBm) | | Limit | Margin | | | | |
| | Port(s) | | | | | | | | | | | |
| MHz | a | b | c | d | Σ Port(s) | Conversion to 3 kHz RBW | dBm | dB | | | | |
| 2412.0 | -4.680 | -5.872 | -5.234 | | -0.464 | N/A | 8.0 | -8.46 | | | | |
| 2437.0 | -4.800 | -5.762 | -5.325 | | -0.507 | N/A | 8.0 | -8.51 | | | | |
| 2462.0 | -4.965 | -5.537 | -5.087 | | -0.418 | N/A | 8.0 | -8.42 | | | | |
| SPLITTABLE!Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | | |
| Work Instruction: | | WI-03 Measuring RF Spectrum Mask | | | | | | | | | | |
| Measurement Uncertainty: | | ±2.81 dB | | | | | | | | | | |
| - | | | | | | | | | | | | |

3x3 802.11g

| Equipment Configuration for power density | | | | | | | | | | | | |
|--|---------------------------------------|----------------------------------|--------|---|---|-------------------------|-------|--------|--|--|--|--|
| Variant: | | 802.11g | | | Duty Cycle (%): | | 100 | | | | | |
| Data Rate: | | 6 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 Power Spectral Density (dBm) | | | | Calculated Total Power Spectral Density (dBm) | | Limit | Margin | | | | |
| | Port(s) | | | | | | | | | | | |
| MHz | a | b | c | d | Σ Port(s) | Conversion to 3 kHz RBW | dBm | dB | | | | |
| 2412.0 | -8.205 | -10.330 | -9.195 | | -4.386 | N/A | 8.0 | -12.39 | | | | |
| 2437.0 | -9.478 | -10.131 | -9.464 | | -4.909 | N/A | 8.0 | -12.91 | | | | |
| 2462.0 | -8.386 | -9.527 | -9.649 | | -4.378 | N/A | 8.0 | -12.38 | | | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | | |
| Work Instruction: | | WI-03 Measuring RF Spectrum Mask | | | | | | | | | | |
| Measurement Uncertainty: | | ±2.81 dB | | | | | | | | | | |
| - | | | | | | | | | | | | |

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3x3 802.11n HT-20

| Equipment Configuration for power density | | | | | | | | | | | |
|--|---------------------------------------|----------------------------------|--------|---|---|-------------------------|-------|--------|--|--|--|
| Variant: | | 802.11n HT-20 | | | 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) | | | | Calculated Total Power Spectral Density (dBm) | | Limit | Margin | | | |
| | Port(s) | | | | | | | | | | |
| 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 802.11n HT-40

| Equipment Configuration for power density | | | | | | | | | | | |
|--|---------------------------------------|----------------------------------|---------|---|---|-------------------------|-------|--------|--|--|--|
| Variant: | | 802.11n HT-40 | | | 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) | | | | Calculated Total Power Spectral Density (dBm) | | Limit | Margin | | | |
| | Port(s) | | | | | | | | | | |
| 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 | | | | | | | | | |
| | | | | | | | | | | | |

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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 |

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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

$$\text{Power Density} = P_d \text{ (mW/cm}^2\text{)} = \text{EIRP}/(4\pi d^2)$$

$$\text{EIRP} = P * G$$

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (cm)

$$\text{Numeric Gain} = 10 ^ {(G \text{ (dBi)})/10}$$

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 / cm² 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 |
|-------------------------|----------|

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| 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 | 27.0 | 501.19 | 17.80 | 0.79 |
| MT0129070 | Omni Directional Antenna | 8 | 6.3 | 28.0 | 630.96 | 17.80 | 0.79 |
| RW-9463-0825 | Omni Directional Antenna | 6.3 | 4.3 | 29.7 | 933.25 | 17.80 | 0.79 |
| RW-9461-0827 | Omni Directional Antenna | 4 | 2.5 | 30.0 | 1000.00 | 14.14 | 0.50 |

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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. (°C): | 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. | | | |

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2x2 802.11b

| Equipment Configuration for bandedge | | | | | | | | | | | | | |
|---|----------------------------|--|--------------|-------------------------------|--------------|-----------|--------------|-----------|--------------|--|--|--|--|
| Variant: | 802.11b | | | Duty Cycle (%): | 100 | | | | | | | | |
| Data Rate: | 1 MBit/s | | | Antenna Gain (dBi): | 0 | | | | | | | | |
| Modulation: | CCK | | | Beam Forming Gain (Y): | N/A | | | | | | | | |
| TPC: | Maximum 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 | -42.206 | -10.20 | -42.780 | -10.36 | | | | | | | | |
| 2437.0 | 30.0 - 26000.0 | -41.279 | -10.76 | -40.213 | -9.68 | | | | | | | | |
| 2462.0 | 30.0 - 26000.0 | -42.005 | -9.56 | -41.574 | -10.30 | | | | | | | | |
| - | | | | | | | | | | | | | |
| 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 | -34.354 | -8.10 | -33.774 | -8.59 | | | | | | | | |
| 2462.0 | 2483.5 | -44.205 | -8.37 | -44.842 | -8.58 | | | | | | | | |
| - | | | | | | | | | | | | | |
| BE - Maximum band-edge emission found | | | | | | | | | | | | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | | | |
| Work Instruction: | | WI-05 Measurement of Spurious Emissions | | | | | | | | | | | |
| Measurement Uncertainty: | | $\leq 40 \text{ GHz} \pm 2.37 \text{ dB}$ | | | | | | | | | | | |
| - | | | | | | | | | | | | | |

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

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2x2 802.11g

| Equipment Configuration for bandedge | | | | | | | | | | | | | | | | | |
|--|---------------------|--|--------|------------------------|--------|--------|-------|--------|-------|--|--|--|--|--|--|--|--|
| Variant: | | 802.11g | | Duty Cycle (%): | | 100 | | | | | | | | | | | |
| Data Rate: | | 6 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 | 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 | -40.121 | -15.51 | -41.552 | -15.77 | | | | | | | | | | | | |
| 2437.0 | 30.0 - 26000.0 | -40.321 | -16.19 | -39.927 | -15.53 | | | | | | | | | | | | |
| 2462.0 | 30.0 - 26000.0 | -41.128 | -16.64 | -40.632 | -16.44 | | | | | | | | | | | | |
| - | | | | | | | | | | | | | | | | | |
| 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 | -23.595 | -14.68 | -23.616 | -14.48 | | | | | | | | | | | | |
| 2462.0 | 2483.5 | -37.419 | -15.14 | -37.486 | -14.65 | | | | | | | | | | | | |
| - | | | | | | | | | | | | | | | | | |
| BE - Maximum band-edge emission found | | | | | | | | | | | | | | | | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | | | | | | | |
| Work Instruction: | | WI-05 Measurement of Spurious Emissions | | | | | | | | | | | | | | | |
| Measurement Uncertainty: | | $\leq 40 \text{ GHz} \pm 2.37 \text{ dB}$ | | | | | | | | | | | | | | | |
| - | | | | | | | | | | | | | | | | | |

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

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2x2 802.11n HT-20

| Equipment Configuration for bandedge | | | | | | | | | | | | | | | |
|--|---------------------|--|--------|------------------------|--------|--------|-------|--------|-------|--|--|--|--|--|--|
| Variant: | | 802.11n HT-20 | | 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: | | $\leq 40 \text{ GHz} \pm 2.37 \text{ dB}$ | | | | | | | | | | | | | |
| - | | | | | | | | | | | | | | | |

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

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2x2 802.11n HT-40

| Equipment Configuration for bandedge | | | | | | | | | | | | | | | | | |
|--|---------------------|--|--------|------------------------|--------|--------|-------|--------|-------|--|--|--|--|--|--|--|--|
| Variant: | | 802.11n HT-40 | | 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: | | $\leq 40 \text{ GHz} \pm 2.37 \text{ dB}$ | | | | | | | | | | | | | | | |
| - | | | | | | | | | | | | | | | | | |

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

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3x3 802.11b

| Equipment Configuration for Transmitter Conducted Spurious and Band-Edge Emissions | | | | | | | | | | | | | | | |
|--|---------------------|---|--------|----------------------------|--------|---------|--------|--------|-------|--|--|--|--|--|--|
| Variant: 802.11b | | | | Duty Cycle (%): 100 | | | | | | | | | | | |
| Data Rate: 1 MBit/s | | | | Antenna Gain (dBi): 0 | | | | | | | | | | | |
| Modulation: CCK | | | | Beam Forming Gain (Y): N/A | | | | | | | | | | | |
| TPC: Maximum Power | | | | | | | | | | | | | | | |
| Engineering Test Notes: | | | | | | | | | | | | | | | |
| SPLITTABLE!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 | -41.986 | -10.63 | -42.680 | -11.35 | -42.017 | -11.55 | | | | | | | | |
| 2437.0 | 30.0 - 26000.0 | -40.656 | -11.08 | -40.321 | -11.21 | -43.514 | -12.02 | | | | | | | | |
| 2462.0 | 30.0 - 26000.0 | -41.777 | -11.92 | -41.550 | -12.59 | -41.490 | -11.23 | | | | | | | | |
| - | | | | | | | | | | | | | | | |
| 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 | -37.063 | -10.01 | -36.308 | -11.59 | -36.501 | -10.78 | | | | | | | | |
| 2462.0 | 2483.5 | -43.768 | -10.30 | -45.332 | -10.91 | -45.431 | -10.33 | | | | | | | | |
| - | | | | | | | | | | | | | | | |
| BE - Maximum band-edge emission found | | | | | | | | | | | | | | | |
| SPLITTABLE!Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | | | | | |
| Work Instruction: | | WI-05 Measurement of Spurious Emissions | | | | | | | | | | | | | |
| Measurement Uncertainty: | | $\leq 40 \text{ GHz} \pm 2.37 \text{ dB}$ | | | | | | | | | | | | | |
| - | | | | | | | | | | | | | | | |

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3x3 802.11g

| Equipment Configuration for Transmitter Conducted Spurious and Band-Edge Emissions | | | | | | | | | | | | | | | | | |
|--|---------------------|---|--------|------------------------|--------|---------|--------|--------|-------|--|--|--|--|--|--|--|--|
| Variant: | | 802.11g | | Duty Cycle (%): | | 100 | | | | | | | | | | | |
| Data Rate: | | 6 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 | 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 | -40.907 | -15.89 | -41.792 | -16.57 | -41.012 | -14.76 | | | | | | | | | | |
| 2437.0 | 30.0 - 26000.0 | -41.342 | -15.49 | -40.213 | -17.00 | -43.371 | -15.25 | | | | | | | | | | |
| 2462.0 | 30.0 - 26000.0 | -41.073 | -17.12 | -40.449 | -17.39 | -40.924 | -14.67 | | | | | | | | | | |
| - | | | | | | | | | | | | | | | | | |
| 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 | -25.149 | -14.84 | -27.102 | -15.52 | -26.719 | -14.64 | | | | | | | | | | |
| 2462.0 | 2483.5 | -41.289 | -15.44 | -40.620 | -15.53 | -41.022 | -14.57 | | | | | | | | | | |
| - | | | | | | | | | | | | | | | | | |
| BE - Maximum band-edge emission found | | | | | | | | | | | | | | | | | |
| Traceability to Industry Recognized Test Methodologies | | | | | | | | | | | | | | | | | |
| Work Instruction: | | WI-05 Measurement of Spurious Emissions | | | | | | | | | | | | | | | |
| Measurement Uncertainty: | | $\leq 40 \text{ GHz} \pm 2.37 \text{ dB}$ | | | | | | | | | | | | | | | |
| - | | | | | | | | | | | | | | | | | |

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3x3 802.11n HT-20

| Equipment Configuration for Transmitter Conducted Spurious and Band-Edge Emissions | | | | | | | | | | | | | | | | | |
|--|---------------------|---|--------|---------|--------|------------------------|--------|--------|-------|--|--|--|--|--|--|--|--|
| Variant: | | 802.11n HT-20 | | | | 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: | | $\leq 40 \text{ GHz} \pm 2.37 \text{ dB}$ | | | | | | | | | | | | | | | |

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Title: AP0127450, AP0127460
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: RDWN14-U1 Rev A
Issue Date: 12th December 2012
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3x3 802.11n HT-40

| Equipment Configuration for Transmitter Conducted Spurious and Band-Edge Emissions | | | | | | | | | | | | | | | |
|--|---------------------|---|--------|------------------------|--------|---------|--------|--------|-------|--|--|--|--|--|--|
| Variant: | | 802.11n HT-40 | | 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: | | $\leq 40 \text{ GHz} \pm 2.37 \text{ dB}$ | | | | | | | | | | | | | |

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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. |

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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 dB μ V; 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:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3 \text{ dB}\mu\text{V/m}$$

Conversion between dB μ V/m (or dB μ V) and μ V/m (or μ V) are done as:

$$\text{Level (dB}\mu\text{V/m)} = 20 * \text{Log} (\text{level (}\mu\text{V/m)})$$

$$40 \text{ dB}\mu\text{V/m} = 100 \mu\text{V/m}$$

$$48 \text{ dB}\mu\text{V/m} = 250 \mu\text{V/m}$$



Title: AP0127450, AP0127460
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: RDWN14-U1 Rev A
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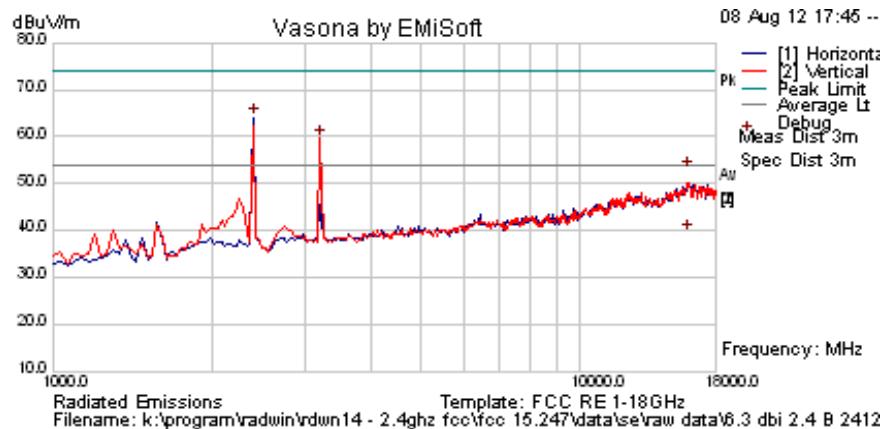
NOTE: KDB 662911 was implemented for Out-of-Band measurements. Where necessary Option (2) Measure and add 10 log (N) dB was implemented

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Antenna #1 6.3 dBi 3x3

3x3 802.11b 2412 MHz

| | | | |
|----------------------|----------------------|-----------------------|------|
| Test Freq. | 2412 MHz | Engineer | JMH |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 38 |
| Power Setting | 17 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi x3 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |

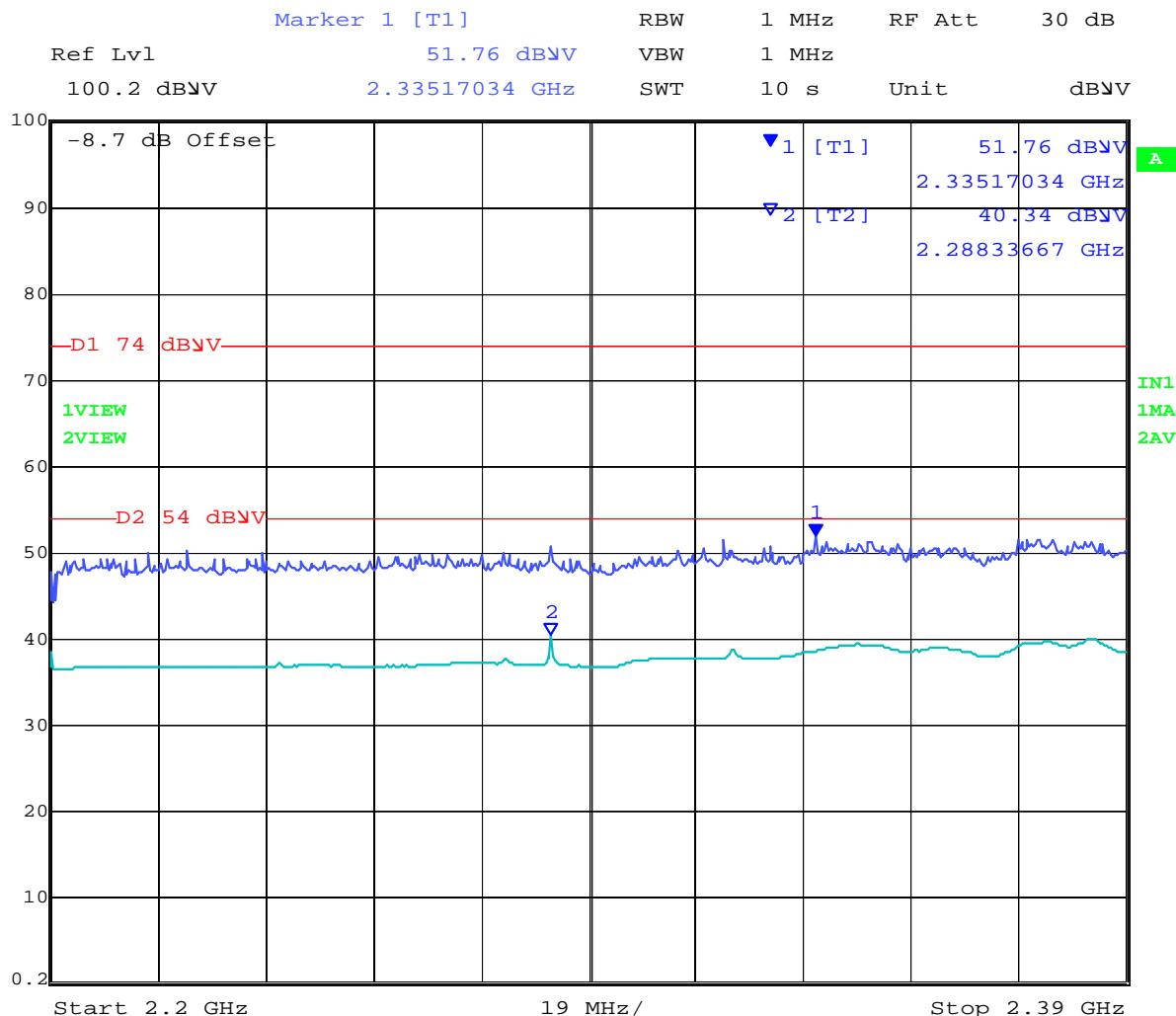


Formally measured emission peaks

| 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 |
|--|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 2414.830 | 72.8 | 3.0 | -11.6 | 64.2 | Peak [Scan] | H | 150 | 0 | | | | FUND |
| 3216.062 | 68.0 | 3.5 | -11.9 | 59.6 | Peak [Scan] | V | 100 | 0 | | | | NRB |
| 15955.912 | 43.8 | 9.0 | 0.0 | 52.7 | Peak Max | H | 137 | 282 | 74 | -21.3 | Pass | RB |
| 15955.912 | 30.6 | 9.0 | 0.0 | 39.5 | Average Max | H | 137 | 282 | 54 | -14.5 | 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 | | | | | | | | | | | | |

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3x3 802.11b 2390 MHz Band Edge ART=17

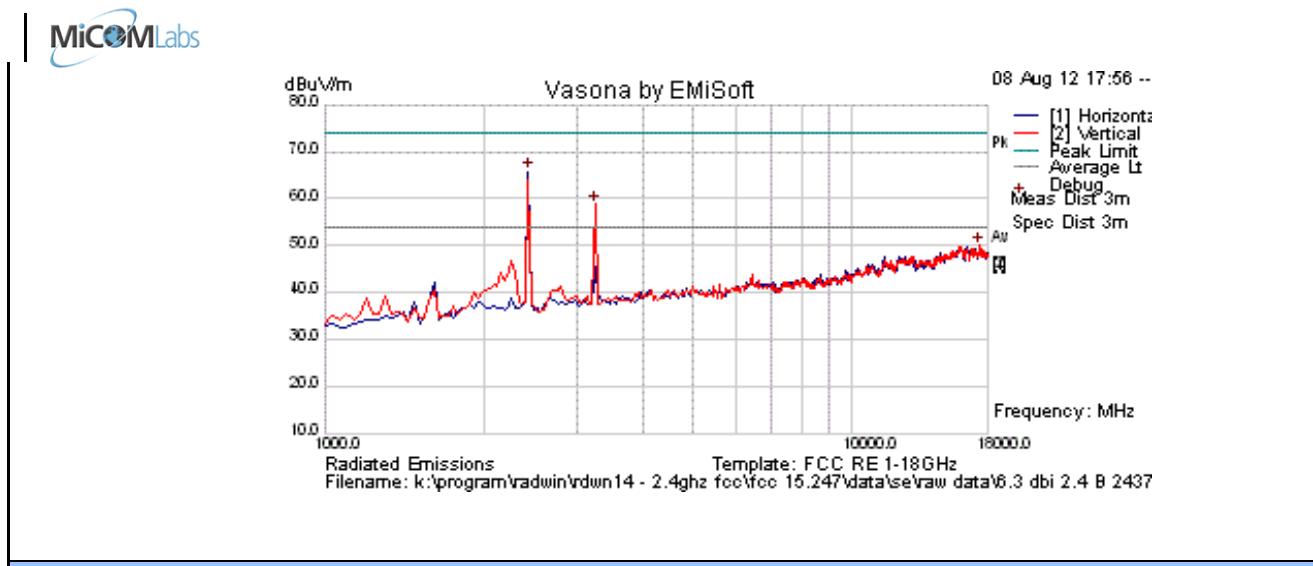


Date: 8.AUG.2012 18:46:38

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3x3 802.11b 2437 MHz

| | | | |
|---------------|----------------------|----------------|------|
| Test Freq. | 2437 MHz | Engineer | JMH |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 38 |
| Power Setting | 17 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi x3 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |



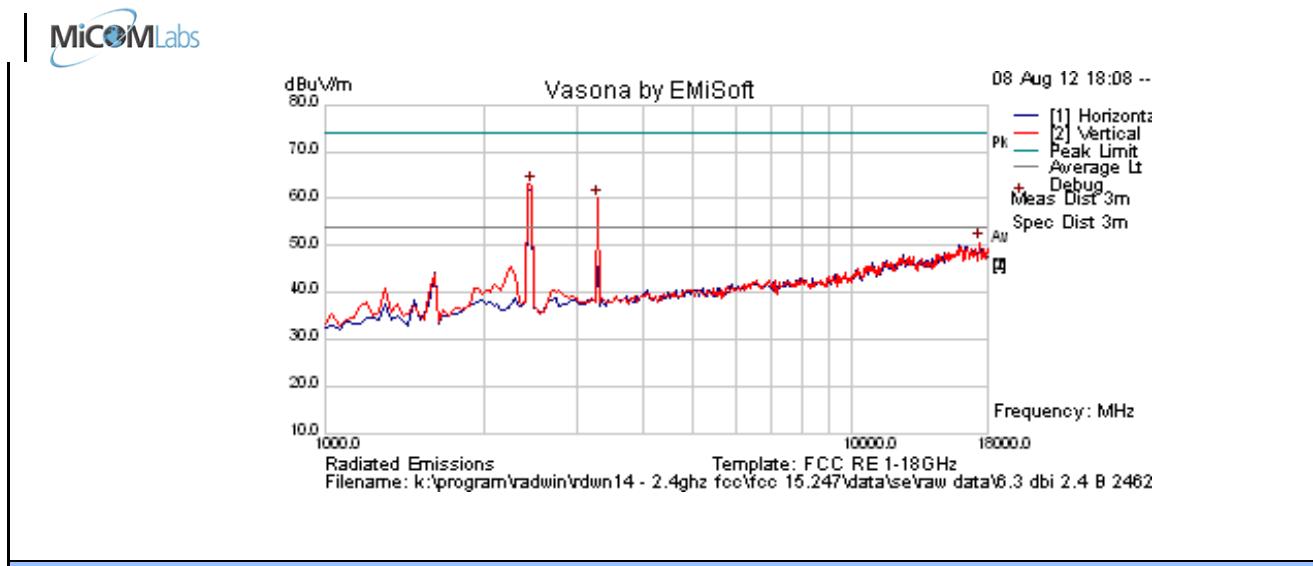
Formally measured emission peaks

| 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 |
|---|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 2430.862 | 74.2 | 3.0 | -11.6 | 65.6 | Peak [Scan] | H | 150 | 0 | | | | FUND |
| 3249.289 | 67.2 | 3.5 | -11.9 | 58.9 | Peak [Scan] | V | 100 | 0 | | | Pass | NRB |
| 17420.842 | 40.1 | 8.7 | 1.3 | 50.1 | Peak [Scan] | V | 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 | | | | | | | | | | | | |

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3x3 802.11b 2462 MHz

| | | | |
|---------------|----------------------|----------------|------|
| Test Freq. | 2462 MHz | Engineer | JMH |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 38 |
| Power Setting | 17 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi x3 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |

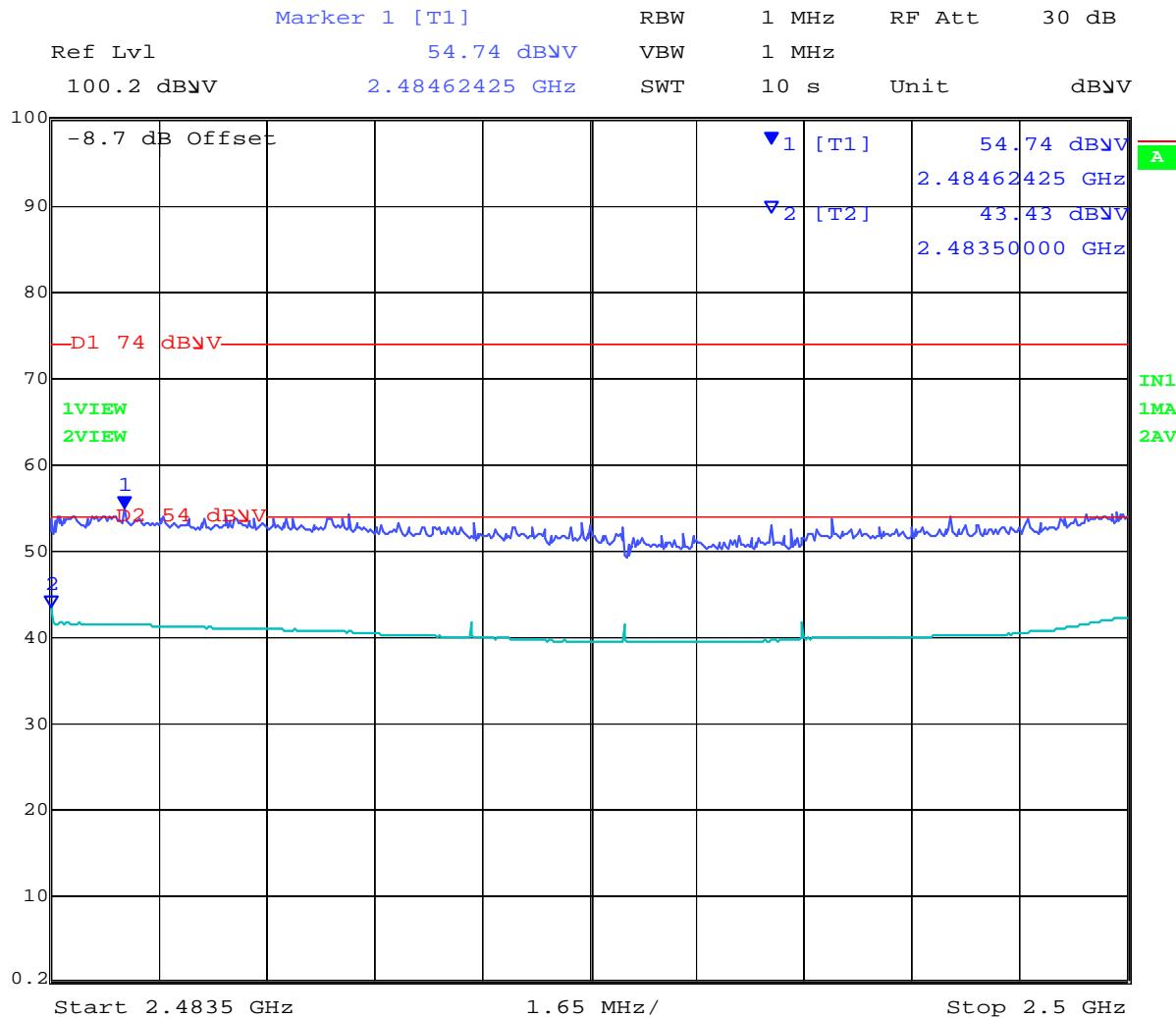


Formally measured emission peaks

| 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 |
|---|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|---|
| 2459.479 | 71.5 | 3.0 | -11.5 | 63.0 | Peak [Scan] | V | 150 | 0 | | | | FUND |
| 3282.715 | 68.4 | 3.5 | -11.8 | 60.1 | Peak [Scan] | V | 100 | 0 | | | Pass | NRB |
| 17420.842 | 40.6 | 8.7 | 1.3 | 50.6 | Peak [Scan] | V | 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 | | | | | | | | | | | | |

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3x3 802.11b 2483.5 MHz Band Edge ART =17

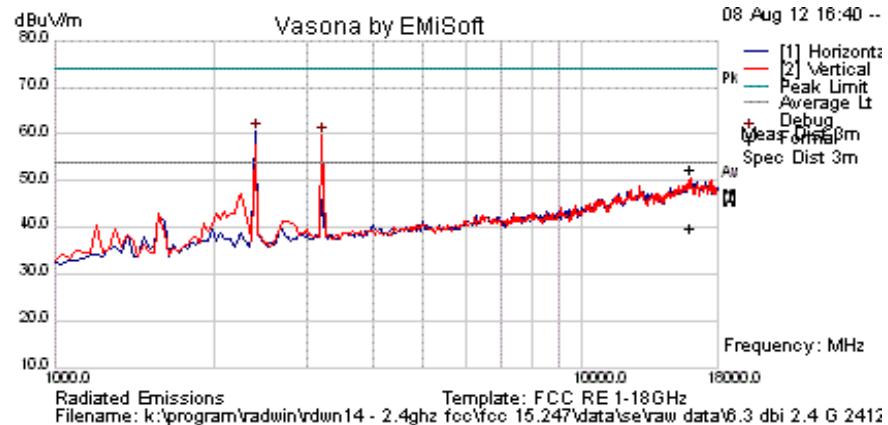


Date: 8.AUG.2012 18:45:13

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3x3 802.11g 2412 MHz

| | | | |
|----------------------|----------------------|-----------------------|------|
| Test Freq. | 2412 MHz | Engineer | JMH |
| Variant | 802.11g; 6 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum.(%) | 38 |
| Power Setting | 14 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi Ant x3 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |

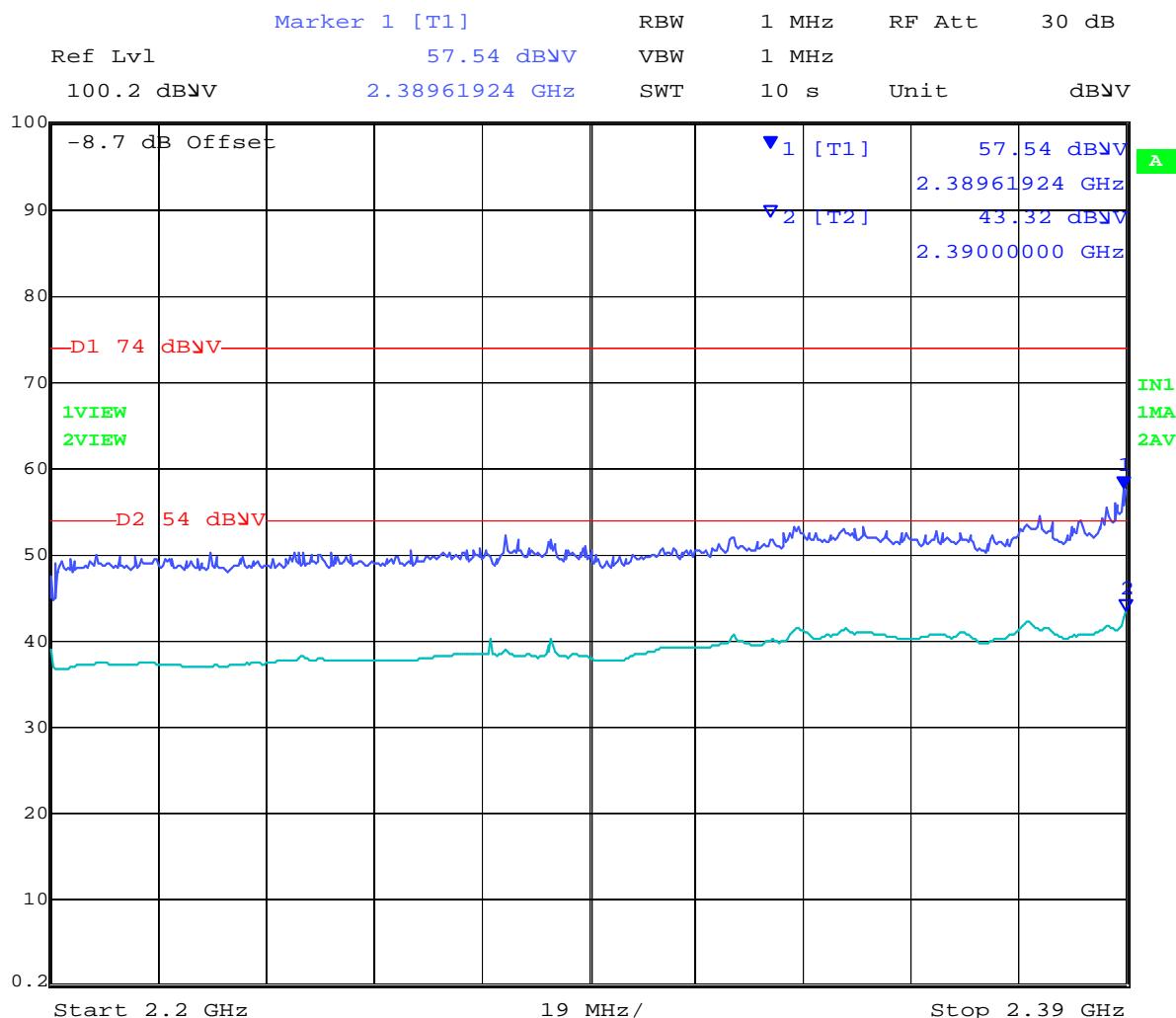


Formally measured emission peaks

| 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 |
|--|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 2417.395 | 69.1 | 3.0 | -11.6 | 60.5 | Peak [Scan] | H | 150 | 0 | | | | FUND |
| 3216.122 | 68.0 | 3.5 | -11.9 | 59.6 | Peak [Scan] | V | 100 | 0 | | | | NRB |
| 15989.980 | 43.5 | 9.0 | 0.1 | 52.6 | Peak Max | V | 197 | 66 | 74 | -21.4 | Pass | RB |
| 15989.980 | 30.6 | 9.0 | 0.1 | 39.7 | Average Max | V | 197 | 66 | 54 | -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 | | | | | | | | | | | | |

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3x3 802.11g 2483.5 MHz Band Edge ART =14

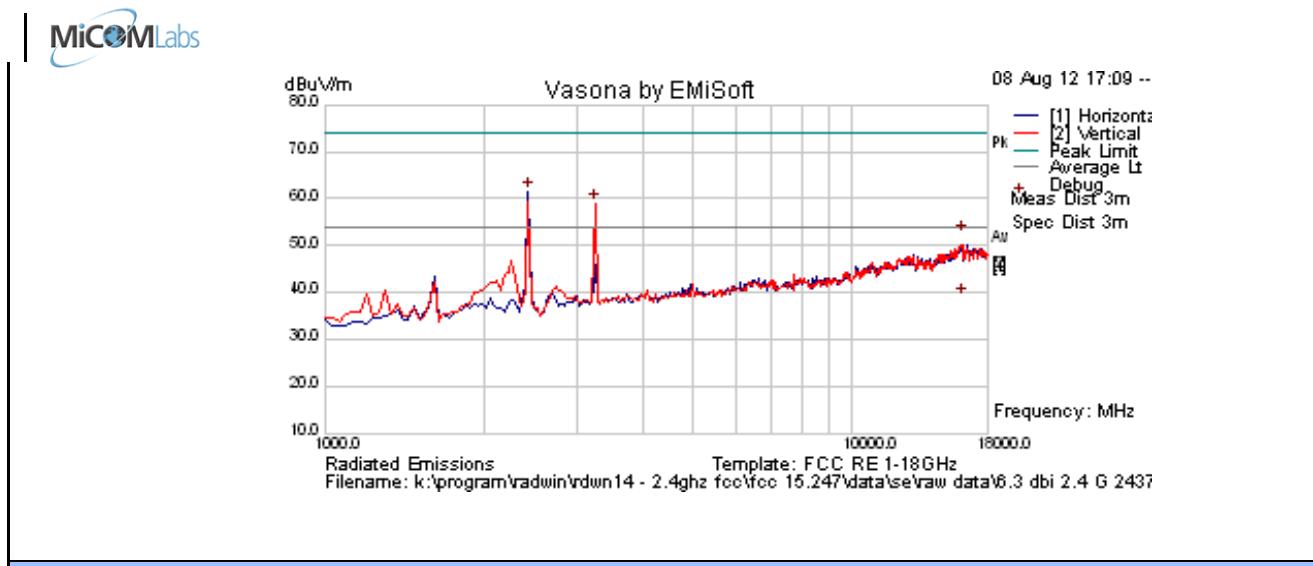


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3x3 802.11g 2437 MHz

| | | | |
|---------------|----------------------|----------------|------|
| Test Freq. | 2437 MHz | Engineer | JMH |
| Variant | 802.11g; 6 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 38 |
| Power Setting | 14 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi Ant x3 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |



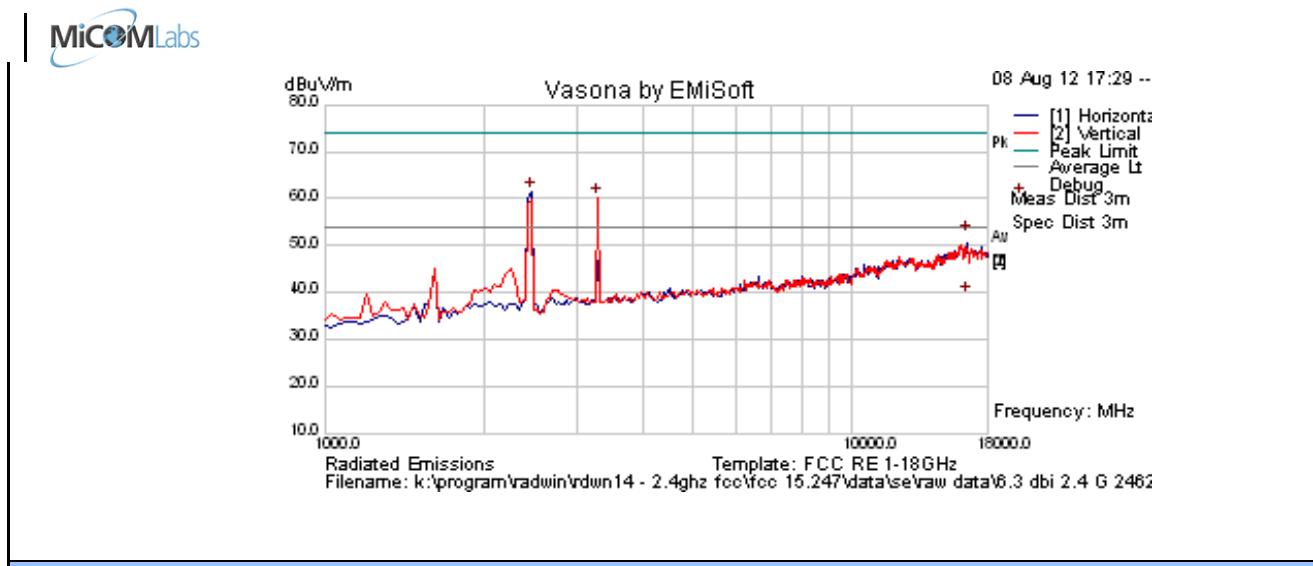
Formally measured emission peaks

| 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 |
|--|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 2430.862 | 70.2 | 3.0 | -11.6 | 61.6 | Peak [Scan] | H | 150 | 0 | | | | FUND |
| 3249.329 | 67.4 | 3.5 | -11.9 | 59.0 | Peak [Scan] | V | 100 | 0 | | | | NRB |
| 16126.253 | 43.0 | 9.0 | 0.2 | 52.2 | Peak Max | V | 124 | 121 | 74 | -21.8 | Pass | RB |
| 16126.253 | 29.9 | 9.0 | 0.2 | 39.1 | Average Max | V | 124 | 121 | 54 | -14.9 | 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 | | | | | | | | | | | | |

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3x3 802.11g 2462 MHz

| | | | |
|---------------|----------------------|----------------|------|
| Test Freq. | 2462 MHz | Engineer | JMH |
| Variant | 802.11g; 6 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 38 |
| Power Setting | 14 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi Ant x3 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |

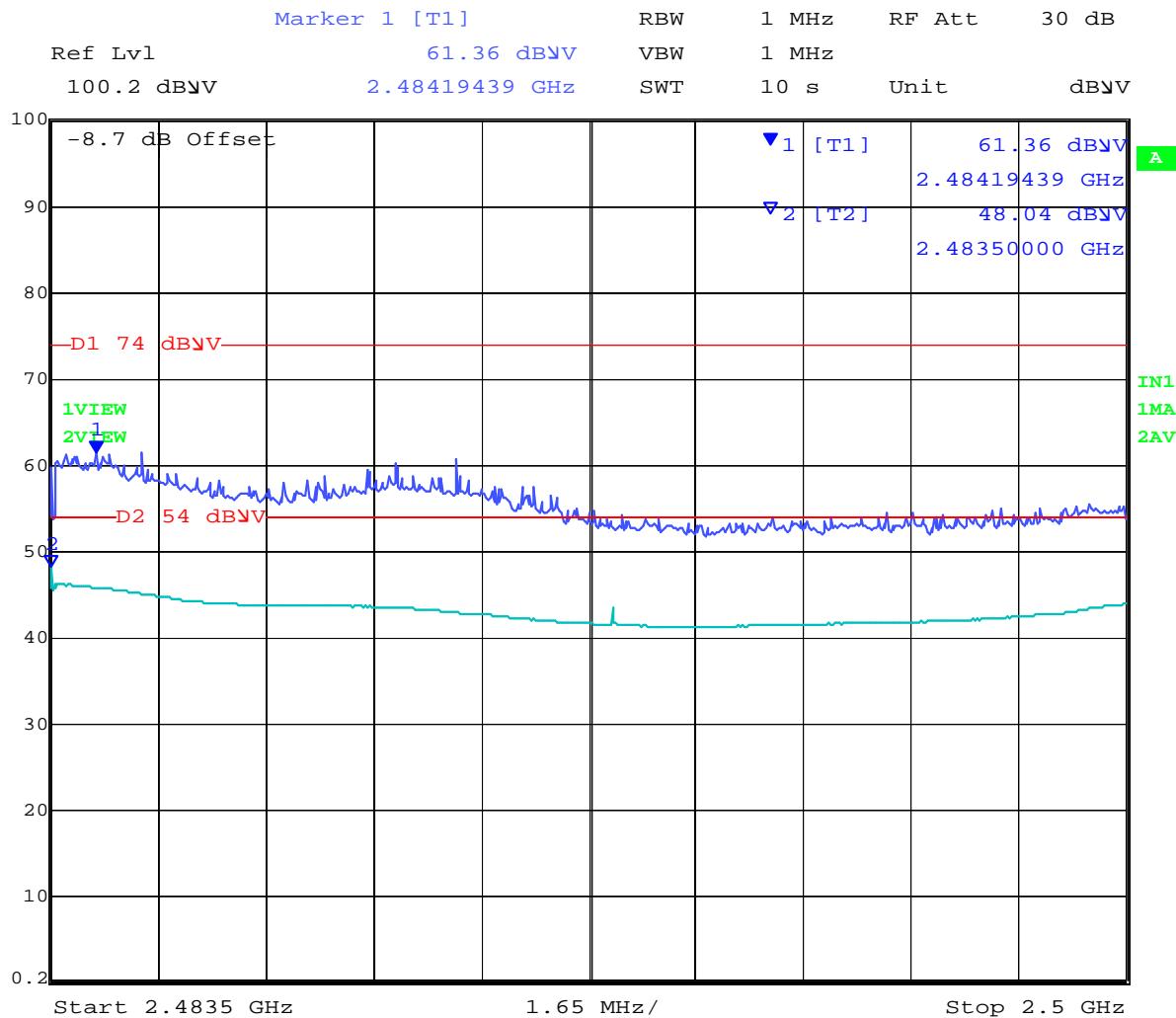


Formally measured emission peaks

| 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 |
|--|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 2464.930 | 70.1 | 3.0 | -11.5 | 61.6 | Peak [Scan] | H | 150 | 0 | | | | FUND |
| 3282.715 | 68.5 | 3.5 | -11.8 | 60.2 | Peak [Scan] | V | 100 | 0 | | | Pass | NRB |
| 16501.002 | 43.4 | 8.8 | 0.3 | 52.6 | Peak Max | H | 200 | 186 | 74 | -21.4 | Pass | RB |
| 16501.002 | 30.4 | 8.8 | 0.3 | 39.5 | Average Max | H | 200 | 186 | 54 | -14.5 | 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 | | | | | | | | | | | | |

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3x3 802.11g 2483.5 MHz Band Edge ART =14

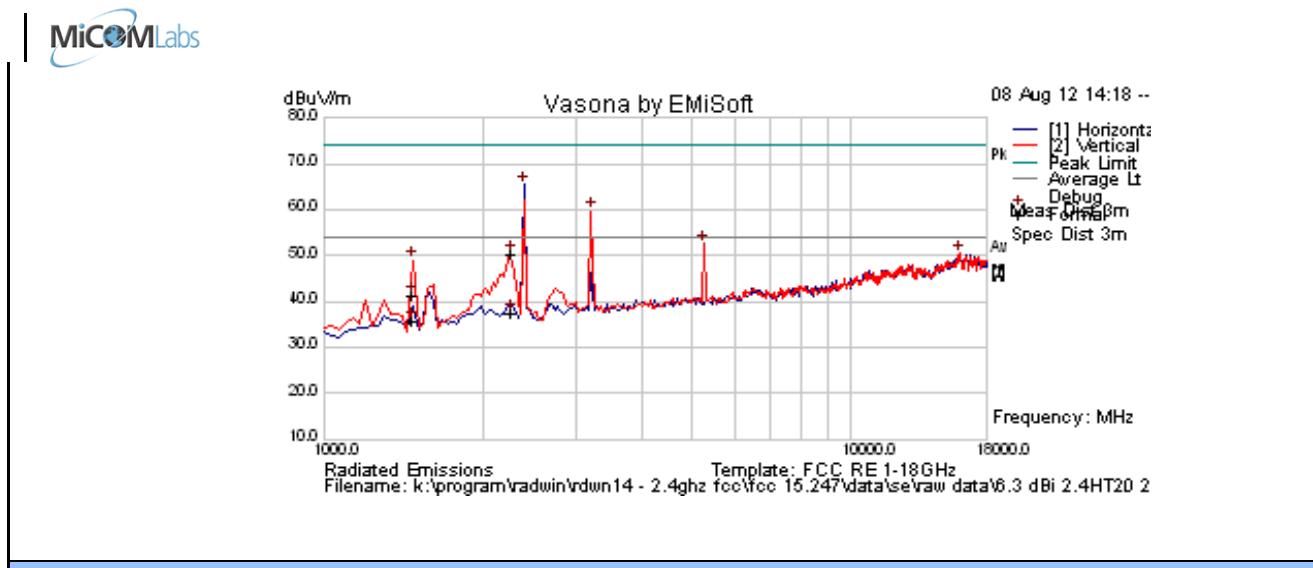


Date: 8.AUG.2012 18:50:42

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3x3 802.11n HT-20 2412 MHz

| | | | |
|---------------|-------------------------|----------------|------|
| Test Freq. | 2412 MHz | Engineer | JMH |
| Variant | 802.11n; HT-20; 6.5 MCS | Temp (°C) | 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 | | | |



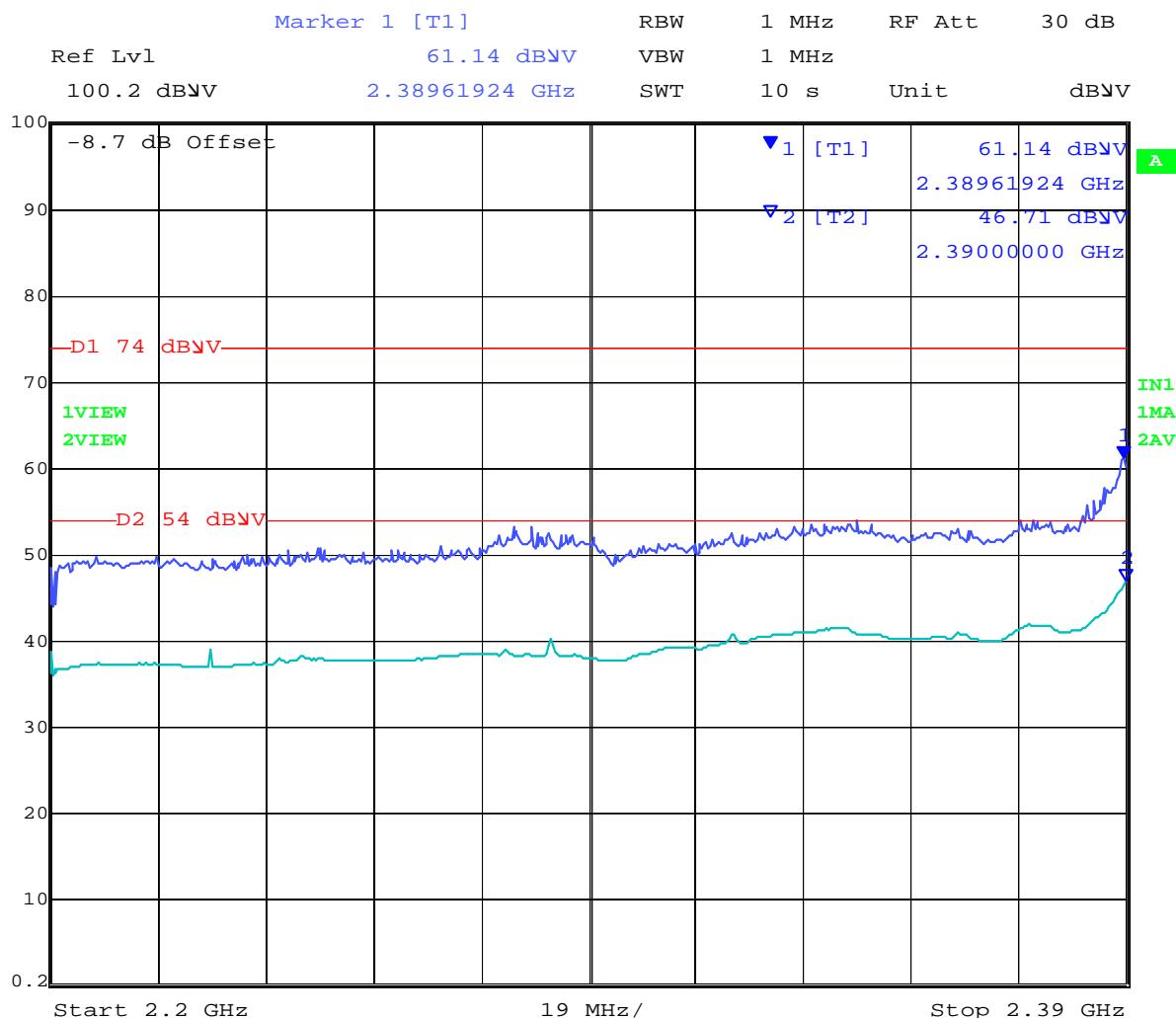
Formally measured emission peaks

| 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

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

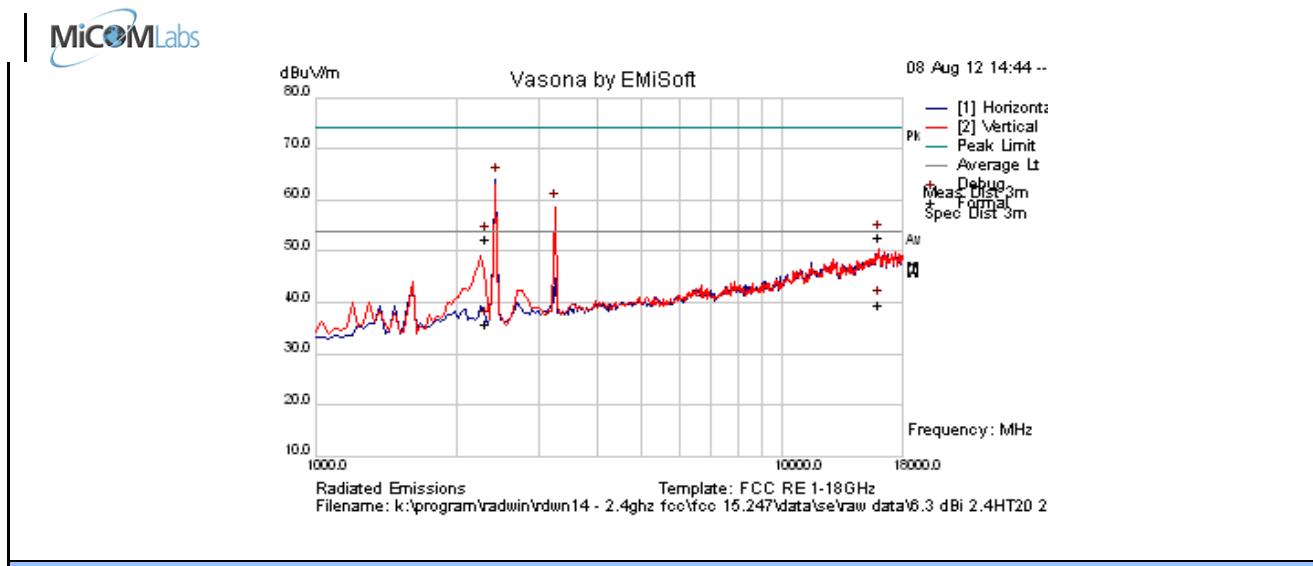


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3x3 802.11n HT-20 2437 MHz

| | | | |
|---------------|-------------------------|----------------|------|
| Test Freq. | 2437 MHz | Engineer | JMH |
| Variant | 802.11n; HT-20; 6.5 MCS | Temp (°C) | 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

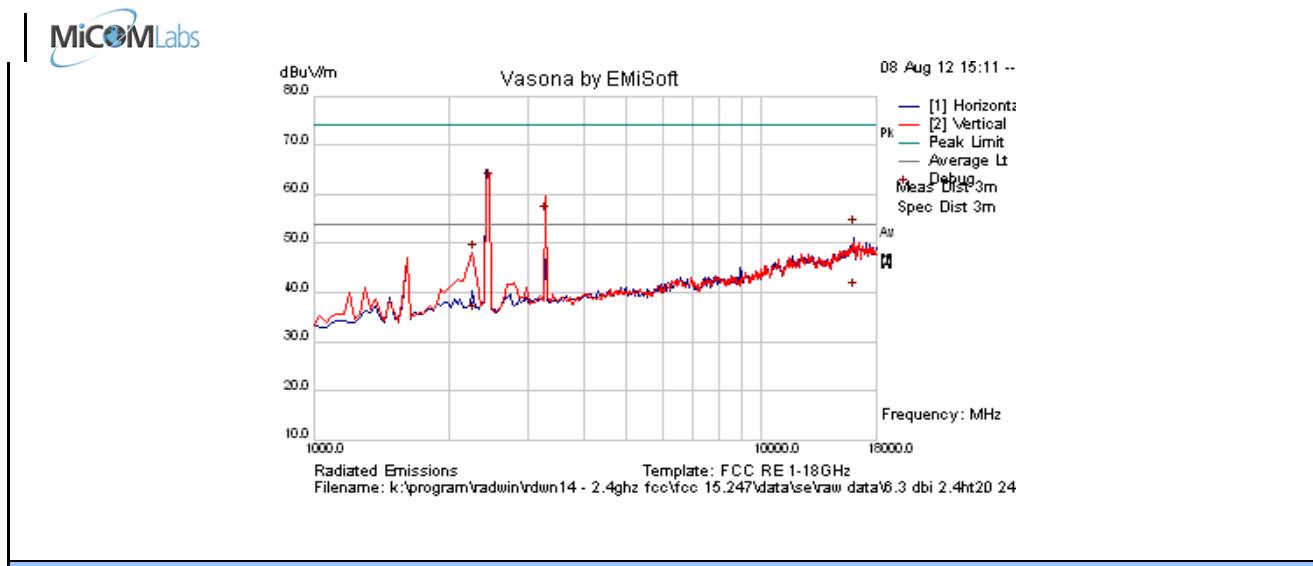
| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail | Comments |
|---------------|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|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

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3x3 802.11n HT-20 2462 MHz

| | | | |
|---------------|-------------------------|----------------|------|
| Test Freq. | 2462 MHz | Engineer | JMH |
| Variant | 802.11n; HT-20; 6.5 MCS | Temp (°C) | 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 | | | |



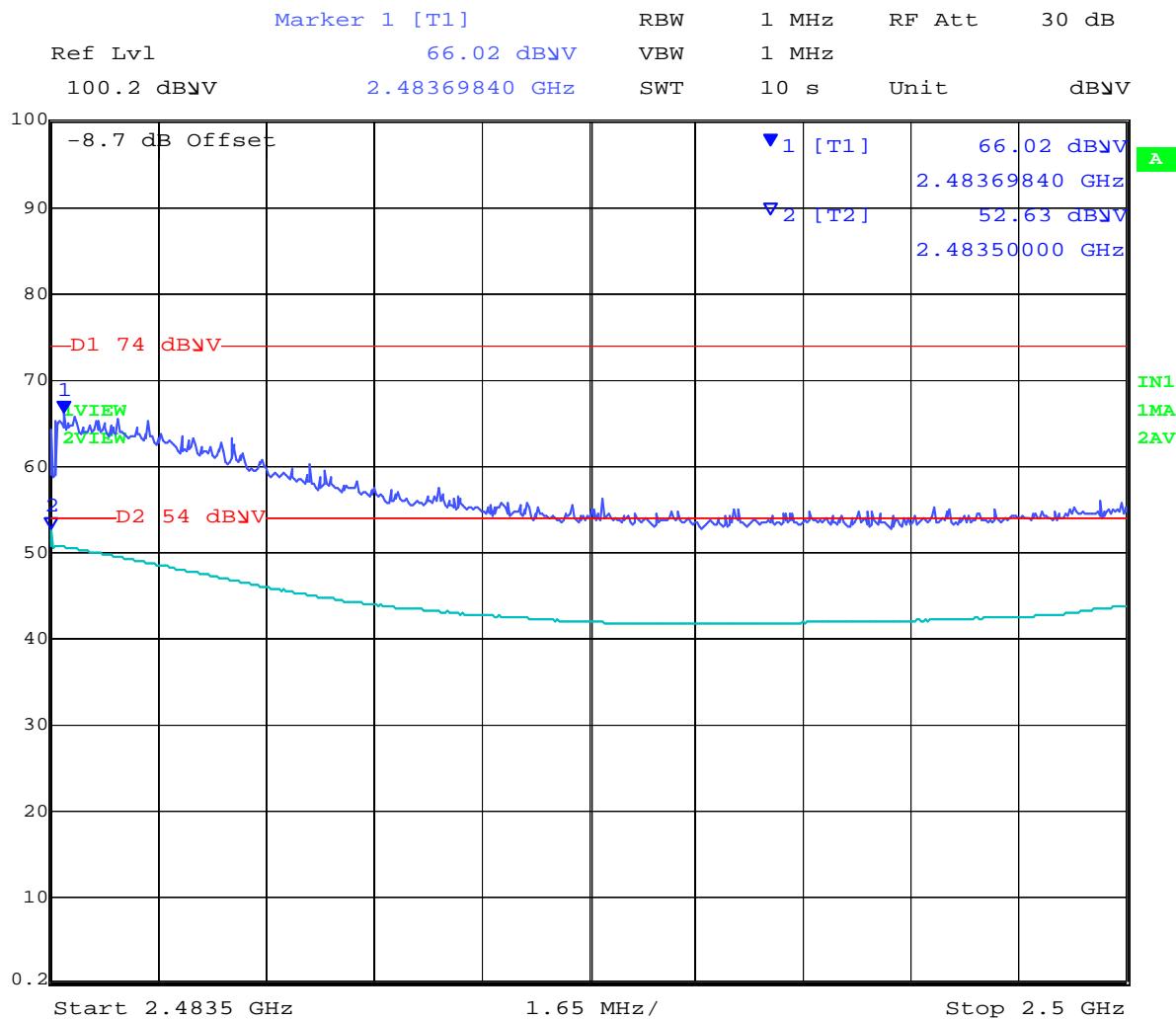
Formally measured emission peaks

| 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

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

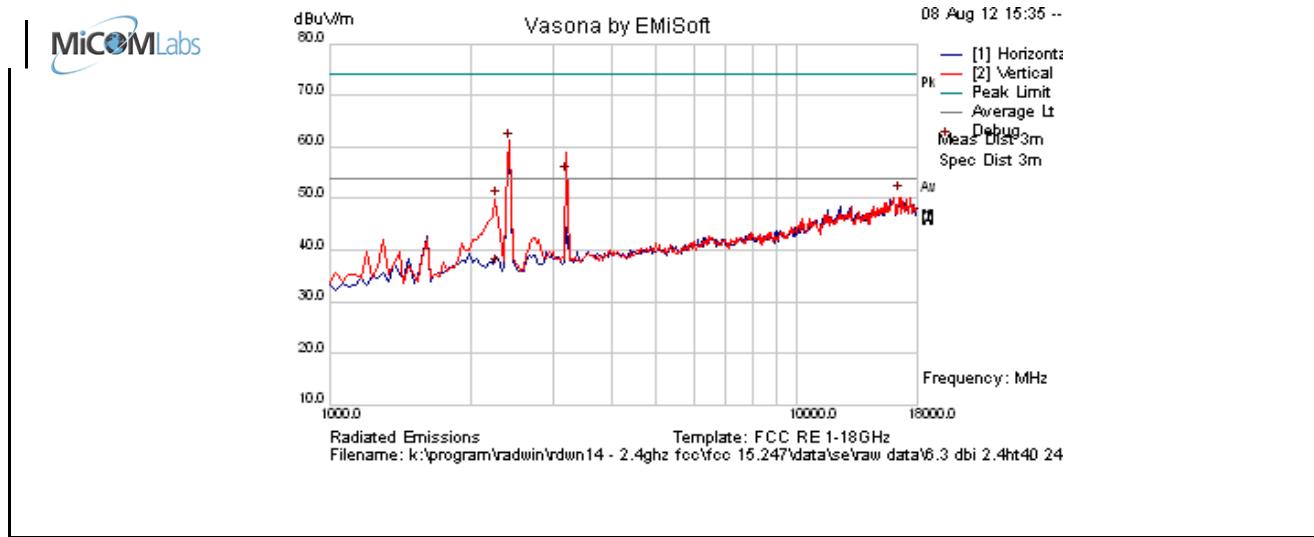


Date: 8.AUG.2012 19:05:46

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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 (°C) | 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 | | | |



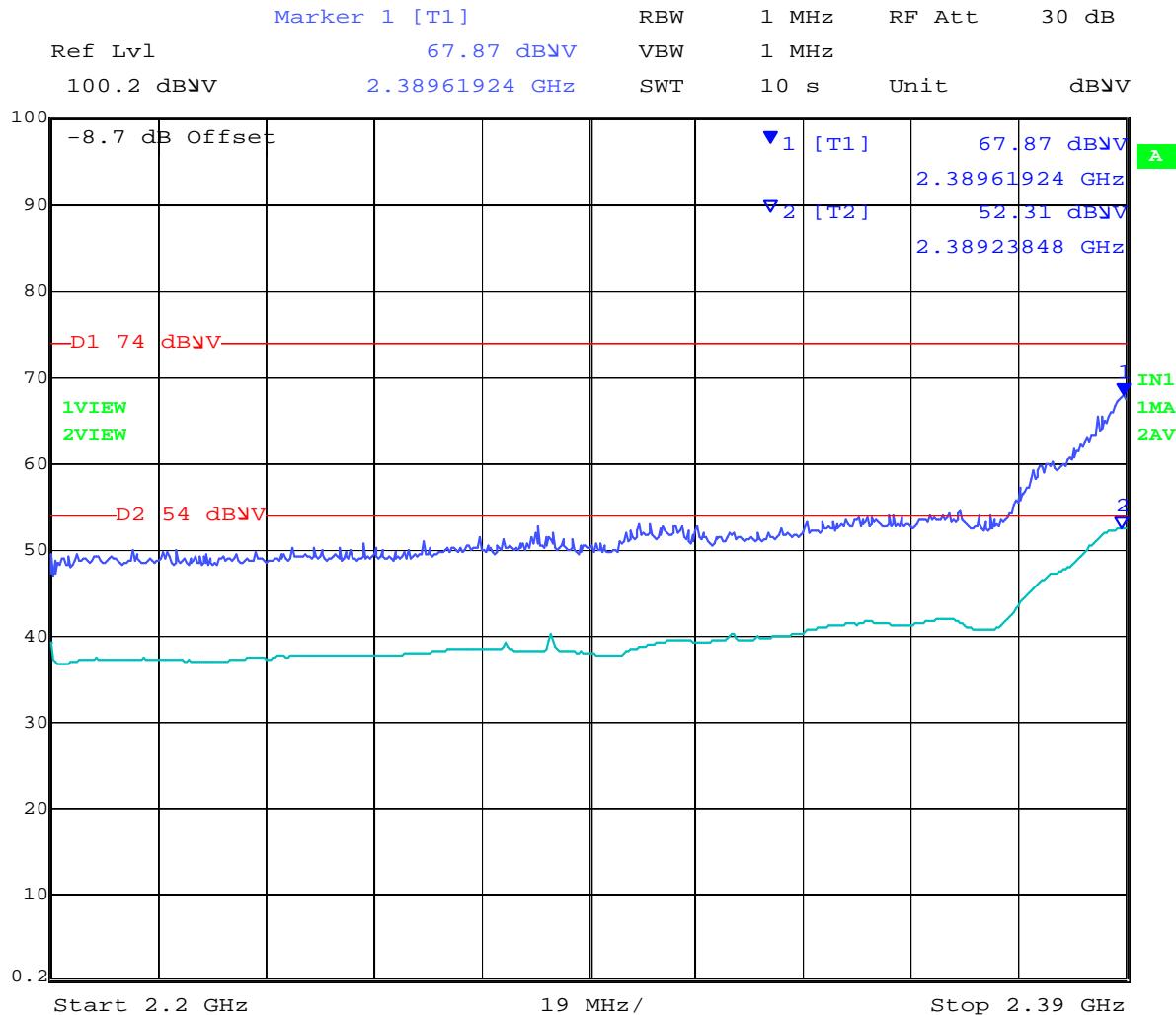
Formally measured emission peaks

| 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

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

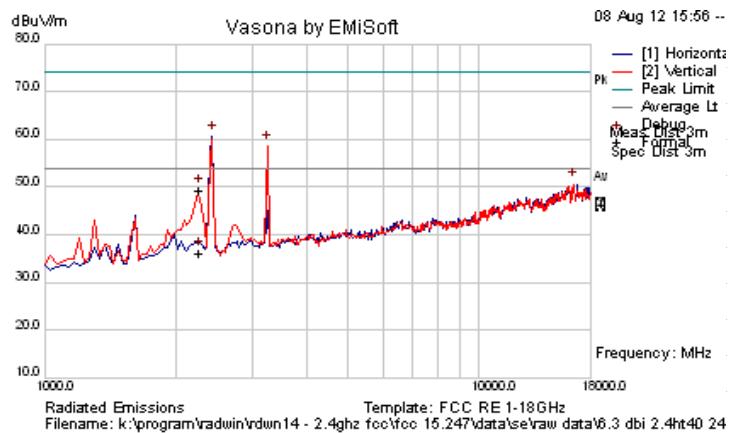


Date: 8.AUG.2012 19:11:52

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3x3 802.11n HT-40 2437 MHz

| | | | |
|---------------|--------------------------|----------------|------|
| Test Freq. | 2437 MHz | Engineer | JMH |
| Variant | 802.11n; HT-40; 13.5 MCS | Temp (°C) | 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 | | | |



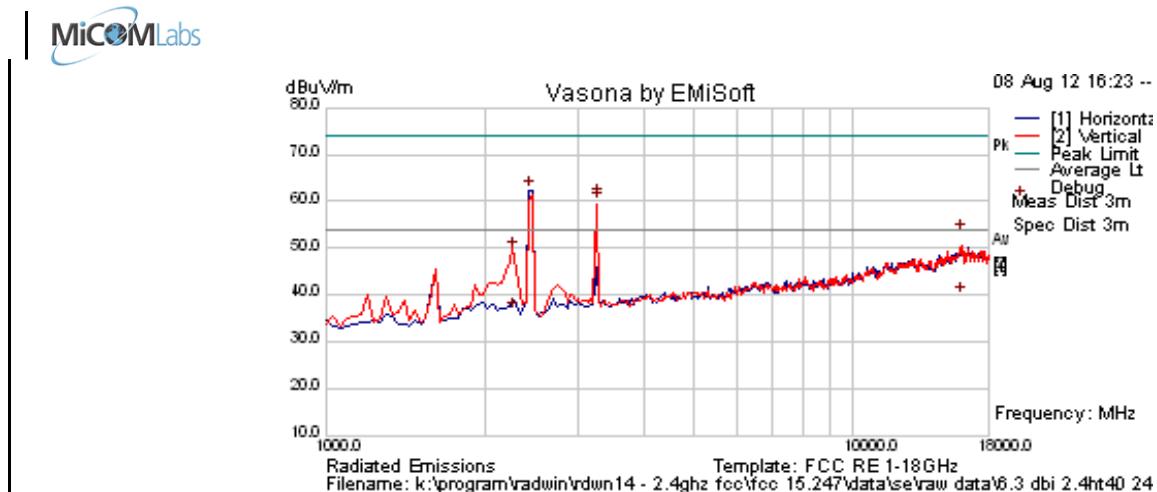
Formally measured emission peaks

| 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 | | | | | | | | | | | | |

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3x3 802.11n HT-40 2452 MHz

| | | | |
|----------------------|--------------------------|-----------------------|------|
| Test Freq. | 2452 MHz | Engineer | JMH |
| Variant | 802.11n; HT-40; 13.5 MCS | Temp (°C) | 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 | | | |

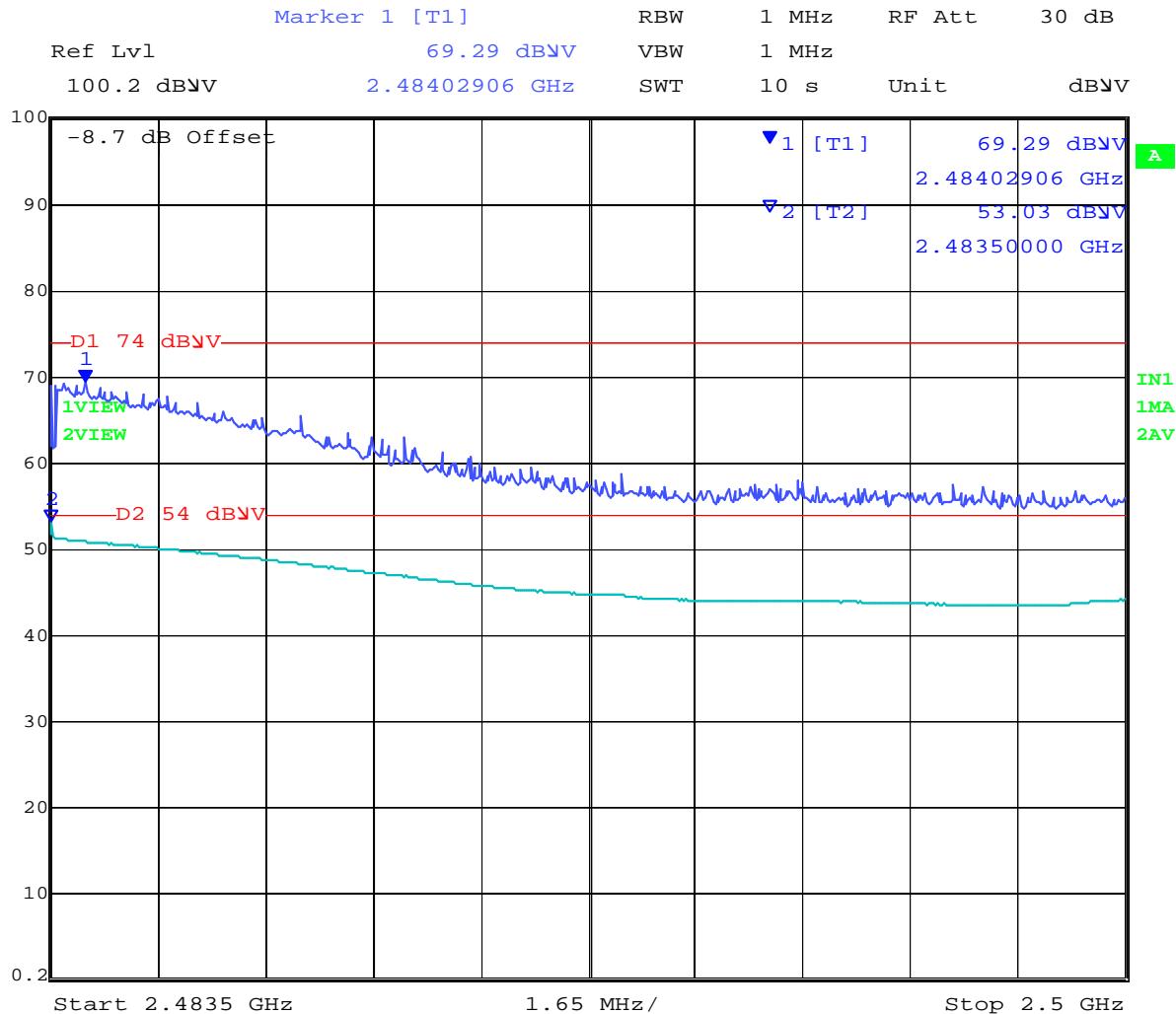


Formally measured emission peaks

| 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 | | | | | | | | | | | | |

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



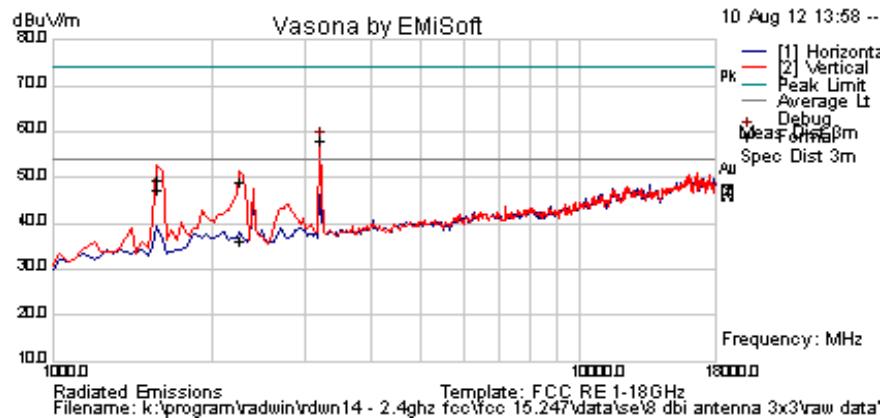
Date: 8.AUG.2012 19:19:26

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Antenna #2 8 dBi 3x3

3x3 802.11b 2412 MHz

| | | | |
|----------------------|----------------------|-----------------------|------|
| Test Freq. | 2412 MHz | Engineer | SB |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 26.6 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 33 |
| Power Setting | 17 | Press. (mBars) | 1012 |
| Antenna | 8 dBi omni | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |



Formally measured emission peaks

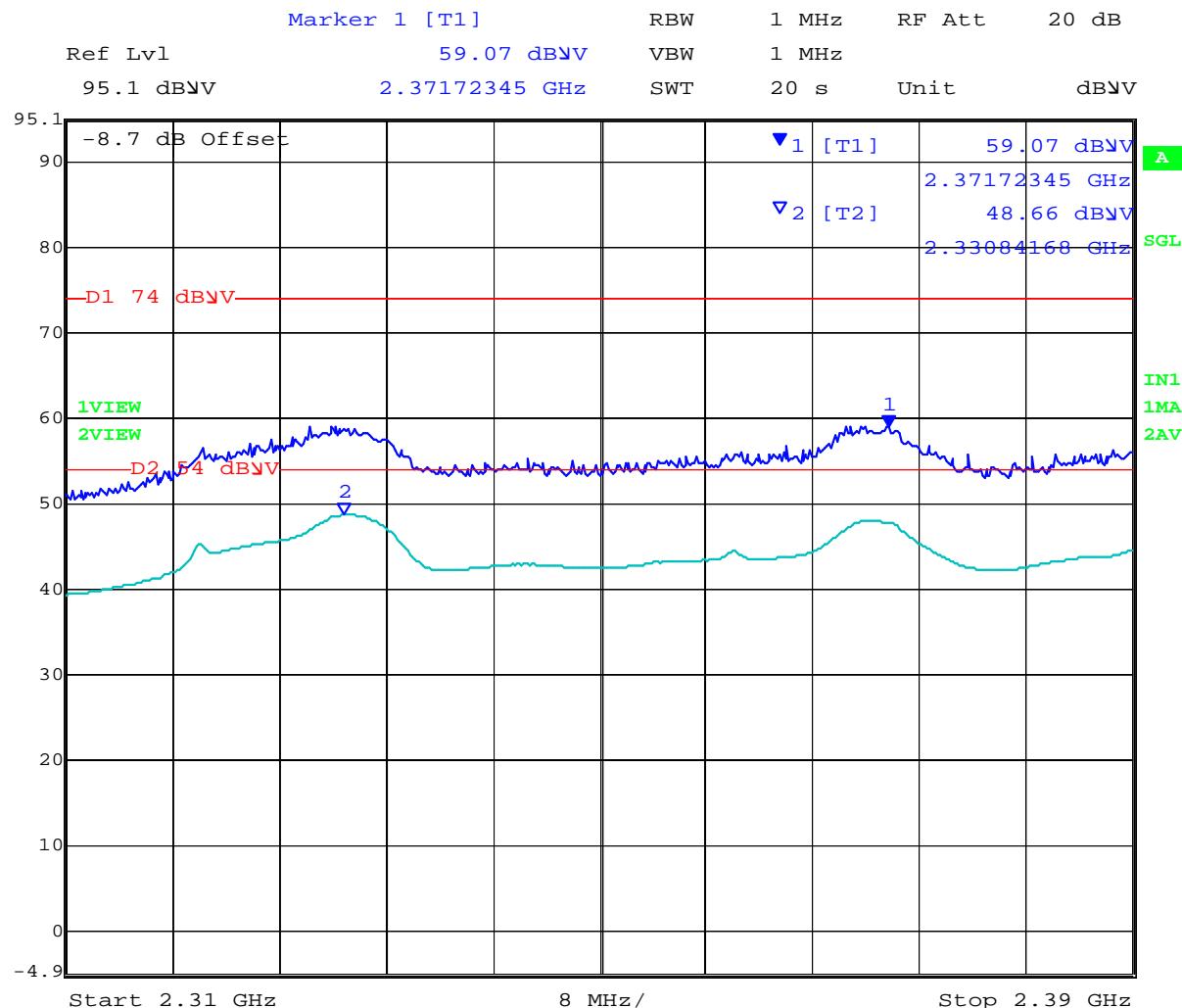
| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail | Comments |
|---------------|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 1583.968 | 62.4 | 2.4 | -15.2 | 49.7 | Peak Max | V | 112 | 302 | 74.0 | -24.3 | Pass | RB |
| 2260.521042 | 58.0 | 2.9 | -11.8 | 49.0 | Peak Max | V | 98 | 256 | 74.0 | -25.0 | Pass | RB |
| 1583.968 | 60.0 | 2.4 | -15.2 | 47.3 | Average Max | V | 112 | 302 | 54 | -6.8 | Pass | RB |
| 2260.521 | 45.0 | 2.9 | -11.8 | 36.1 | Average Max | V | 98 | 256 | 54 | -17.9 | Pass | RB |
| 3215.973 | 66.3 | 3.5 | -11.9 | 57.9 | Peak [Scan] | V | 200 | | | | 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

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3x3 802.11b 2390 MHz Band Edge ART =17

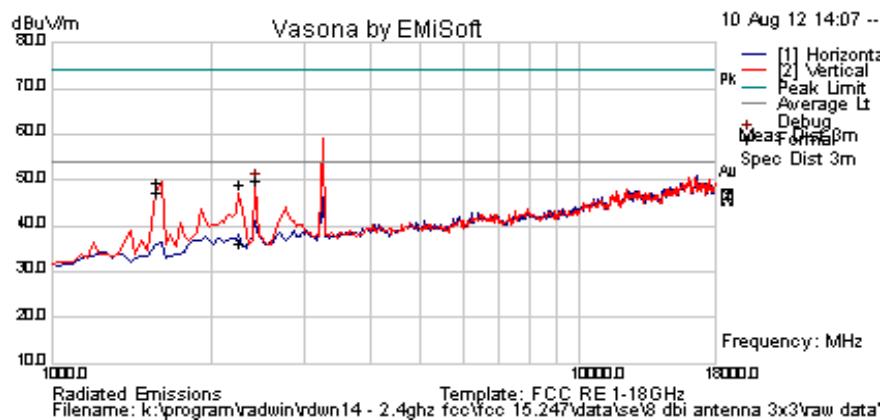


Date: 10.AUG.2012 14:43:32

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3x3 802.11b 2437 MHz

| | | | |
|---------------|----------------------|----------------|------|
| Test Freq. | 2437 MHz | Engineer | SB |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 26.6 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 33 |
| Power Setting | 17 | Press. (mBars) | 1012 |
| Antenna | 8 dBi omni | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |



Formally measured emission peaks

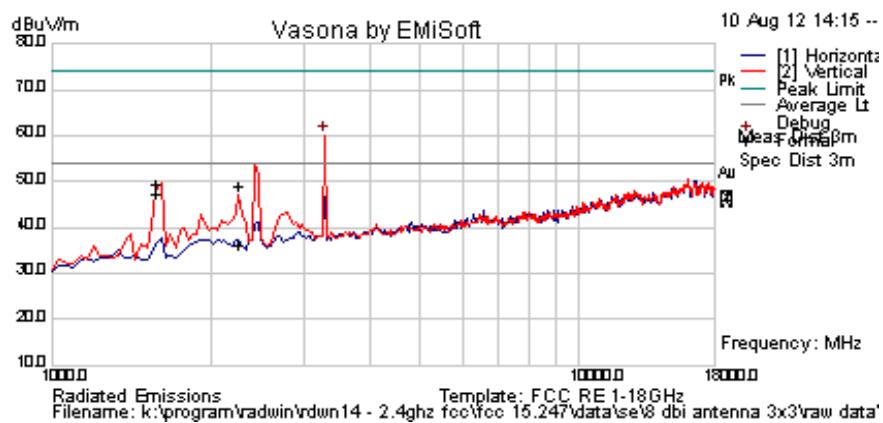
| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail | Comments |
|---------------|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 1583.968 | 62.4 | 2.4 | -15.2 | 49.7 | Peak Max | V | 112 | 302 | 74.0 | -24.3 | Pass | RB |
| 2260.521042 | 58.0 | 2.9 | -11.8 | 49.0 | Peak Max | V | 98 | 256 | 74.0 | -25.0 | Pass | RB |
| 1583.968 | 60.0 | 2.4 | -15.2 | 47.3 | Average Max | V | 112 | 302 | 54 | -6.8 | Pass | RB |
| 2260.521 | 45.0 | 2.9 | -11.8 | 36.1 | Average Max | V | 98 | 256 | 54 | -17.9 | Pass | RB |
| 3215.973 | 66.3 | 3.5 | -11.9 | 57.9 | Peak [Scan] | V | | | | | Pass | NRB |
| 2430.862 | 58.3 | 3.0 | -11.6 | 49.7 | 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

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3x3 802.11b 2462 MHz

| | | | |
|---------------|----------------------|----------------|------|
| Test Freq. | 2462 MHz | Engineer | SB |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 26.6 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 33 |
| Power Setting | 17 | Press. (mBars) | 1012 |
| Antenna | 8 dBi omni | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |

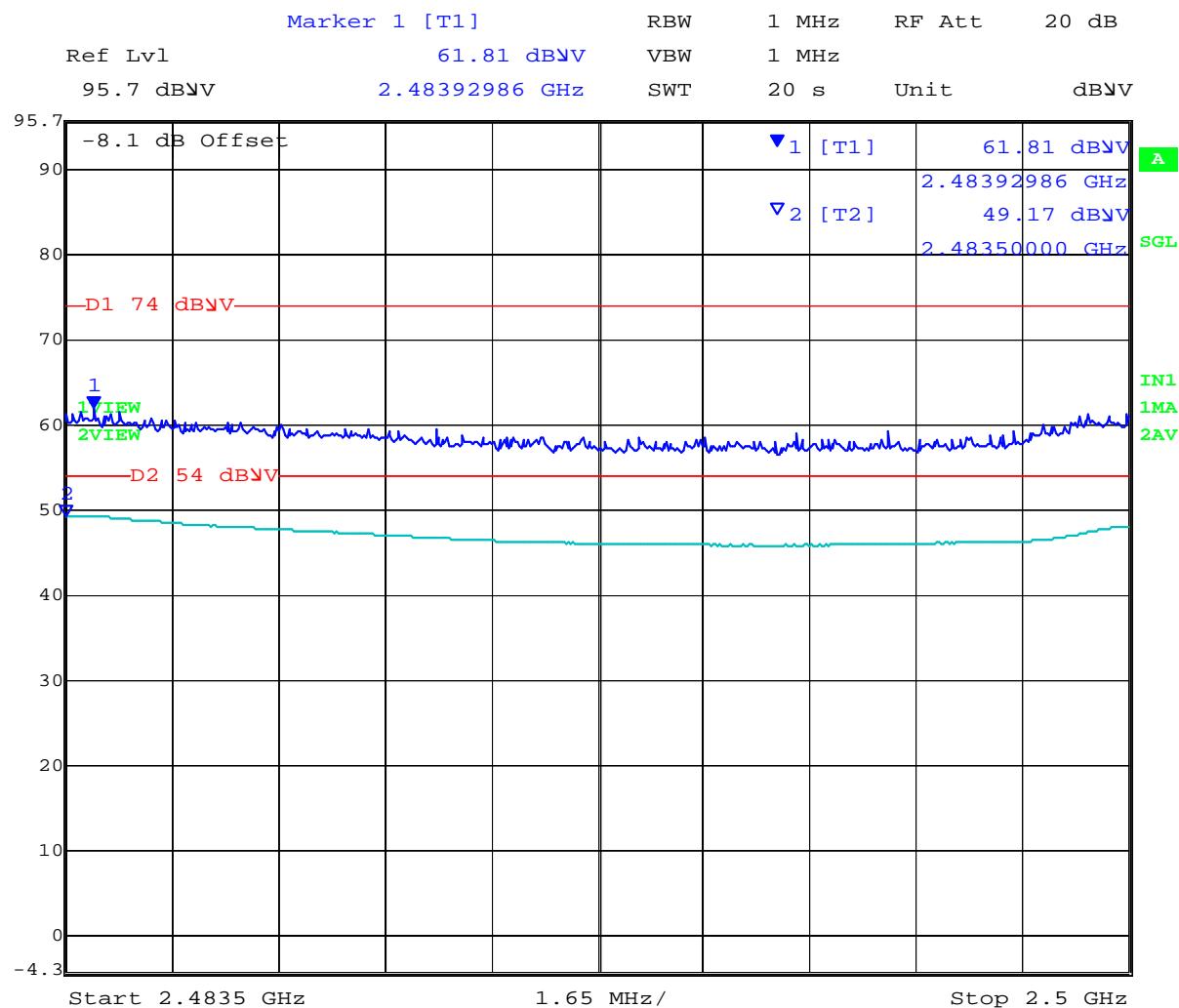


Formally measured emission peaks

| 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 |
|--|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 1583.968 | 62.4 | 2.4 | -15.2 | 49.7 | Peak Max | V | 112 | 302 | 74.0 | -24.3 | Pass | RB |
| 2260.521042 | 58.0 | 2.9 | -11.8 | 49.0 | Peak Max | V | 98 | 256 | 74.0 | -25.0 | Pass | RB |
| 1583.968 | 60.0 | 2.4 | -15.2 | 47.3 | Average Max | V | 112 | 302 | 54 | -6.8 | Pass | RB |
| 2260.521 | 45.0 | 2.9 | -11.8 | 36.1 | Average Max | V | 98 | 256 | 54 | -17.9 | 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 | | | | | | | | | | | | |

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3x3 802.11b 2483.5 MHz Band Edge ART = 17



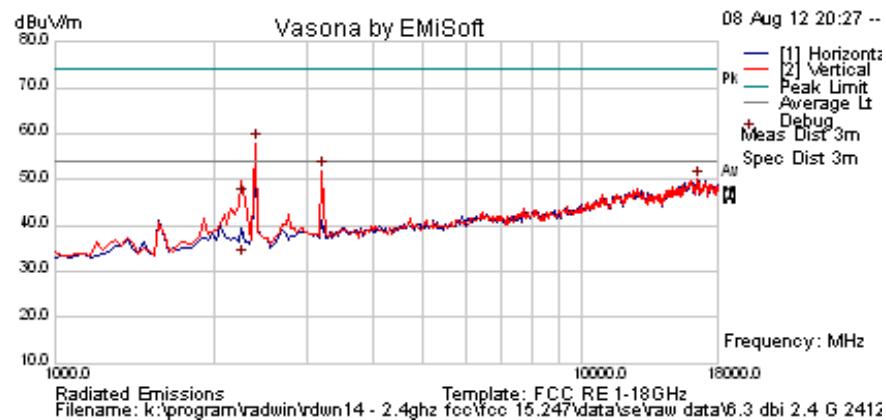
Date: 10.AUG.2012 15:45:11

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Antenna #3 6.3 dBi 2x2

2x2 802.11b 2412 MHz

| | | | |
|----------------------|----------------------|-----------------------|------|
| Test Freq. | 2412 MHz | Engineer | JMH |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 38 |
| Power Setting | 20.5 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi x2 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |

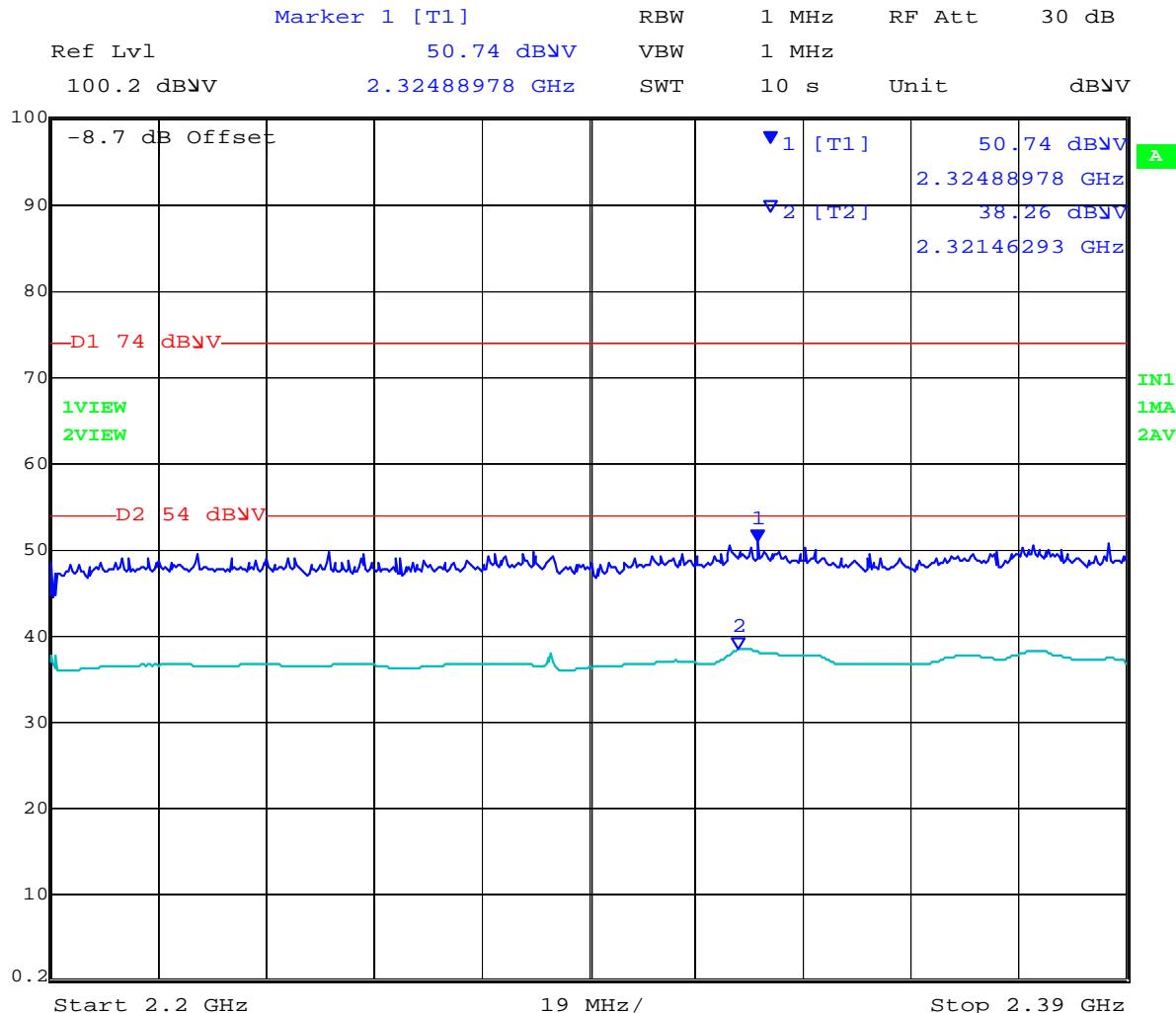


Formally measured emission peaks

| 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 |
|---------------|----------|---|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 2412.585 | 66.6 | 3.0 | -11.6 | 57.9 | Peak [Scan] | V | 150 | 0 | | | | FUND |
| 3215.942 | 60.3 | 3.5 | -11.9 | 52.0 | Peak [Scan] | V | 100 | 0 | | | | Pass NRB |
| 16535.070 | 41.0 | 8.8 | 0.4 | 50.1 | Peak [Scan] | V | 100 | 0 | | | | Pass NRB |
| 2260.521 | 54.9 | 2.9 | -11.8 | 46.0 | Peak Max | V | 187 | 213 | 74 | -28.0 | | Pass |
| 2260.521 | 41.6 | 2.9 | -11.8 | 32.7 | Average Max | V | 187 | 213 | 54 | -21.3 | | Pass |
| <hr/> | | | | | | | | | | | | |
| 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 | | | | | | | | | | |

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2x2 802.11b 2390 MHz Band Edge ART = 20.5

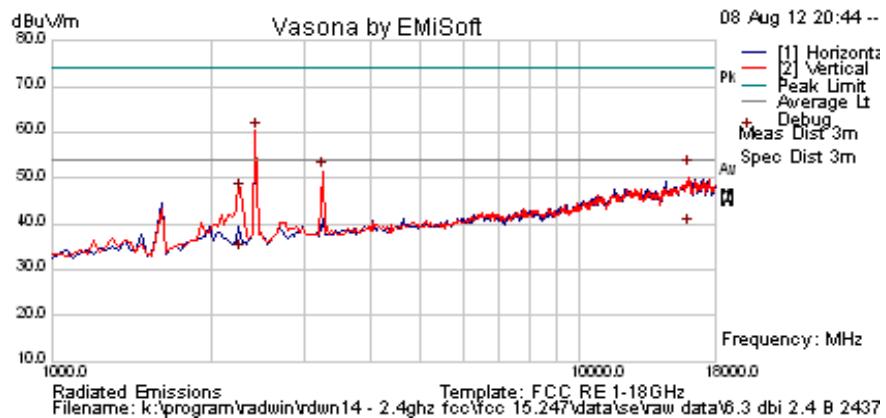


Date: 8.AUG.2012 20:12:05

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2x2 802.11b 2437 MHz

| | | | |
|----------------------|----------------------|-----------------------|------|
| Test Freq. | 2437 MHz | Engineer | JMH |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum.(%) | 38 |
| Power Setting | 20.5 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi x2 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |



Formally measured emission peaks

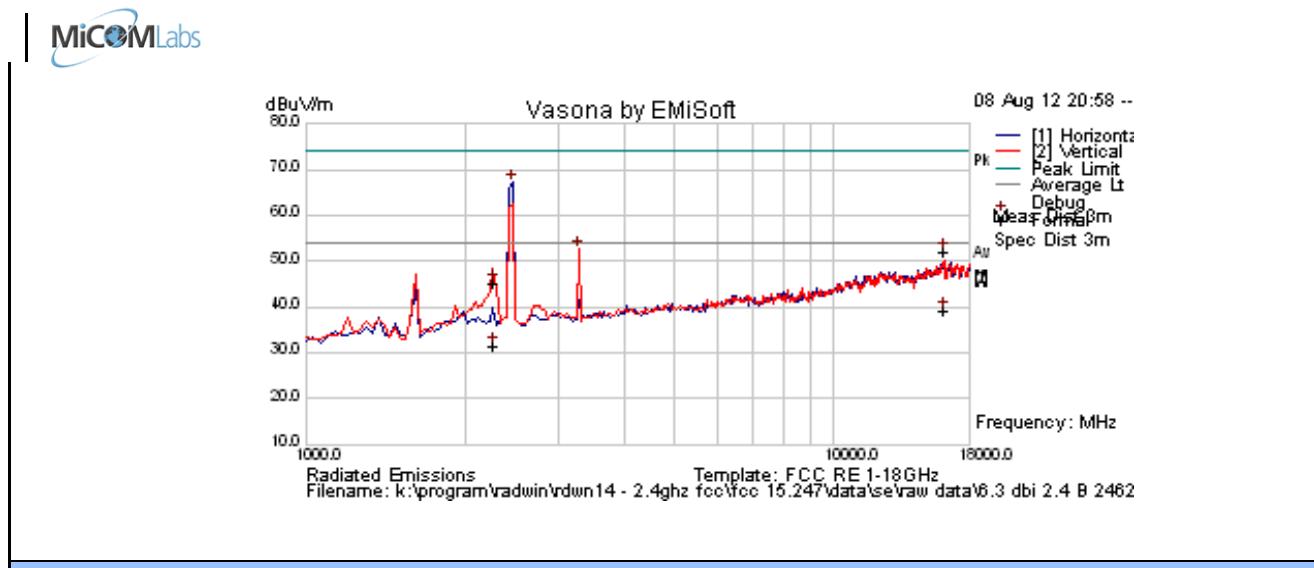
| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail | Comments |
|---------------|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 2435.641 | 69.0 | 3.0 | -11.6 | 60.4 | Peak [Scan] | V | 150 | 0 | | | | FUND |
| 3249.228 | 59.9 | 3.5 | -11.9 | 51.5 | Peak [Scan] | V | 100 | 0 | | | | NRB |
| 16024.048 | 43.0 | 9.0 | 0.2 | 52.3 | Peak Max | V | 161 | 41 | 74.0 | -21.7 | Pass | RB |
| 2270.301 | 56.0 | 2.9 | -11.8 | 47.1 | Peak Max | V | 174 | 91 | 74 | -27.0 | Pass | RB |
| 16024.048 | 30.1 | 9.0 | 0.2 | 39.4 | Average Max | V | 161 | 41 | 54 | -14.6 | Pass | RB |
| 2270.301 | 42.4 | 2.9 | -11.8 | 33.5 | Average Max | V | 174 | 91 | 54 | -20.5 | 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

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2x2 802.11b 2462 MHz

| | | | |
|---------------|----------------------|----------------|------|
| Test Freq. | 2462 MHz | Engineer | JMH |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum.(%) | 38 |
| Power Setting | 20.5 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi x2 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |



Formally measured emission peaks

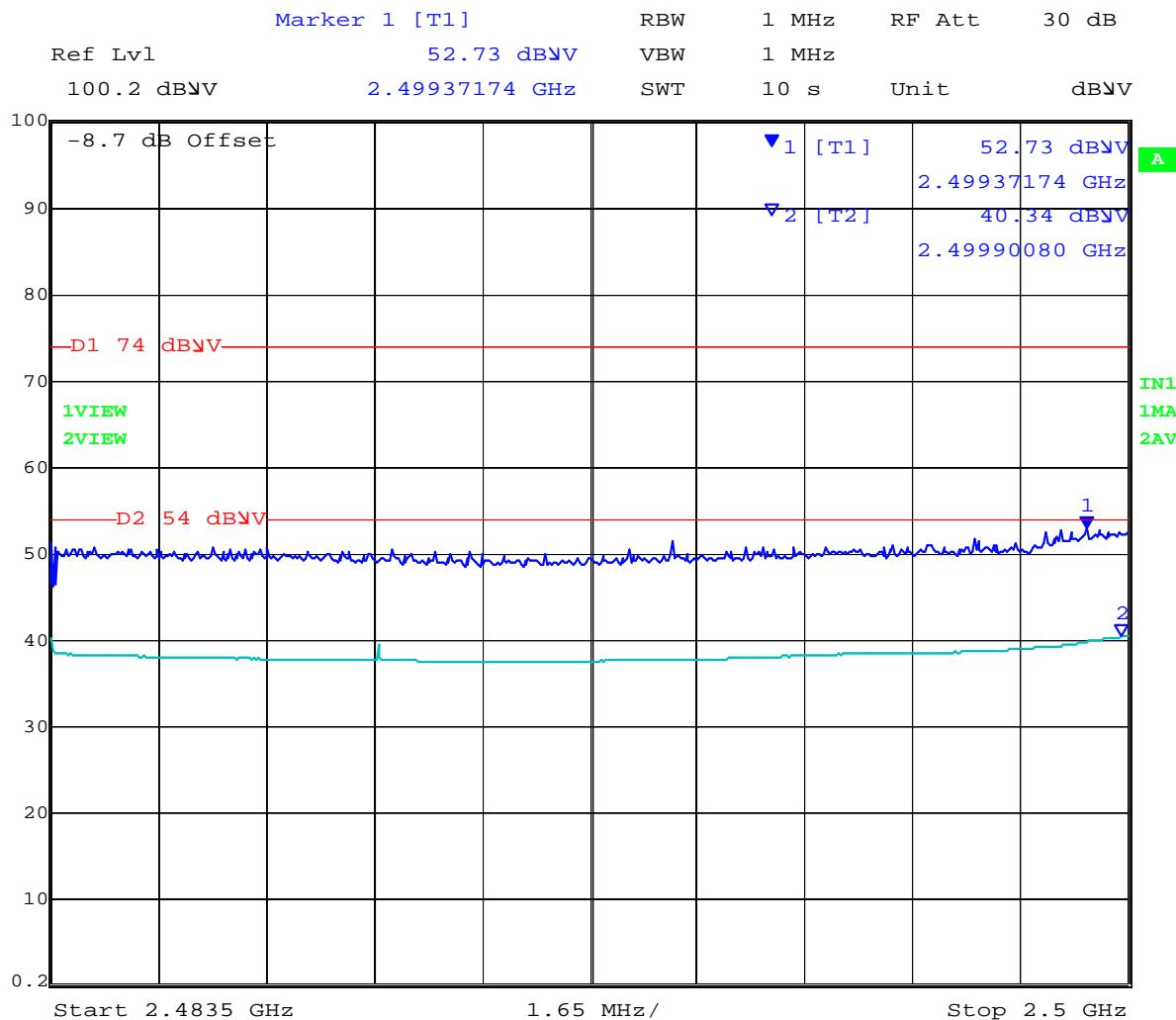
| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail | Comments |
|---------------|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 2464.930 | 75.8 | 3.0 | -11.5 | 67.2 | Peak [Scan] | H | 100 | 0 | | | | FUND |
| 3282.56513 | 60.9 | 3.5 | -11.8 | 52.6 | Peak [Scan] | V | 100 | 0 | | | | Pass |
| 16126.253 | 43.0 | 9.0 | 0.2 | 52.2 | Peak Max | V | 118 | 14 | 74.0 | -21.8 | Pass | RB |
| 2260.521 | 54.0 | 2.9 | -11.8 | 45.1 | Peak Max | V | 131 | 266 | 74 | -28.9 | Pass | RB |
| 16126.253 | 30.0 | 9.0 | 0.2 | 39.2 | Average Max | V | 118 | 14 | 54 | -14.8 | Pass | RB |
| 2260.521 | 40.5 | 2.9 | -11.8 | 31.6 | Average Max | V | 131 | 266 | 54 | -22.4 | 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

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2x2 802.11b 2483.5 MHz Band Edge ART = 20.5

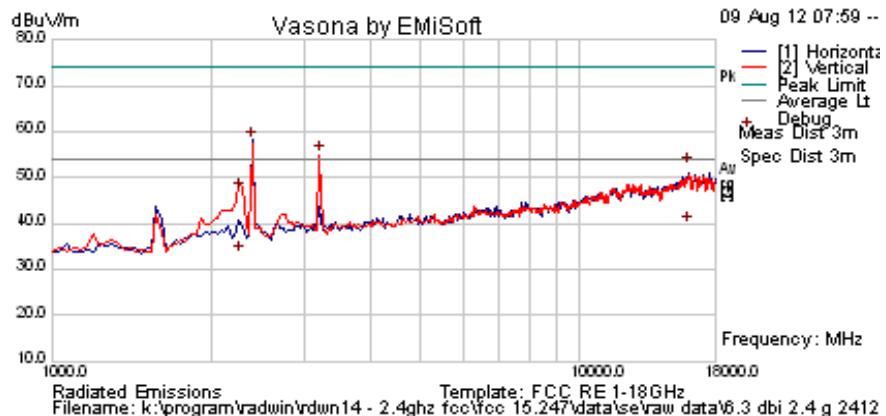


Date: 8.AUG.2012 20:09:49

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2x2 802.11g 2412 MHz

| | | | |
|----------------------|----------------------|-----------------------|------|
| Test Freq. | 2412 MHz | Engineer | JMH |
| Variant | 802.11g; 6 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum.(%) | 38 |
| Power Setting | 17.5 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi Ant x2 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |

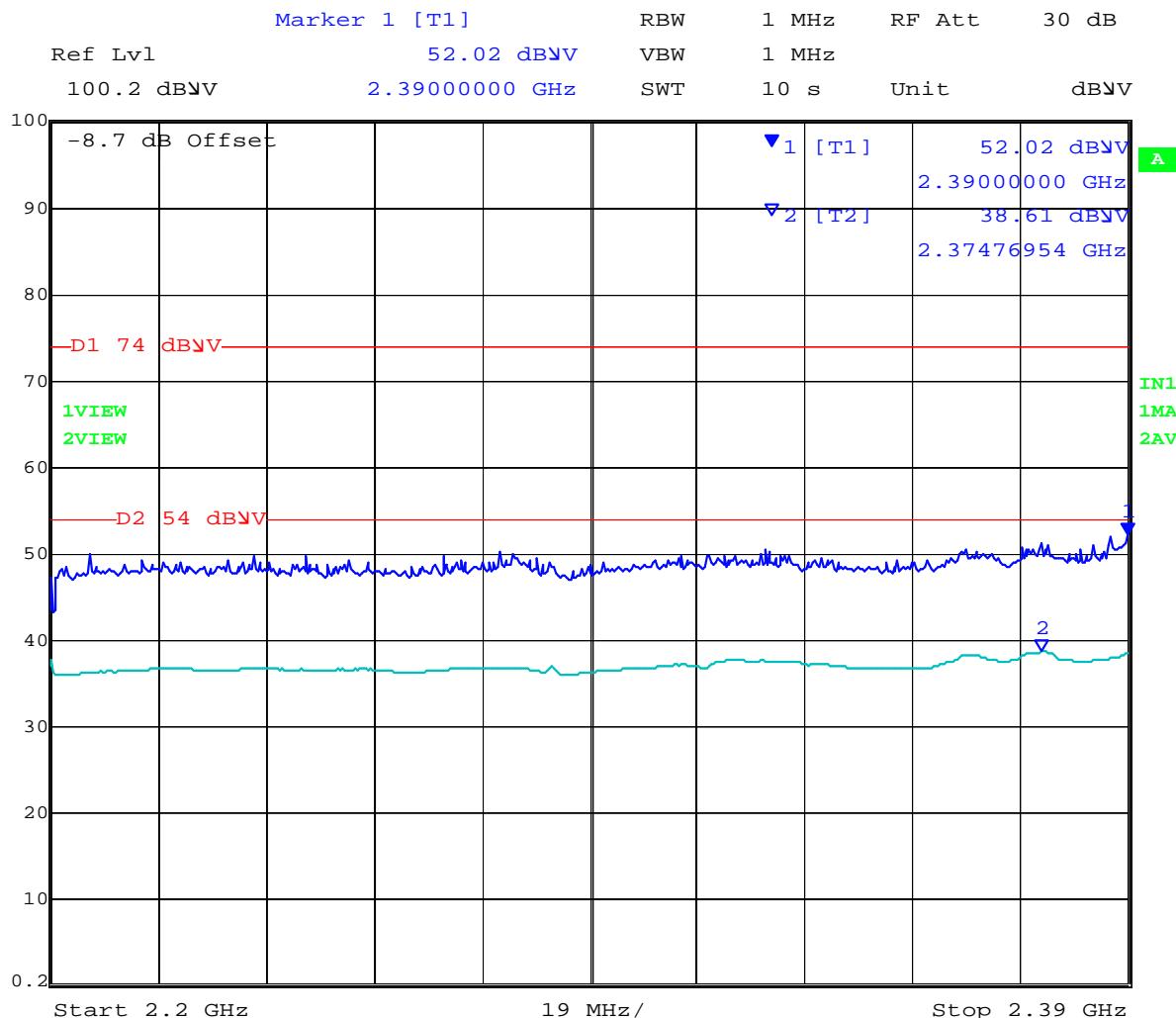


Formally measured emission peaks

| 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 |
|---|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 2396.794 | 66.9 | 3.0 | -11.7 | 58.2 | Peak [Scan] | H | 150 | 0 | | | | FUND |
| 3216.042 | 63.4 | 3.5 | -11.9 | 55.0 | Peak [Scan] | V | 100 | 0 | | | | Pass |
| 16024.048 | 43.3 | 9.0 | 0.2 | 52.6 | Peak Max | H | 121 | 132 | 74 | -21.5 | Pass | RB |
| 2260.521 | 55.9 | 2.9 | -11.8 | 46.9 | Peak Max | V | 158 | 74 | 74 | -27.1 | Pass | RB |
| 16024.048 | 30.5 | 9.0 | 0.2 | 39.8 | Average Max | H | 121 | 132 | 54 | -14.2 | Pass | RB |
| 2260.521 | 42.0 | 2.9 | -11.8 | 33.0 | Average Max | V | 158 | 74 | 54 | -21.0 | 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 | | | | | | | | | | | | |

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2x2 802.11g 2483.5 MHz Band Edge ART = 17.5



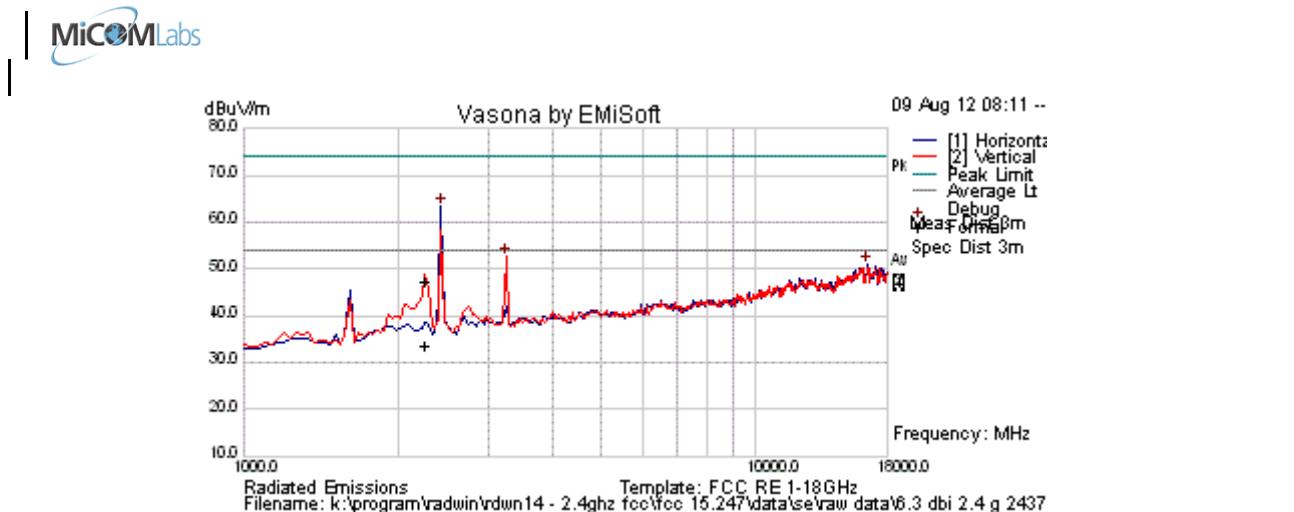
Date: 8.AUG.2012 20:04:31

Power reduction required in order to bring unit into compliance NART = 17

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2x2 802.11g 2437 MHz

| | | | |
|----------------------|----------------------|-----------------------|------|
| Test Freq. | 2437 MHz | Engineer | JMH |
| Variant | 802.11g; 6 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum.(%) | 38 |
| Power Setting | 17.5 | 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 |
| 2430.862 | 71.9 | 3.0 | -11.6 | 63.3 | Peak [Scan] | H | 100 | 0 | | | | FUND |
| 3249.329 | 61.0 | 3.5 | -11.9 | 52.6 | Peak [Scan] | V | 100 | 0 | | | | NRB |
| 16466.934 | 41.8 | 8.8 | 0.3 | 50.9 | Peak [Scan] | H | 200 | 0 | | | | NRB |
| 2260.581 | 56.1 | 2.9 | -11.8 | 47.2 | Peak Max | V | 192 | 144 | 74 | -26.8 | Pass | RB |
| 2260.581 | 42.4 | 2.9 | -11.8 | 33.5 | Average Max | V | 192 | 144 | 54 | -20.5 | Pass | RB |

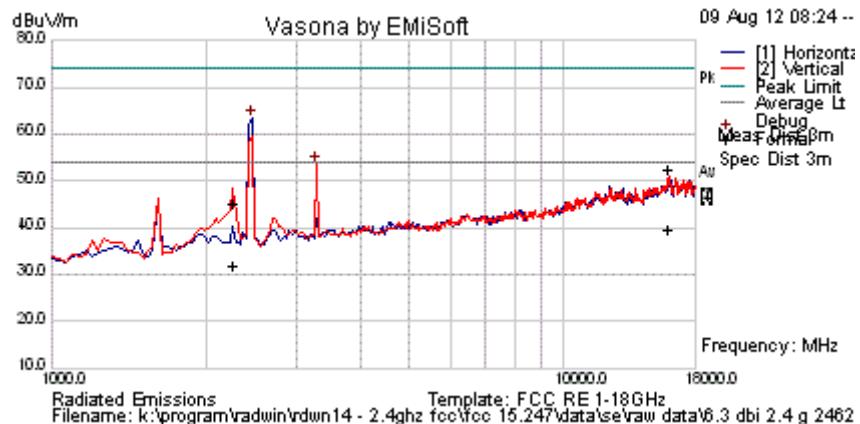
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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2x2 802.11g 2462 MHz

| | | | |
|----------------------|----------------------|-----------------------|------|
| Test Freq. | 2462 MHz | Engineer | JMH |
| Variant | 802.11g; 6 Mbs | Temp (°C) | 27 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum.(%) | 38 |
| Power Setting | 17.5 | Press. (mBars) | 1007 |
| Antenna | 6.3 dBi Ant x2 | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |



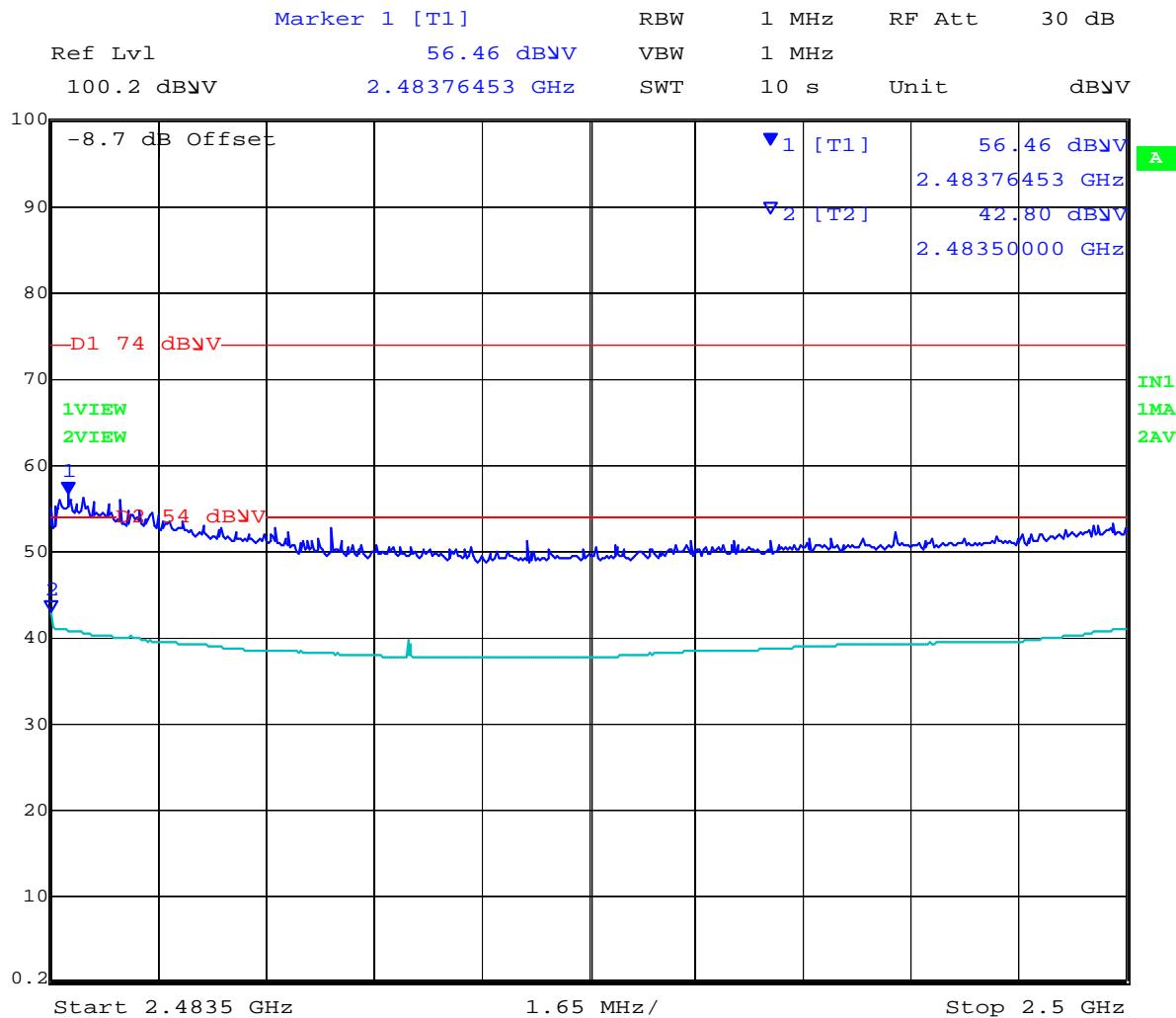
Formally measured emission peaks

| 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 |
|---------------|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|
| 2464.930 | 71.9 | 3.0 | -11.5 | 63.4 | Peak [Scan] | H | 100 | 0 | | | | FUND |
| 3282.56513 | 61.7 | 3.5 | -11.8 | 53.4 | Peak [Scan] | V | 100 | 0 | | | Pass | NRB |
| 15988.485 | 43.5 | 9.0 | 0.1 | 52.6 | Peak Max | V | 190 | 299 | 74 | -21.4 | Pass | RB |
| 2261.936 | 54.2 | 2.9 | -11.8 | 45.3 | Peak Max | V | 162 | 186 | 74 | -28.7 | Pass | RB |
| 15988.485 | 30.5 | 9.0 | 0.1 | 39.6 | Average Max | V | 190 | 299 | 54 | -14.4 | Pass | RB |
| 2261.936 | 40.9 | 2.9 | -11.8 | 32.0 | Average Max | V | 162 | 186 | 54 | -22.0 | 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

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2x2 802.11g 2483.5 MHz Band Edge ART = 15.0

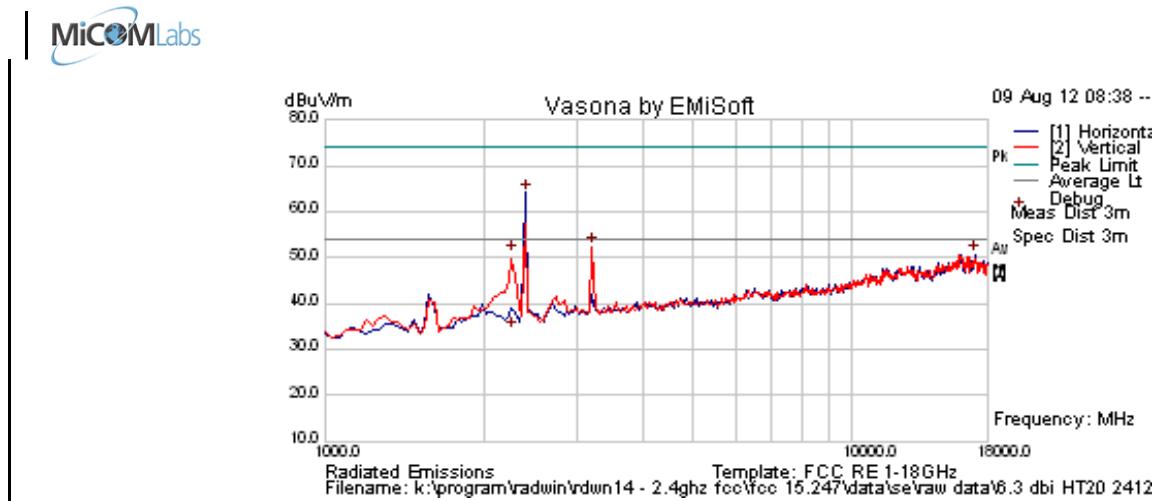


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2x2 802.11n HT-20 2412 MHz

| | | | |
|----------------------|-------------------------|-----------------------|------|
| Test Freq. | 2412 MHz | Engineer | JMH |
| Variant | 802.11n; HT-20; 6.5 MCS | Temp (°C) | 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 | | | |



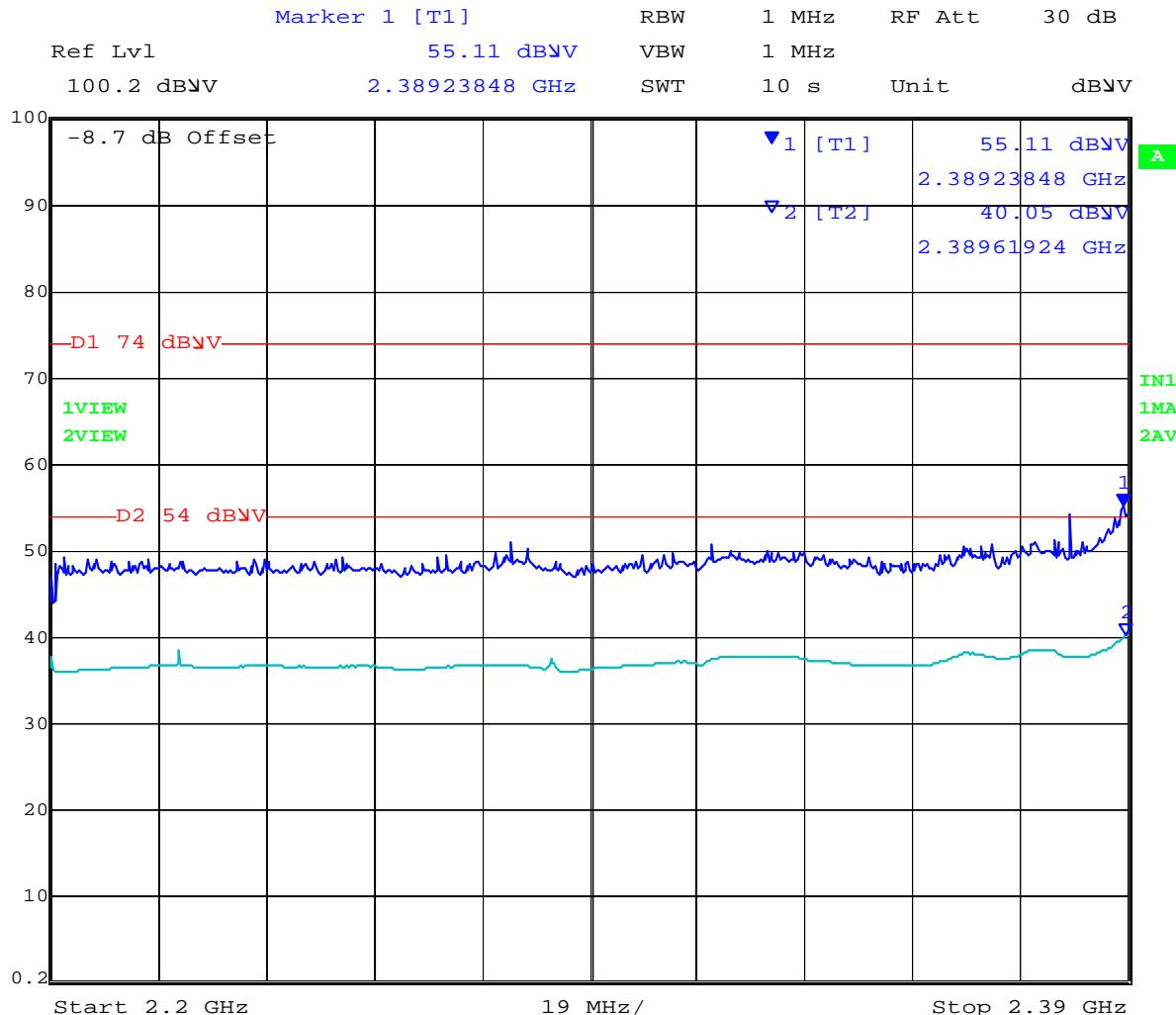
Formally measured emission peaks

| 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

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

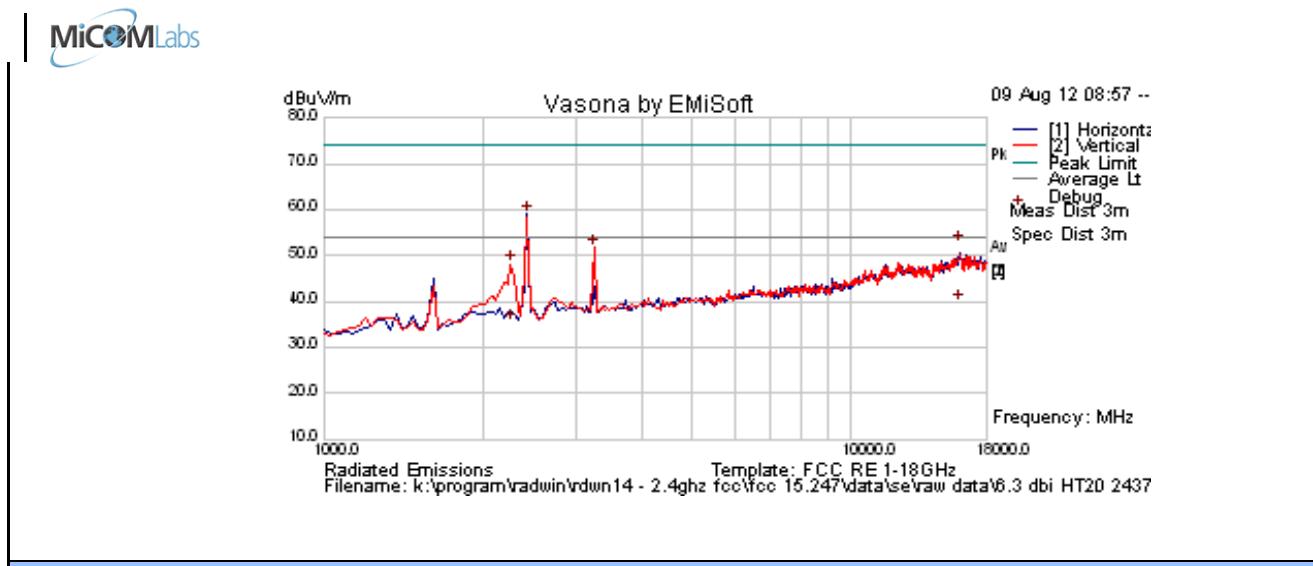


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2x2 802.11n HT-20 2437 MHz

| | | | |
|---------------|-------------------------|----------------|------|
| Test Freq. | 2437 MHz | Engineer | JMH |
| Variant | 802.11n; HT-20; 6.5 MCS | Temp (°C) | 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

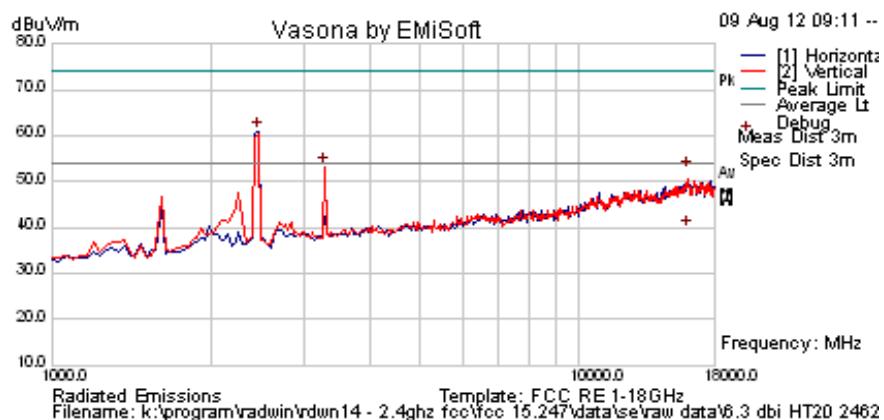
| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail | Comments |
|---------------|----------|------------|-------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|----------|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

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2x2 802.11n HT-20 2462 MHz

| | | | |
|---------------|-------------------------|----------------|------|
| Test Freq. | 2462 MHz | Engineer | JMH |
| Variant | 802.11n; HT-20; 6.5 MCS | Temp (°C) | 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 | | | | | | | | | | | | |

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

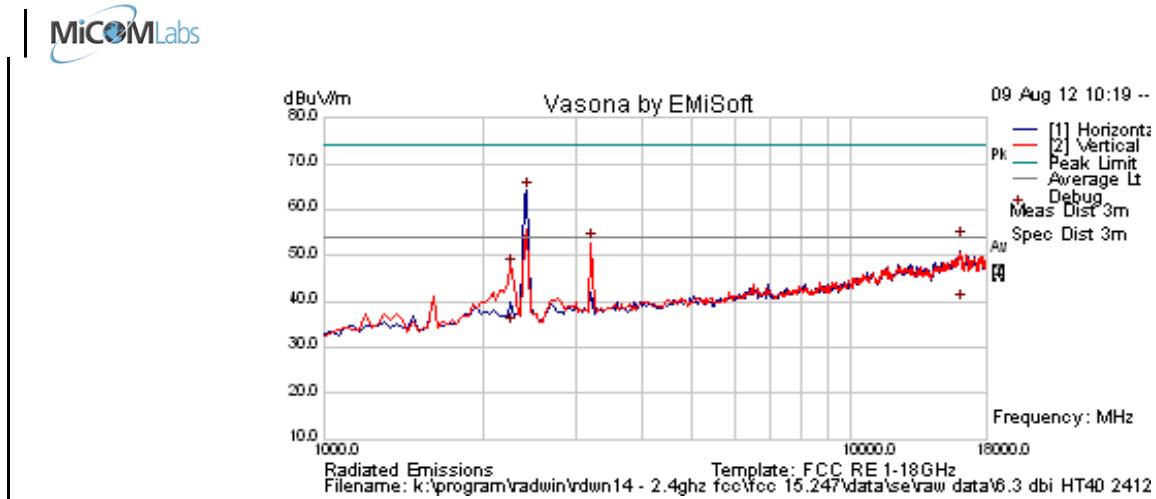


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2x2 802.11n HT-40 2422 MHz

| | | | |
|----------------------|--------------------------|-----------------------|------|
| Test Freq. | 2422 MHz | Engineer | JMH |
| Variant | 802.11n; HT-40; 13.5 MCS | Temp (°C) | 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 | | | |

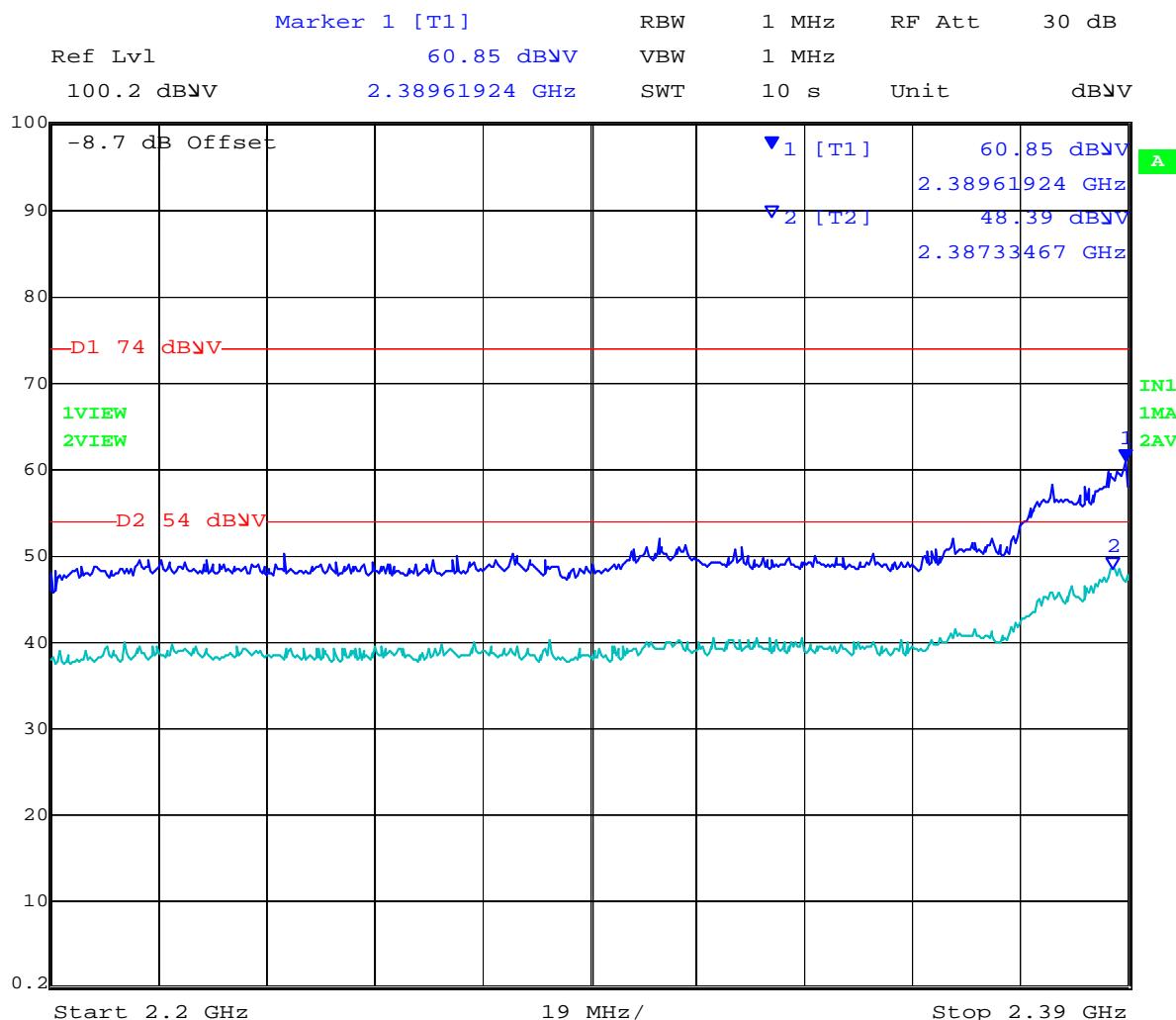


Formally measured emission peaks

| 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 | | | | 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 | | | | | | | | | | | | |

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

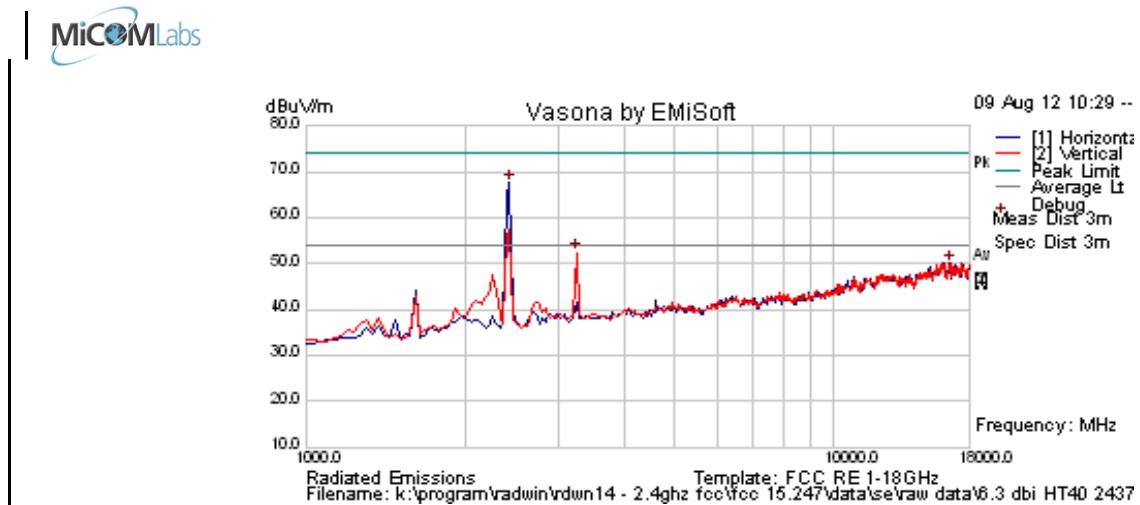


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2x2 802.11n HT-40 2437 MHz

| | | | |
|----------------------|--------------------------|-----------------------|------|
| Test Freq. | 2437 MHz | Engineer | JMH |
| Variant | 802.11n; HT-40; 13.5 MCS | Temp (°C) | 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 | | | |



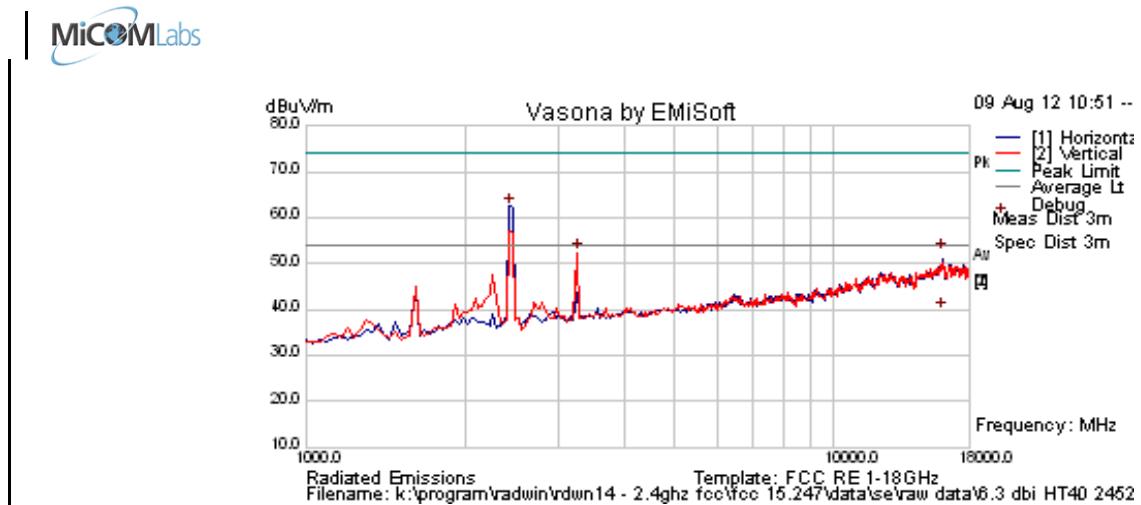
Formally measured emission peaks

| 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 | | | | | | | | | | |

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2x2 802.11n HT-40 2452 MHz

| | | | |
|----------------------|--------------------------|-----------------------|------|
| Test Freq. | 2452 MHz | Engineer | JMH |
| Variant | 802.11n; HT-40; 13.5 MCS | Temp (°C) | 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 | | | |

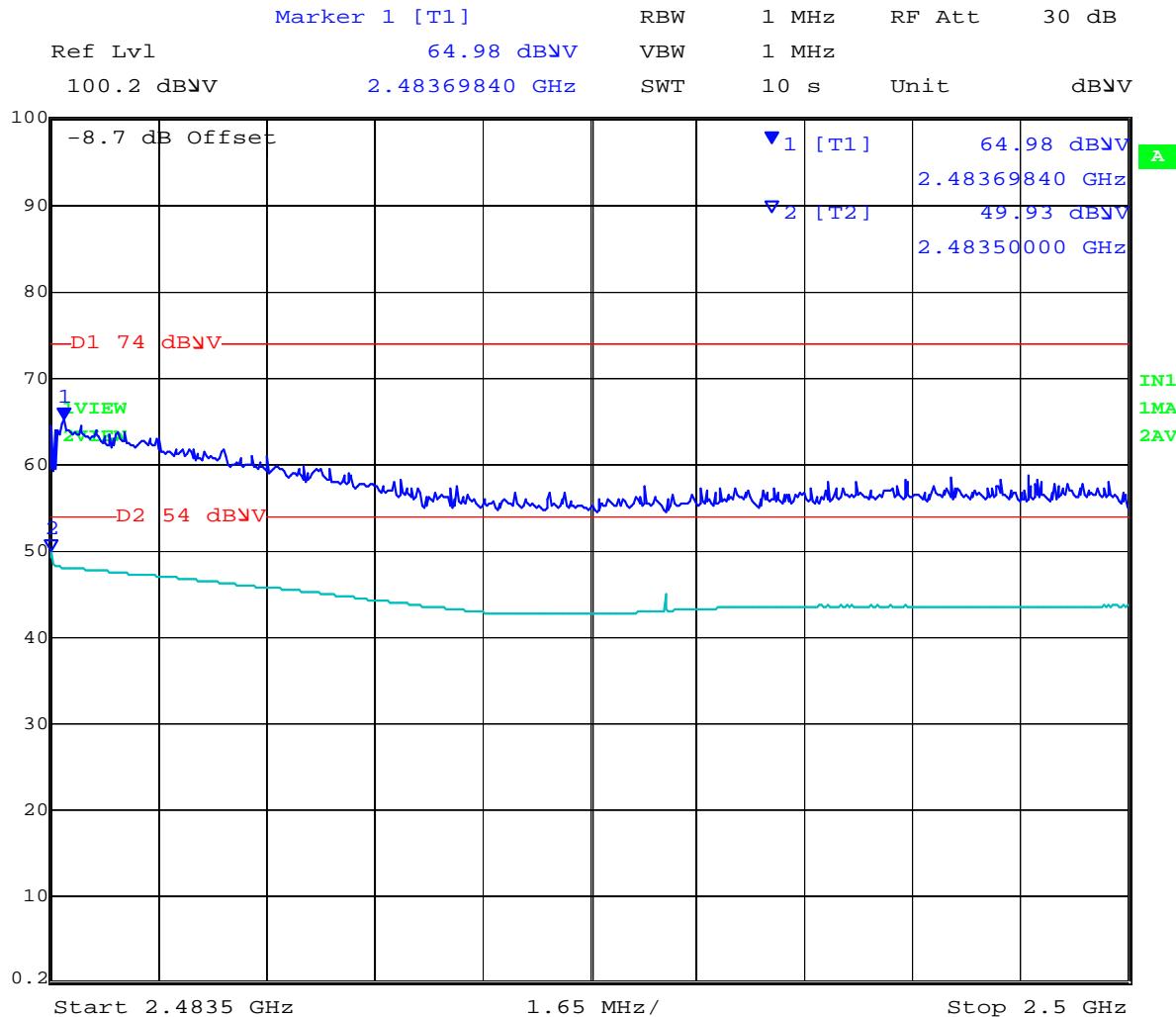


Formally measured emission peaks

| 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 | | | | | | | | | | | | |

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



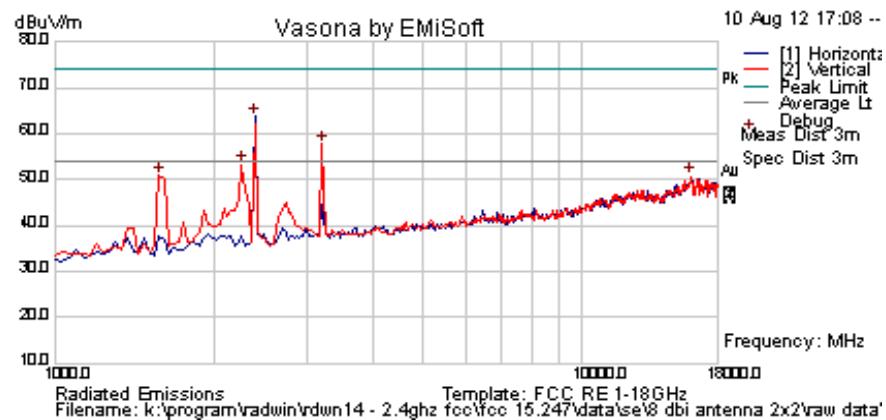
Date: 8.AUG.2012 19:54:37

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Antenna #4 8 dBi 2x2

2x2 802.11b 2412 MHz

| | | | |
|----------------------|----------------------|-----------------------|------|
| Test Freq. | 2412 MHz | Engineer | SB |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 28 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 33 |
| Power Setting | 20.5 | Press. (mBars) | 1010 |
| Antenna | 8 dBi omni | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |

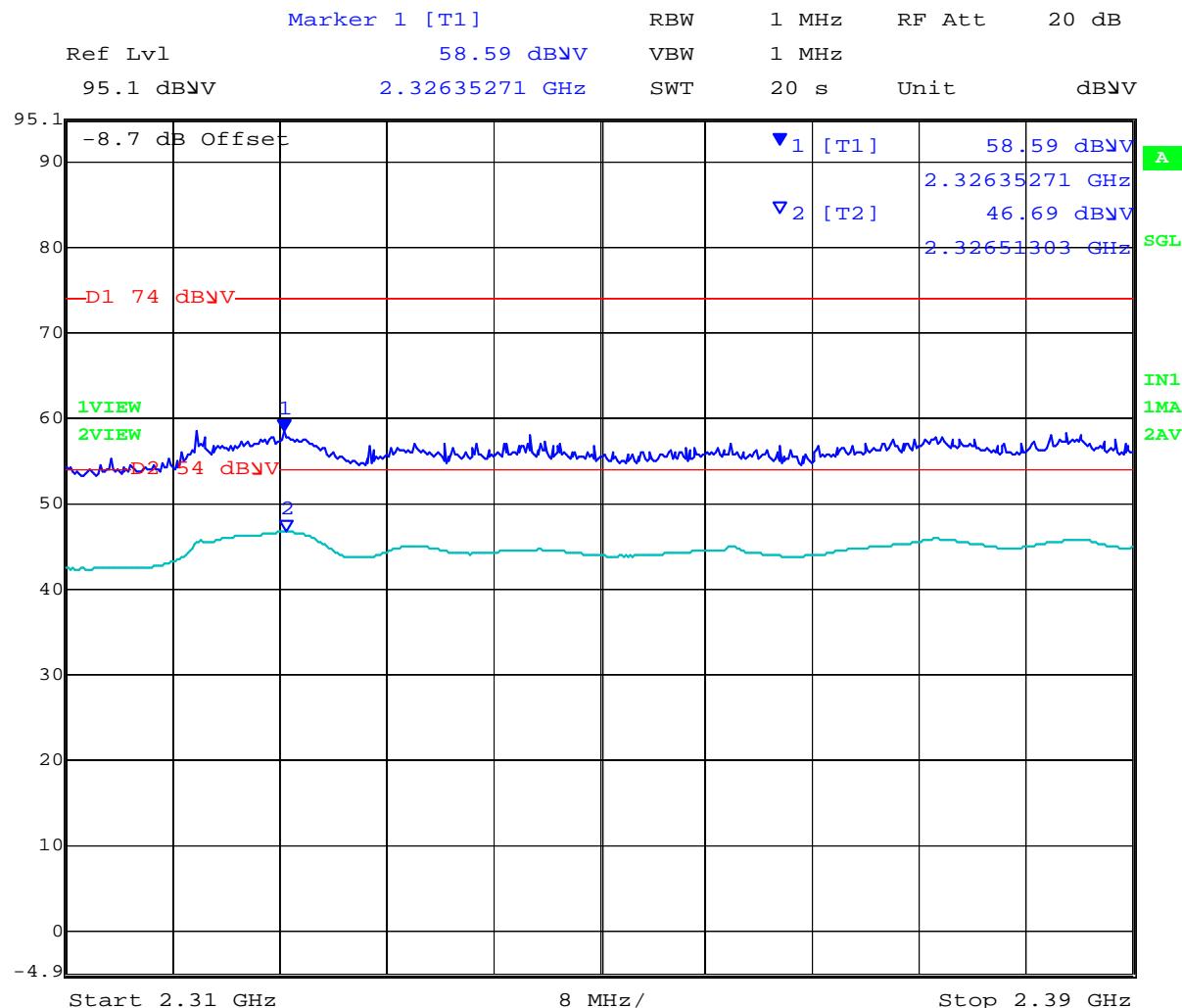


Formally measured emission peaks

| 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 | 72.5 | 3.0 | -11.7 | 63.8 | Peak [Scan] | H | | | | | | FUND |
| 3214.428858 | 66.1 | 3.5 | -11.9 | 57.7 | Peak [Scan] | V | | | | | | Pass NRB |
| 2287.970 | 63.2 | 2.9 | -11.9 | 54.2 | Peak Max | V | 114 | 142 | 74.0 | -19.8 | Pass | RB |
| 2287.970 | 57.4 | 2.9 | -11.9 | 48.4 | Average Max | V | 114 | 142 | 54.0 | -5.6 | Pass | RB |
| 1579.158 | 63.7 | 2.4 | -15.2 | 50.9 | Peak [Scan] | V | | | | | | Pass NRB |
| 16058.116 | 41.5 | 9.0 | 0.3 | 50.8 | Peak [Scan] | V | 100 | 0 | 54 | -3.2 | 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 | | | | | | | | | | | | |

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2x2 802.11b 2390 MHz Band Edge ART = 20.5



Date: 10.AUG.2012 16:08:40

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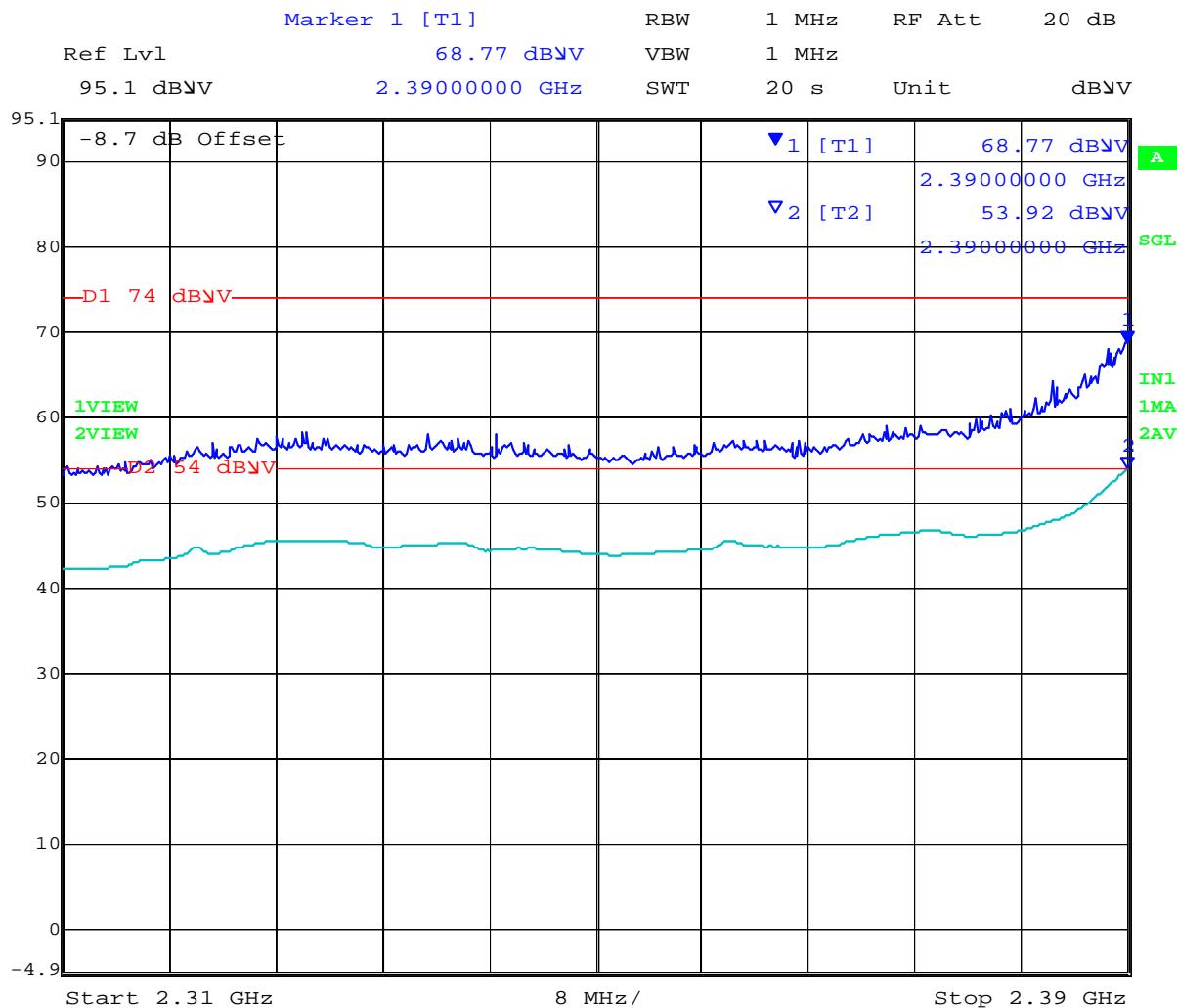
2x2 802.11g 2390 MHz Band Edge ART = 17.5



Date: 10.AUG.2012 16:20:16

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



Date: 10.AUG.2012 16:27:14

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

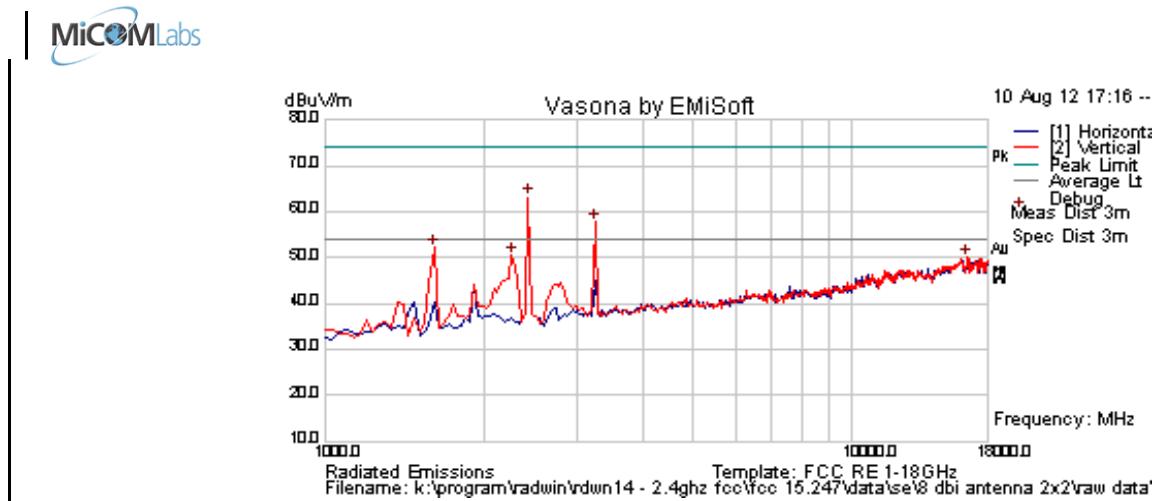


Date: 10.AUG.2012 16:29:38

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2x2 802.11b 2437 MHz

| | | | |
|----------------------|----------------------|-----------------------|------|
| Test Freq. | 2437 MHz | Engineer | SB |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 28 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum.(%) | 33 |
| Power Setting | 20.5 | Press. (mBars) | 1010 |
| Antenna | 8 dBi omni | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |



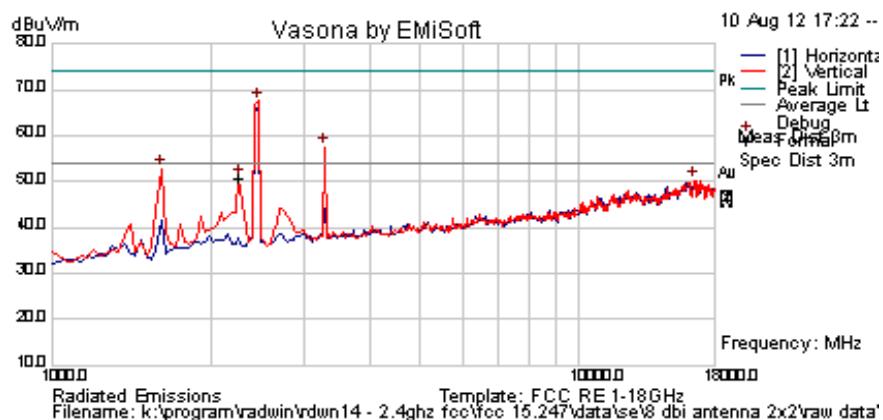
Formally measured emission peaks

| 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 | 71.7 | 3.0 | -11.6 | 63.1 | Peak [Scan] | V | | | | | | FUND |
| 3248.496994 | 66.1 | 3.5 | -11.9 | 57.7 | Peak [Scan] | V | | | | | Pass | NRB |
| 1613.226 | 64.8 | 2.5 | -15.1 | 52.1 | Peak [Scan] | V | 150 | 0 | 54 | -1.9 | Pass | NRB |
| 2287.970 | 63.2 | 2.9 | -11.9 | 54.2 | Peak Max | V | 114 | 142 | 74.0 | -19.8 | Pass | RB |
| 2287.970 | 57.4 | 2.9 | -11.9 | 48.4 | Average Max | V | 114 | 142 | 54.0 | -5.6 | Pass | RB |
| 16466.934 | 40.8 | 8.8 | 0.3 | 49.9 | Peak [Scan] | V | 100 | 0 | 54 | -4.1 | 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 | | | | | | | | | | | | |

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2x2 802.11b 2462 MHz

| | | | |
|---------------|----------------------|----------------|------|
| Test Freq. | 2462 MHz | Engineer | SB |
| Variant | 802.11b; 1 Mbs | Temp (°C) | 28 |
| Freq. Range | 1000 MHz - 18000 MHz | Rel. Hum. (%) | 33 |
| Power Setting | 20.5 | Press. (mBars) | 1010 |
| Antenna | 8 dBi omni | Duty Cycle (%) | 100 |
| Test Notes 1 | | | |
| Test Notes 2 | | | |



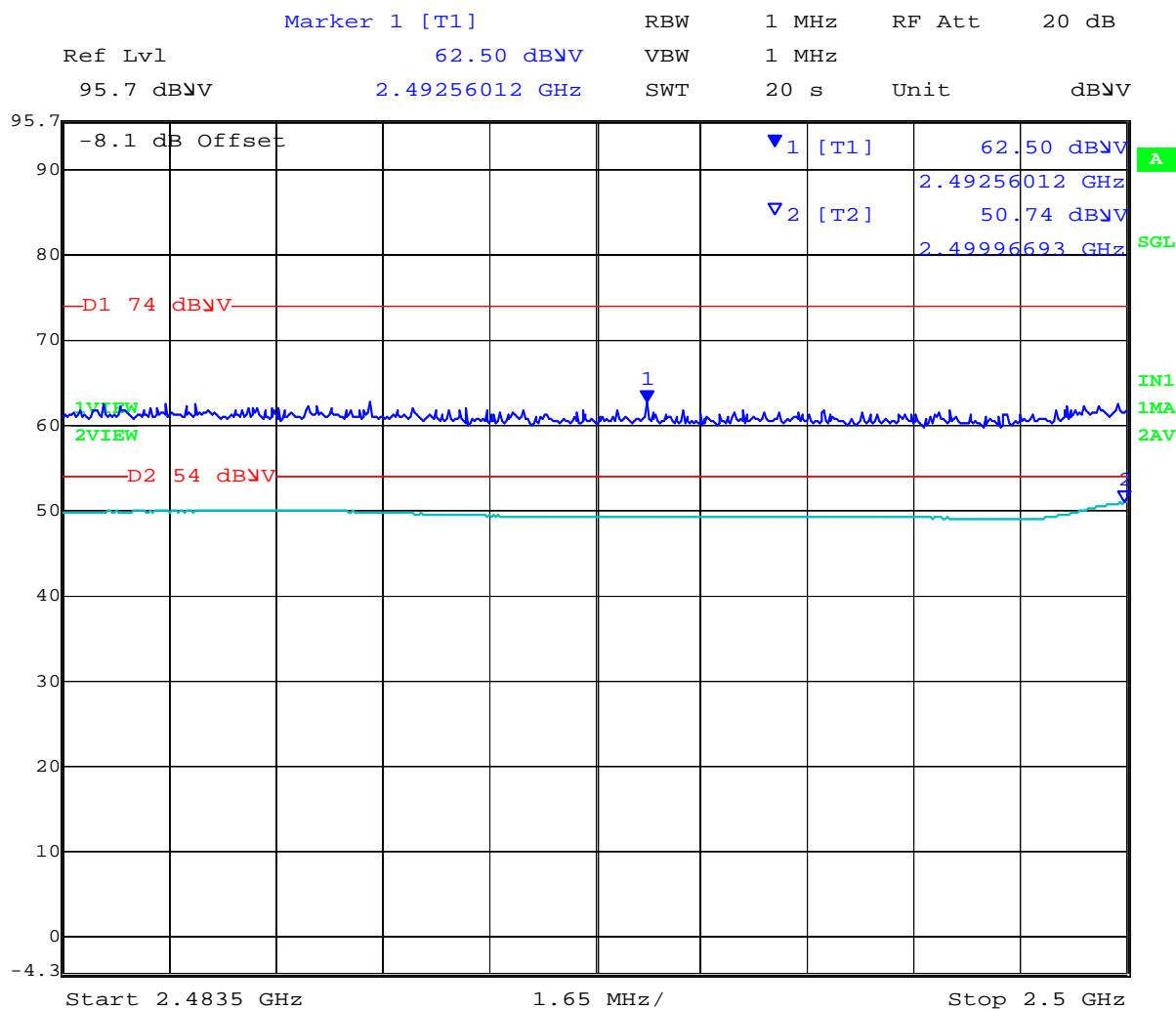
Formally measured emission peaks

| 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 | 76.0 | 3.0 | -11.5 | 67.5 | Peak [Scan] | V | | | | | | FUND |
| 3282.56513 | 65.8 | 3.5 | -11.8 | 57.5 | Peak [Scan] | V | | | | | | NRB |
| 1613.226 | 65.4 | 2.5 | -15.1 | 52.8 | Peak [Scan] | V | 150 | 0 | 54 | -1.2 | | NRB |
| 2287.970 | 63.2 | 2.9 | -11.9 | 54.2 | Peak Max | V | 114 | 142 | 74.0 | -19.8 | | RB |
| 2287.970 | 57.4 | 2.9 | -11.9 | 48.4 | Average Max | V | 114 | 142 | 54.0 | -5.6 | | RB |
| 16501.002 | 41.1 | 8.8 | 0.3 | 50.3 | Peak [Scan] | V | 200 | 0 | 54 | -3.7 | | 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

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2x2 802.11b 2483.5 MHz Band Edge ART = 20.5



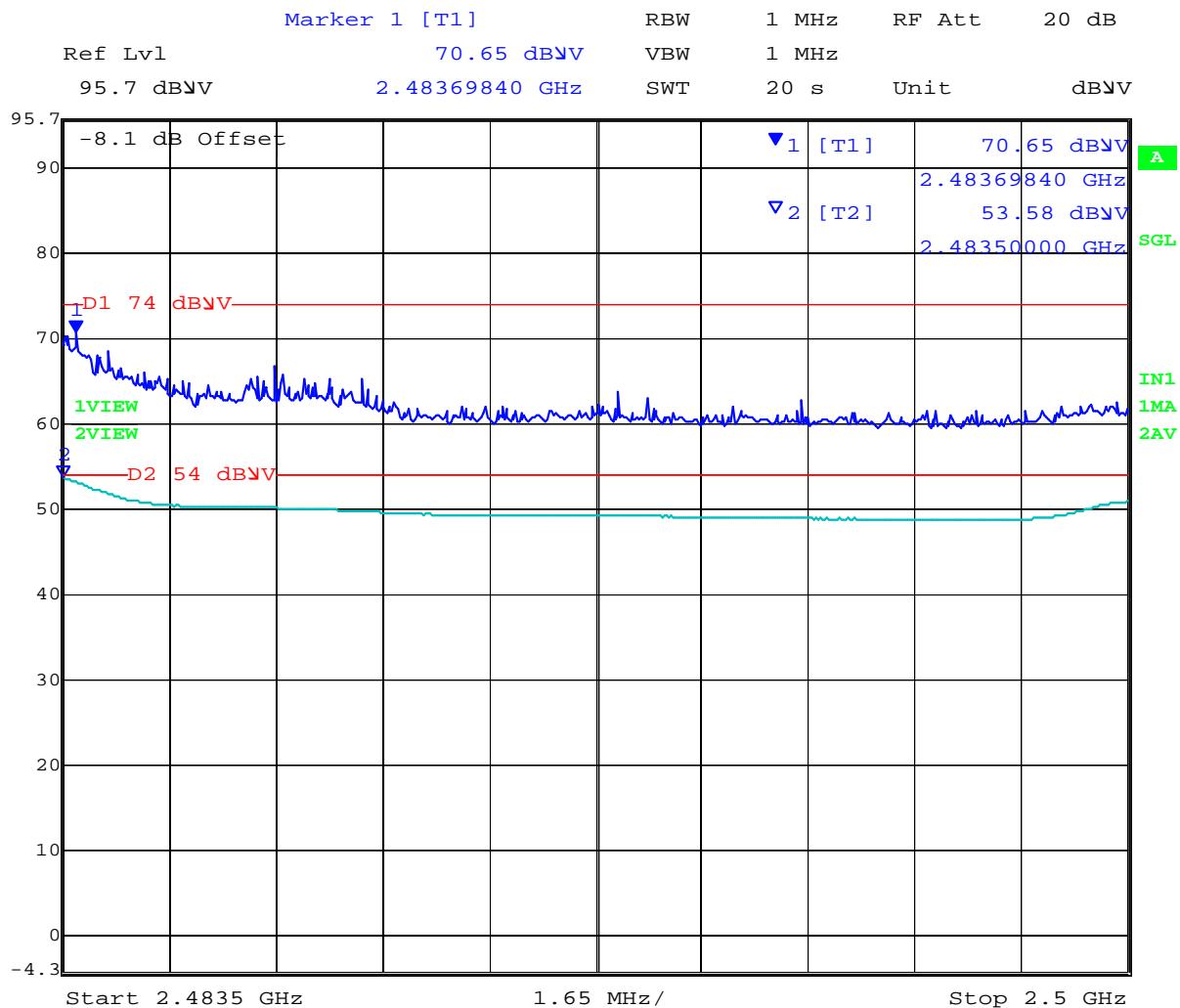
Date: 10.AUG.2012 16:42:45

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Title: AP0127450, AP0127460
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: RDWN14-U1 Rev A
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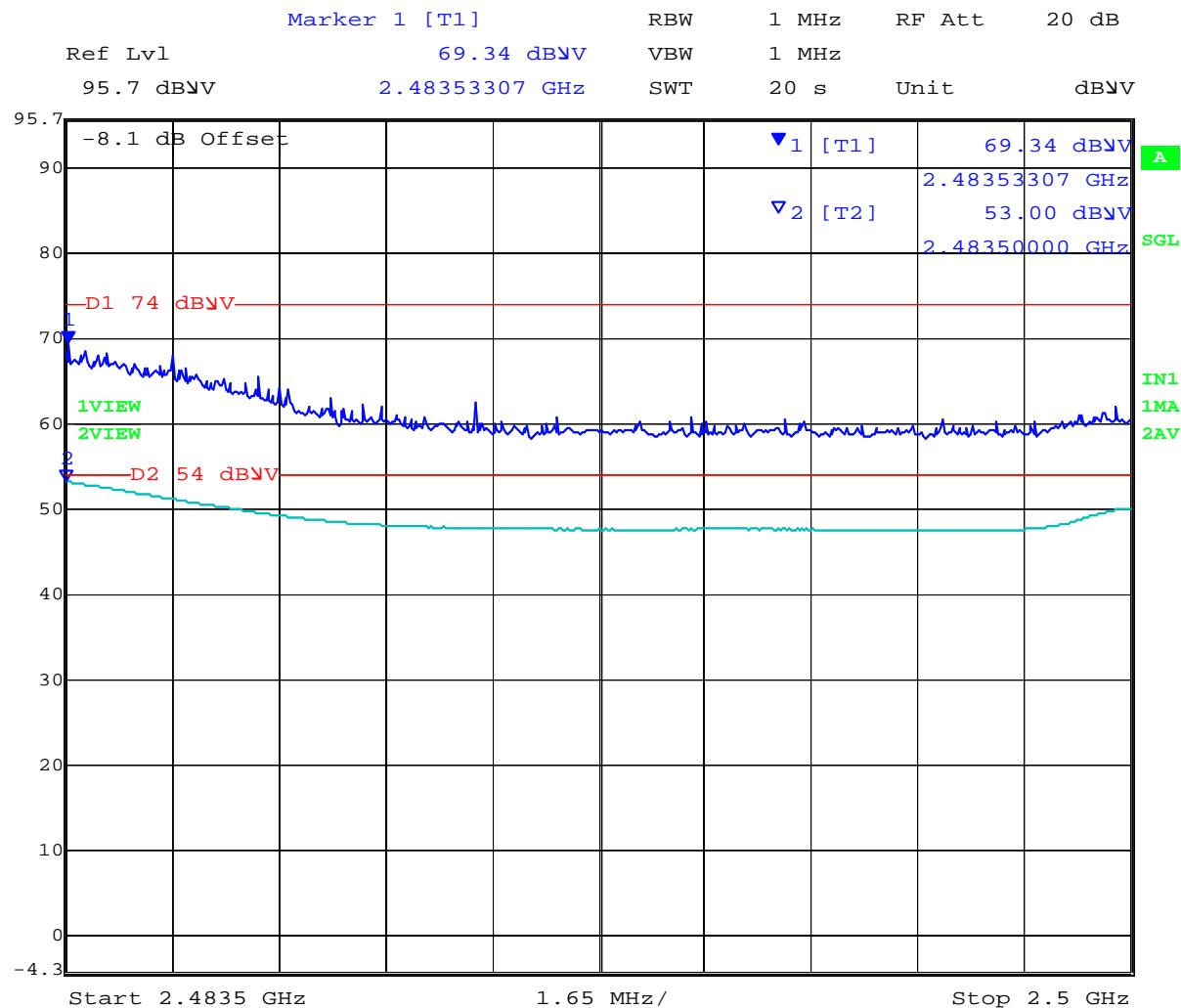
2x2 802.11g 2483.5 MHz Band Edge ART = 15



Date: 10.AUG.2012 16:37:47

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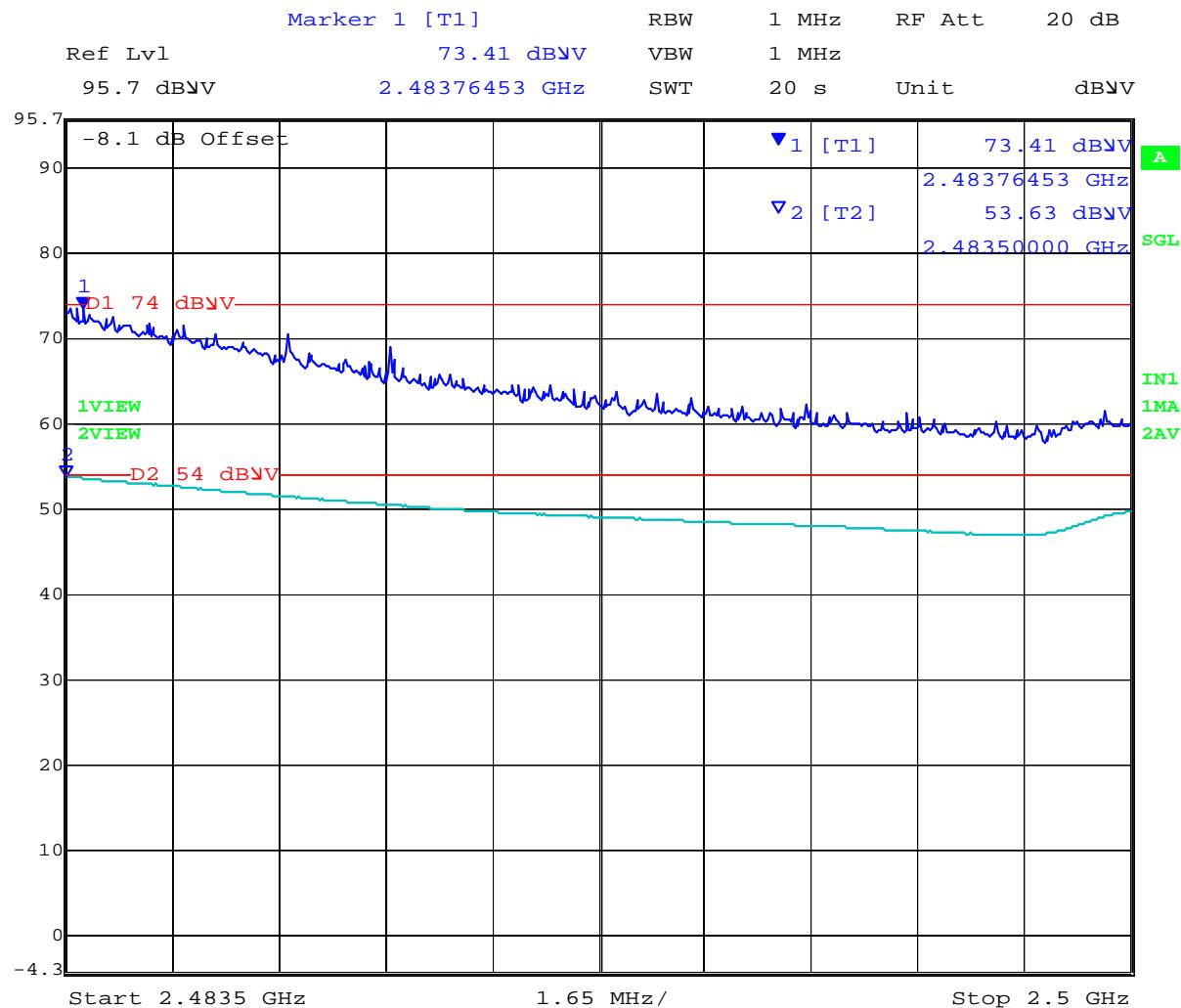
2x2 802.11n HT-20 2483.5 MHz Band Edge ART = 14.5



Date: 10.AUG.2012 16:36:09

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



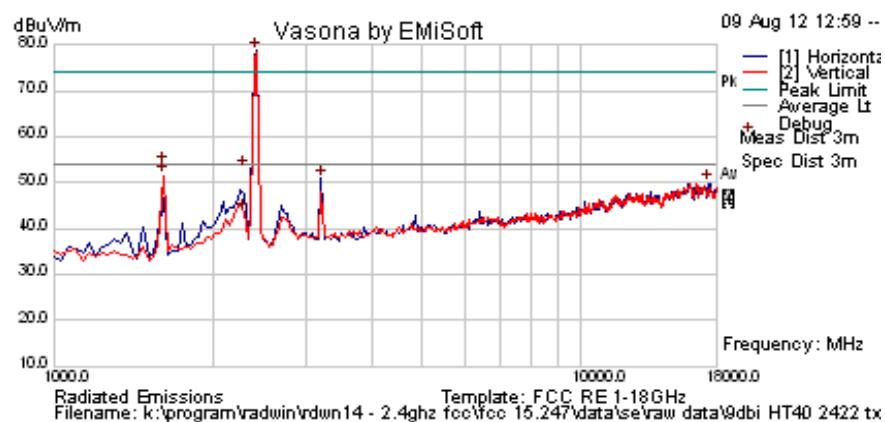
Date: 10.AUG.2012 16:33:57

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Antenna #5 9 dBi 2x2

2x2 802.11n HT-40 2422 MHz

| | | | |
|----------------------|--------------------------|-----------------------|------|
| Test Freq. | 2422 MHz | Engineer | JMH |
| Variant | 802.11n; HT-40; 13.5 MCS | Temp (°C) | 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 | | | |

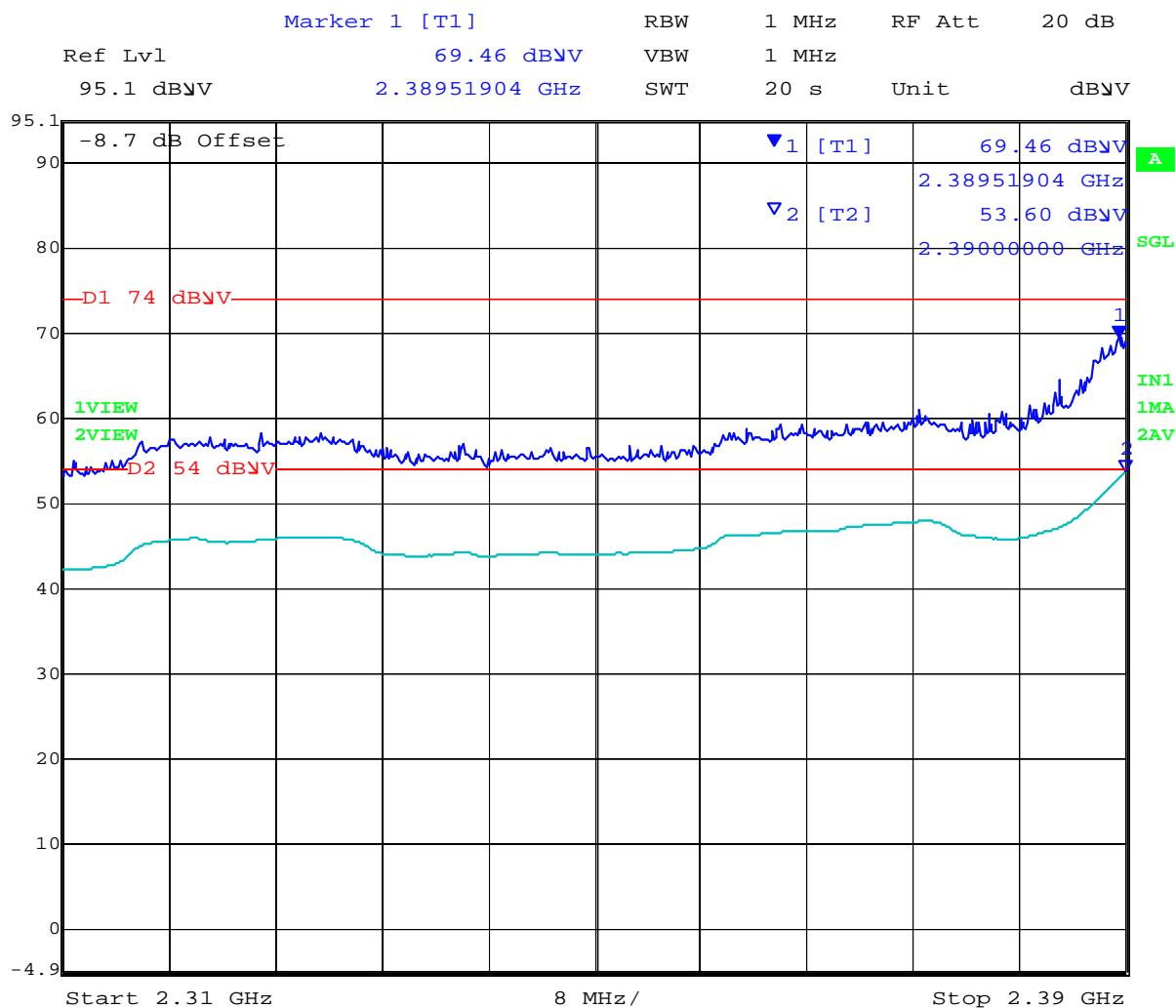


Formally measured emission peaks

| 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 | | | | | | | | | | | | |

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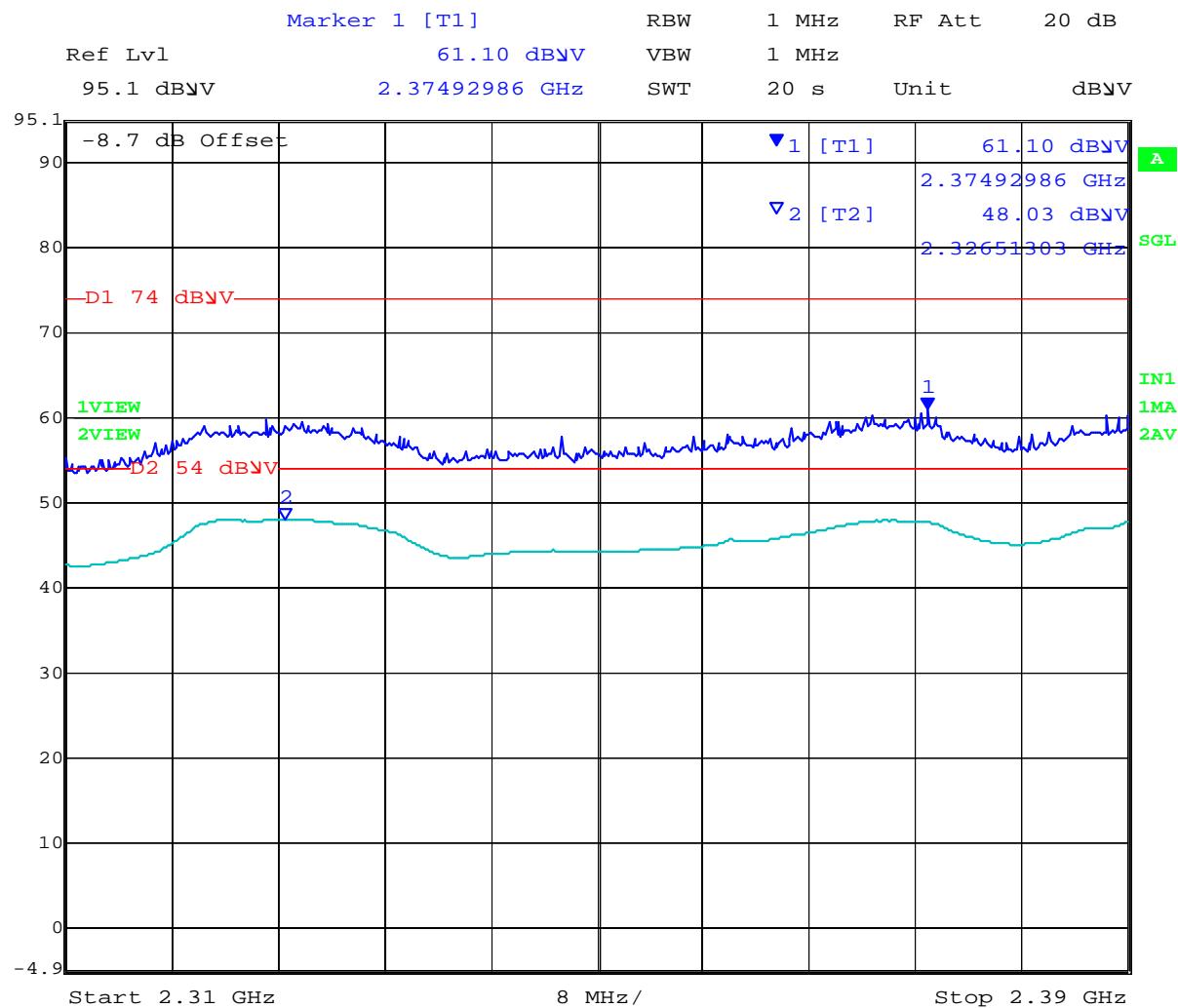
2x2 802.11n HT-40 2390 MHz Band Edge ART = 16.5



Date: 10.AUG.2012 10:29:16

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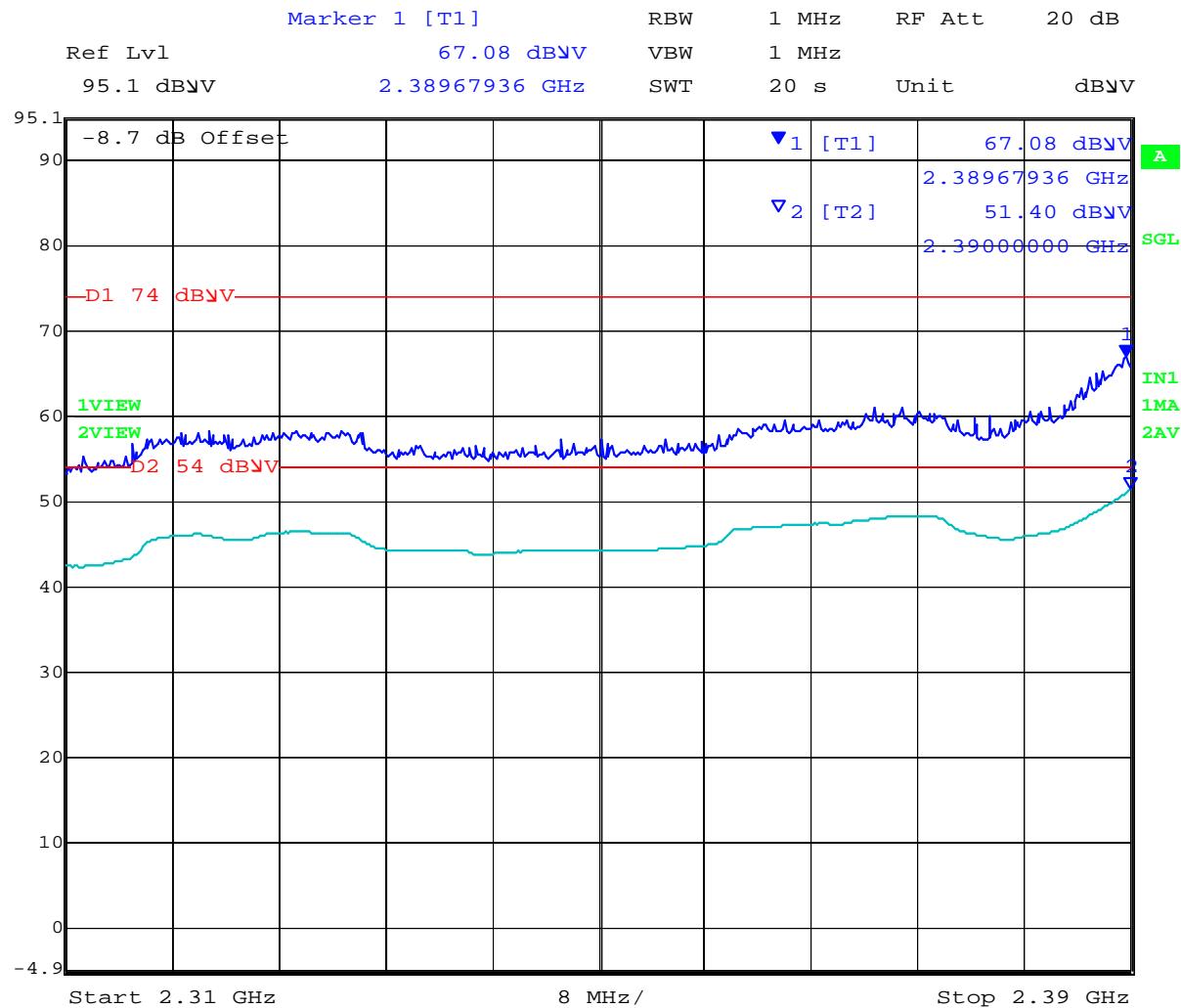
2x2 802.11b 2390 MHz Band Edge ART = 19.5



Date: 10.AUG.2012 10:14:24

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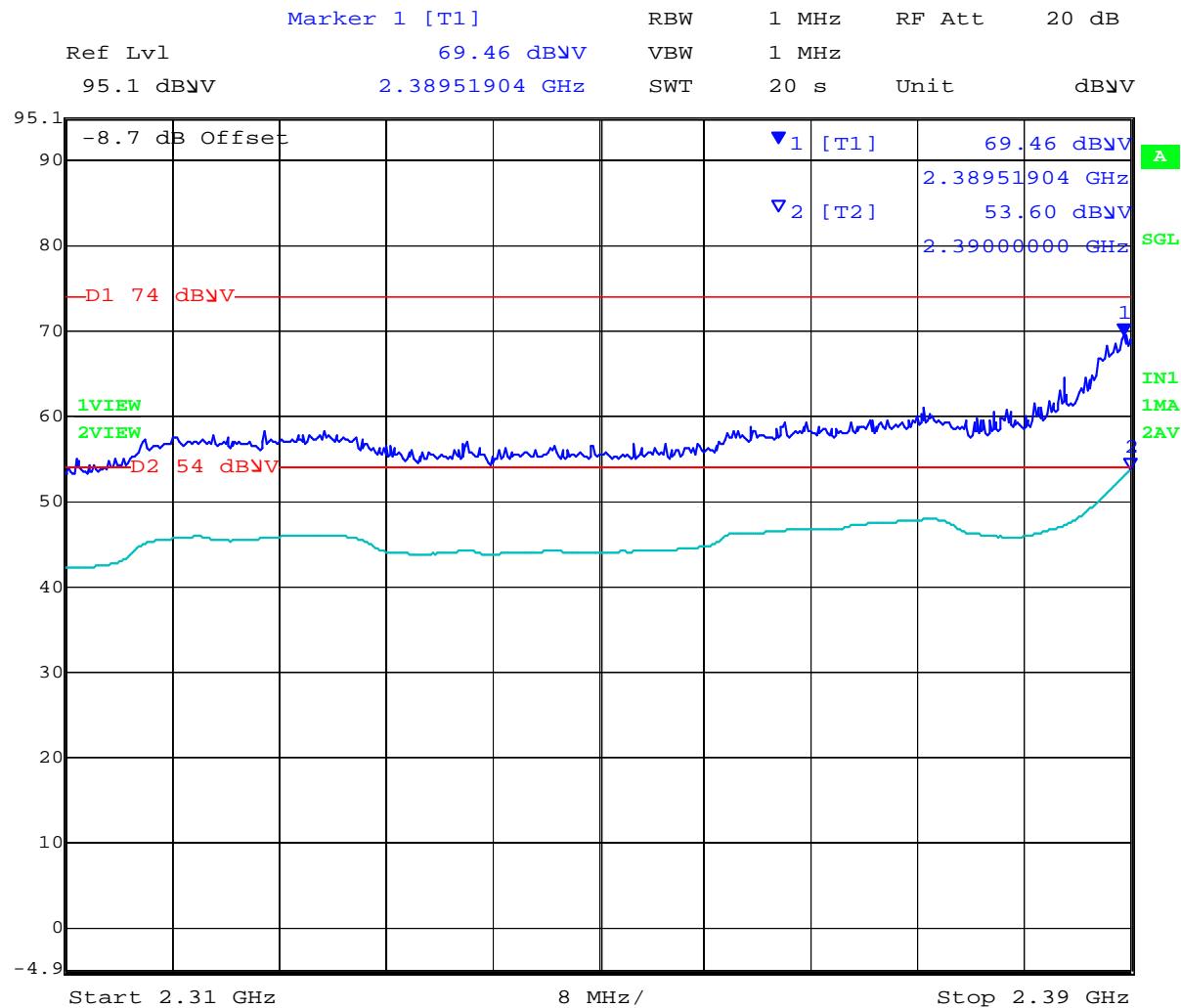
2x2 802.11g 2390 MHz Band Edge ART = 16.5



Date: 10.AUG.2012 10:19:39

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2x2 802.11n HT-20 2390 MHz Band Edge ART = 16.5



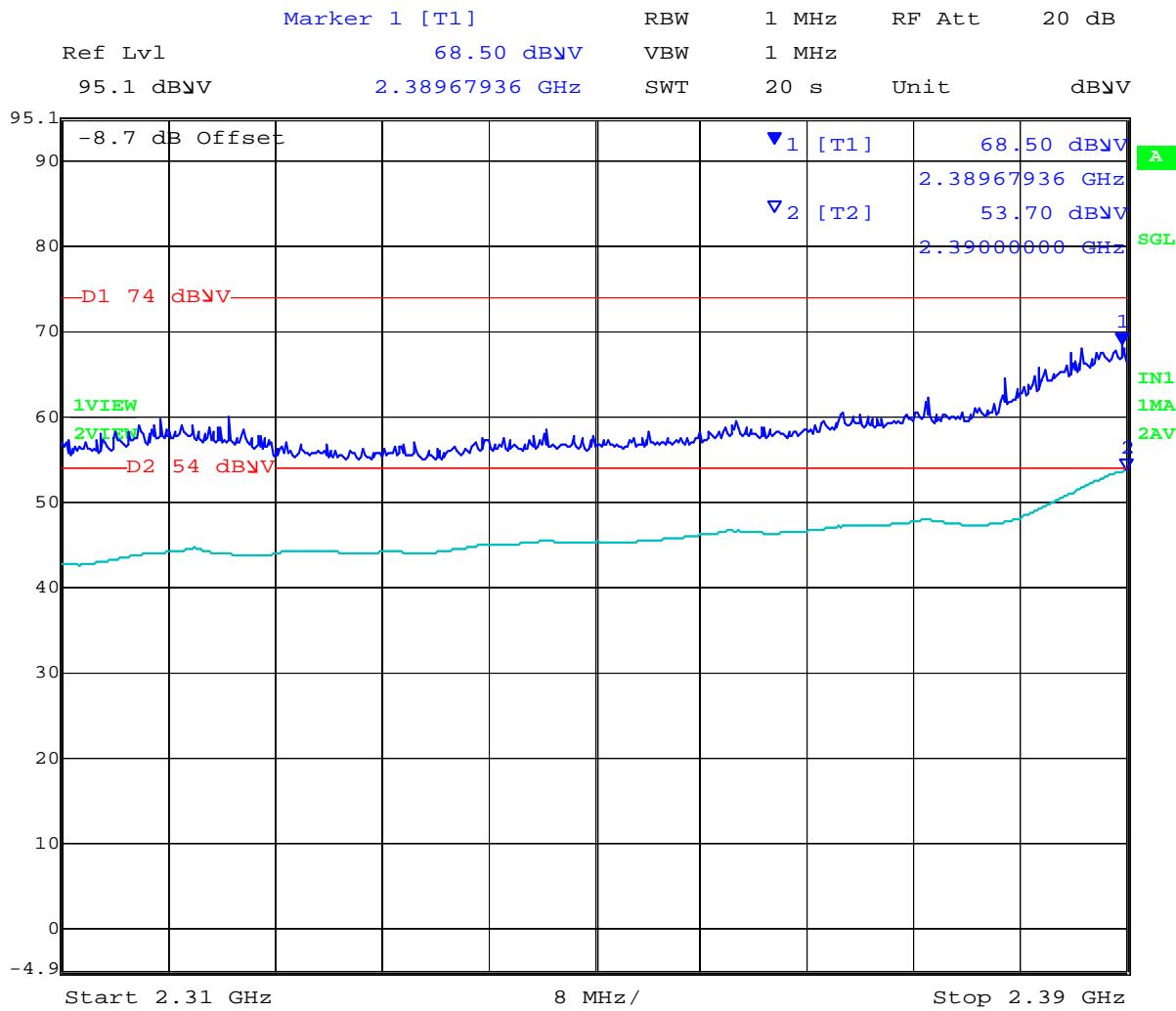
Date: 10.AUG.2012 10:29:16

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

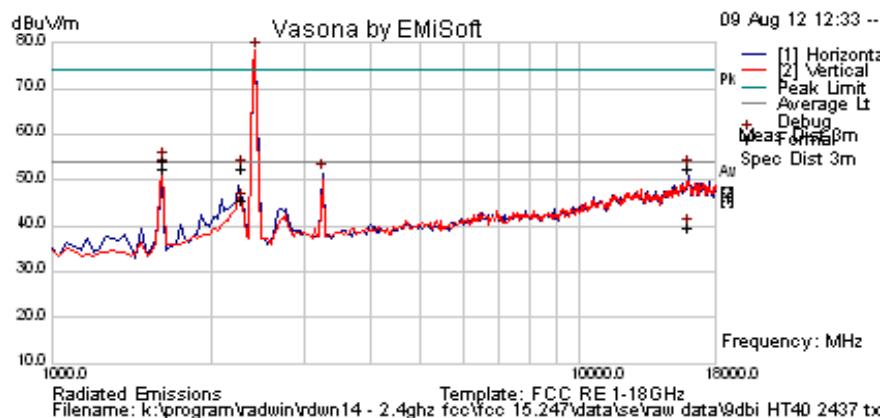


Date: 10.AUG.2012 10:33:08

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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 (°C) | 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 |

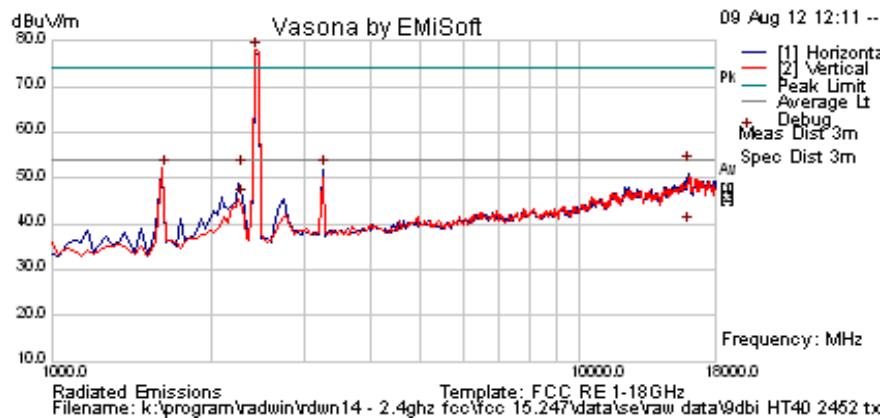
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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2x2 802.11n HT-40 2452 MHz

| | | | |
|---------------|--------------------------|----------------|------|
| Test Freq. | 2452 MHz | Engineer | JMH |
| Variant | 802.11n; HT-40; 13.5 MCS | Temp (°C) | 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 |

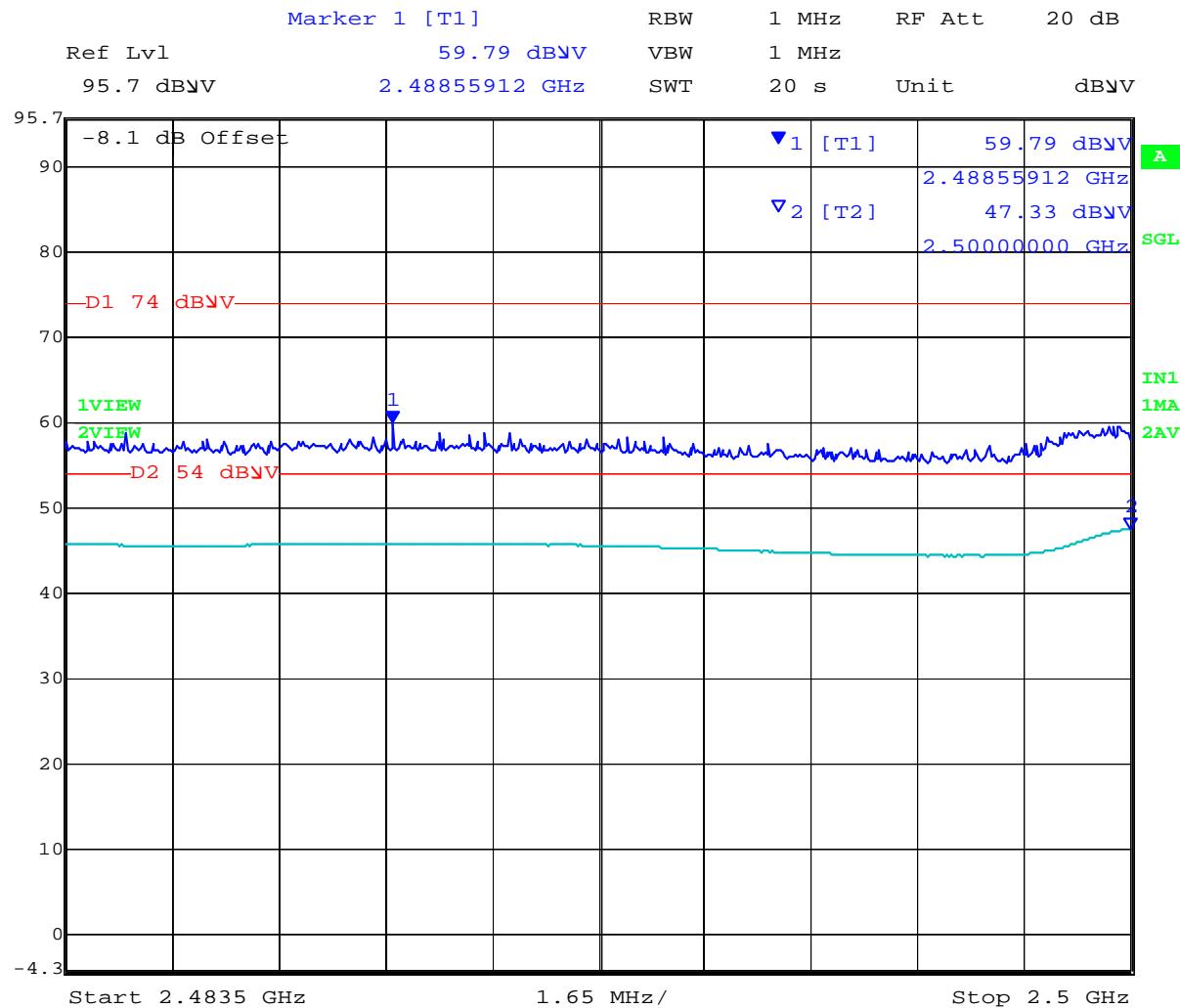
Legend:

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

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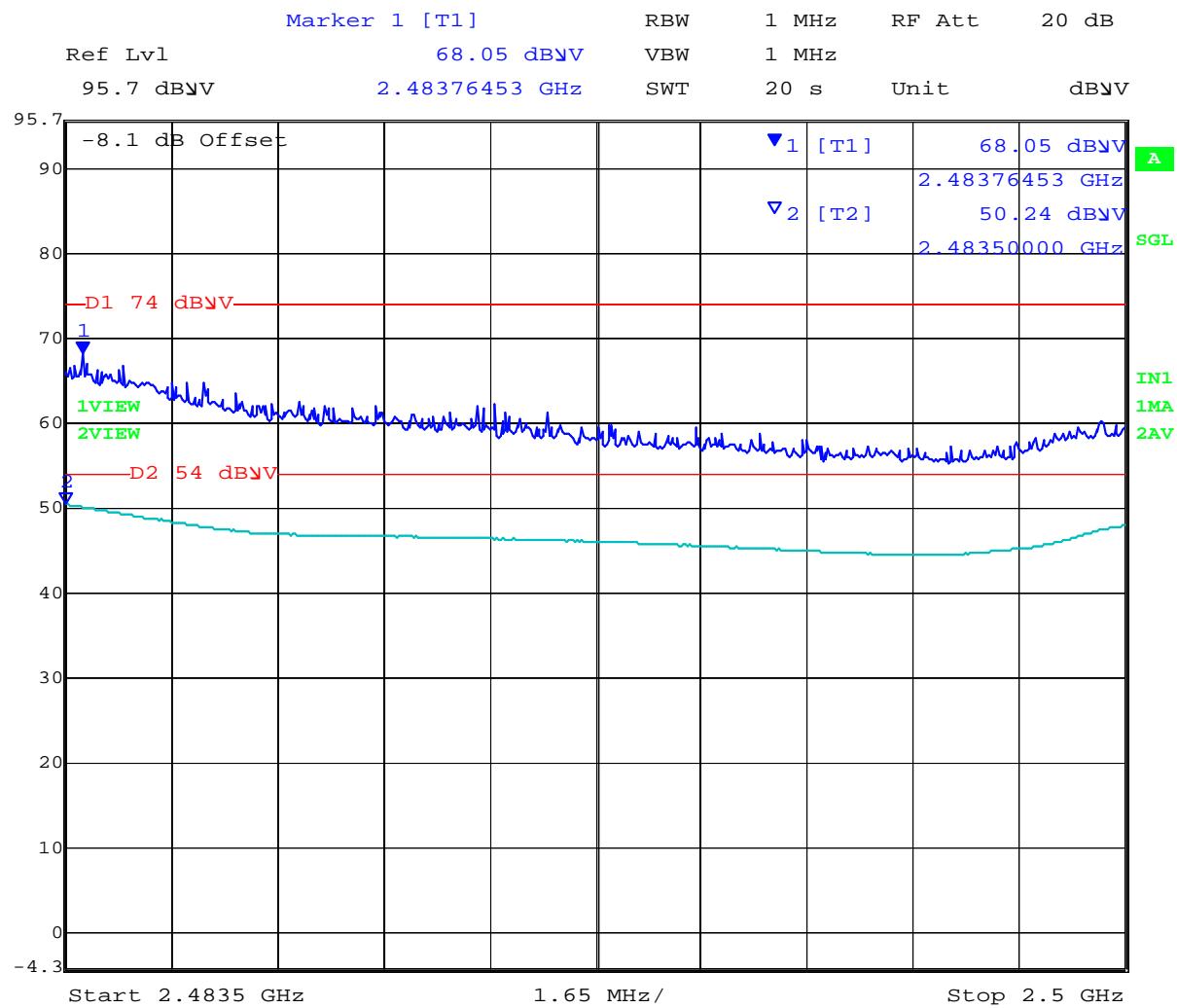
2x2 802.11b 2483.5 MHz Band Edge ART = 19.5



Date: 10.AUG.2012 10:35:20

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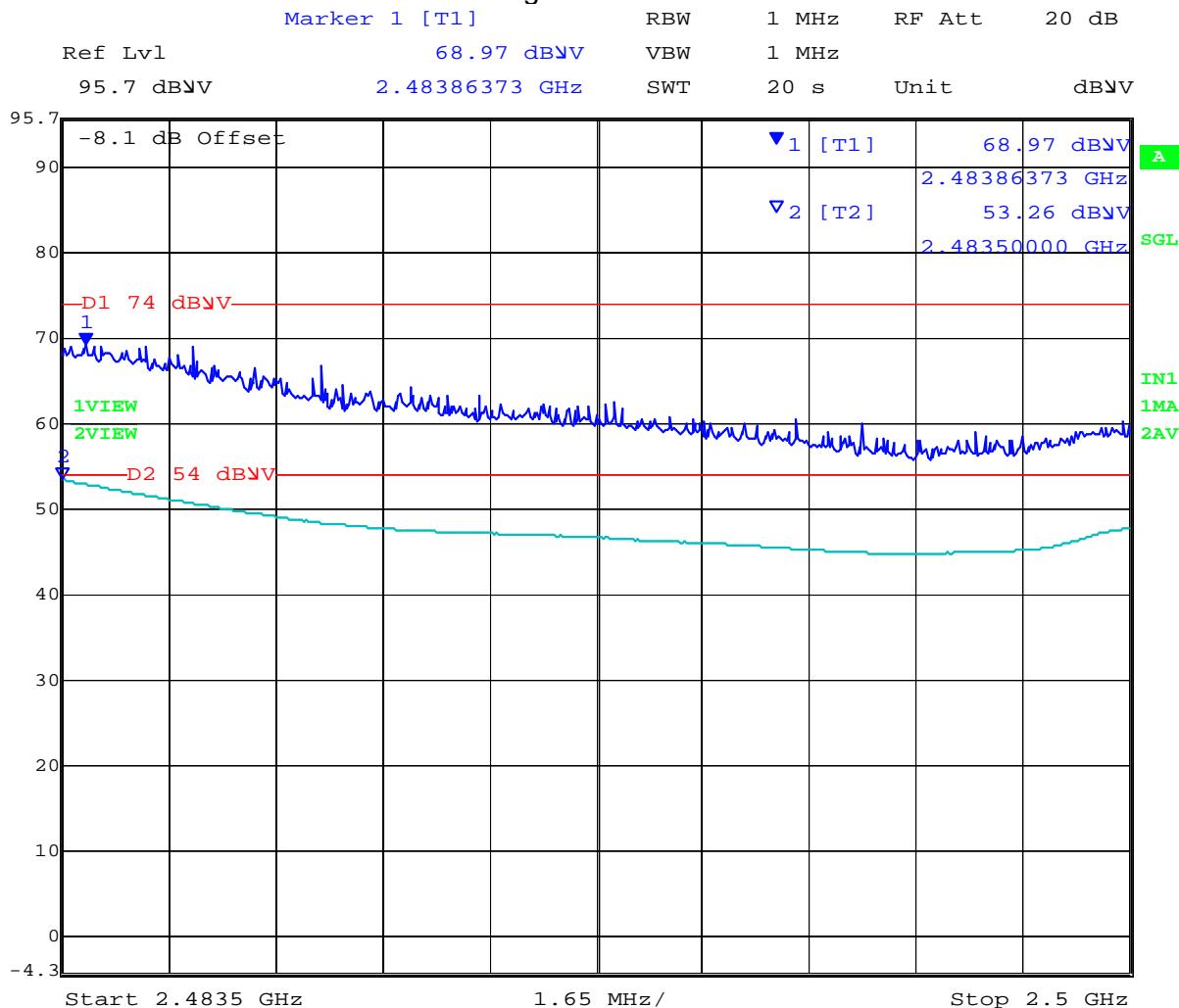
2x2 802.11g 2483.5 MHz Band Edge ART = 16.5



Date: 10.AUG.2012 10:43:09

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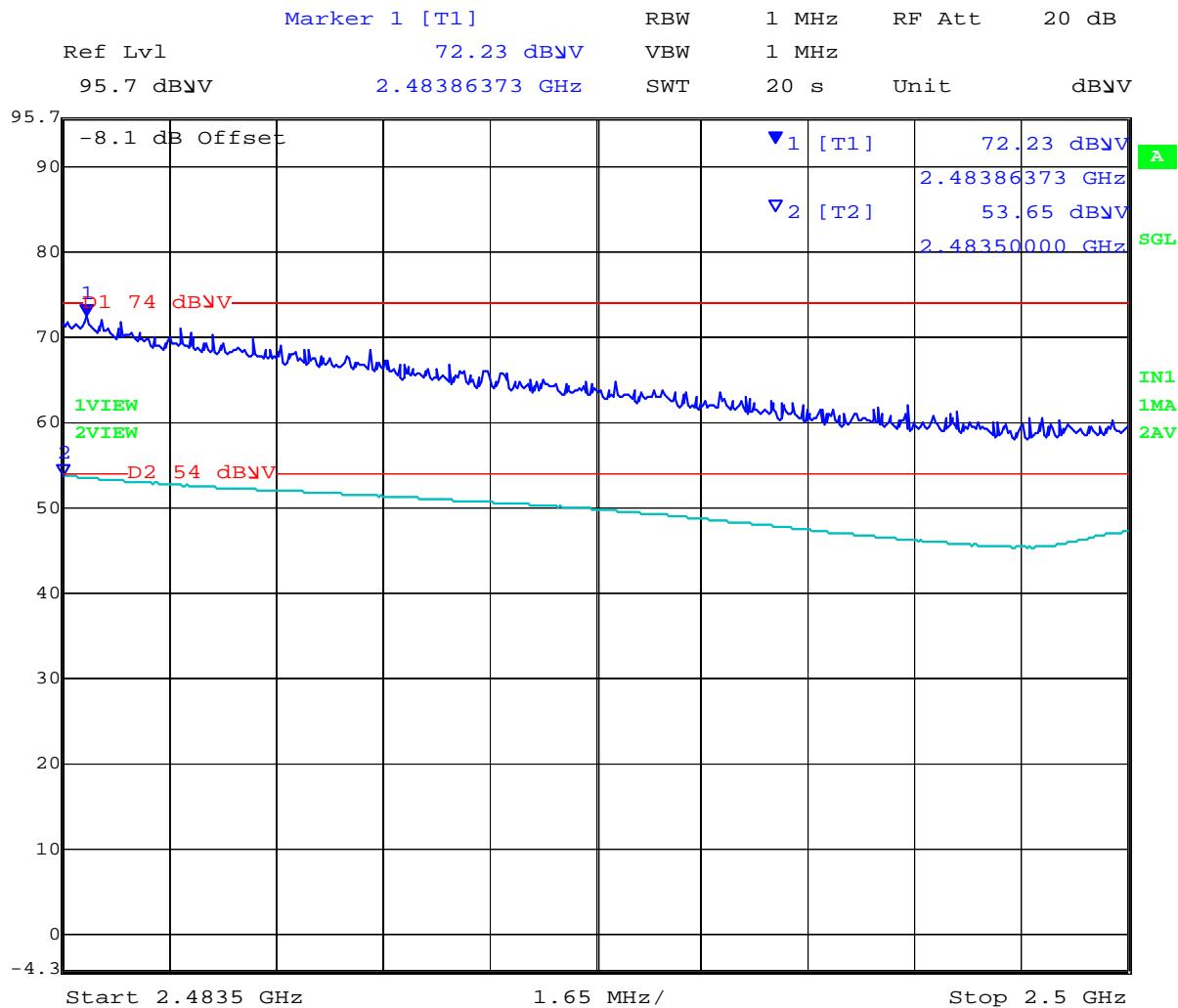
2x2 802.11n HT-20 2483.5 MHz Band Edge ART = 17.5



Date: 10.AUG.2012 10:48:24

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



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

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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.



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§15.209 (a) Limit Matrix

| Frequency(MHz) | Field Strength (μ V/m) | Field Strength (dB μ V/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 |

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5.1.1. 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 dB μ V; 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:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3 \text{ dB}\mu\text{V/m}$$

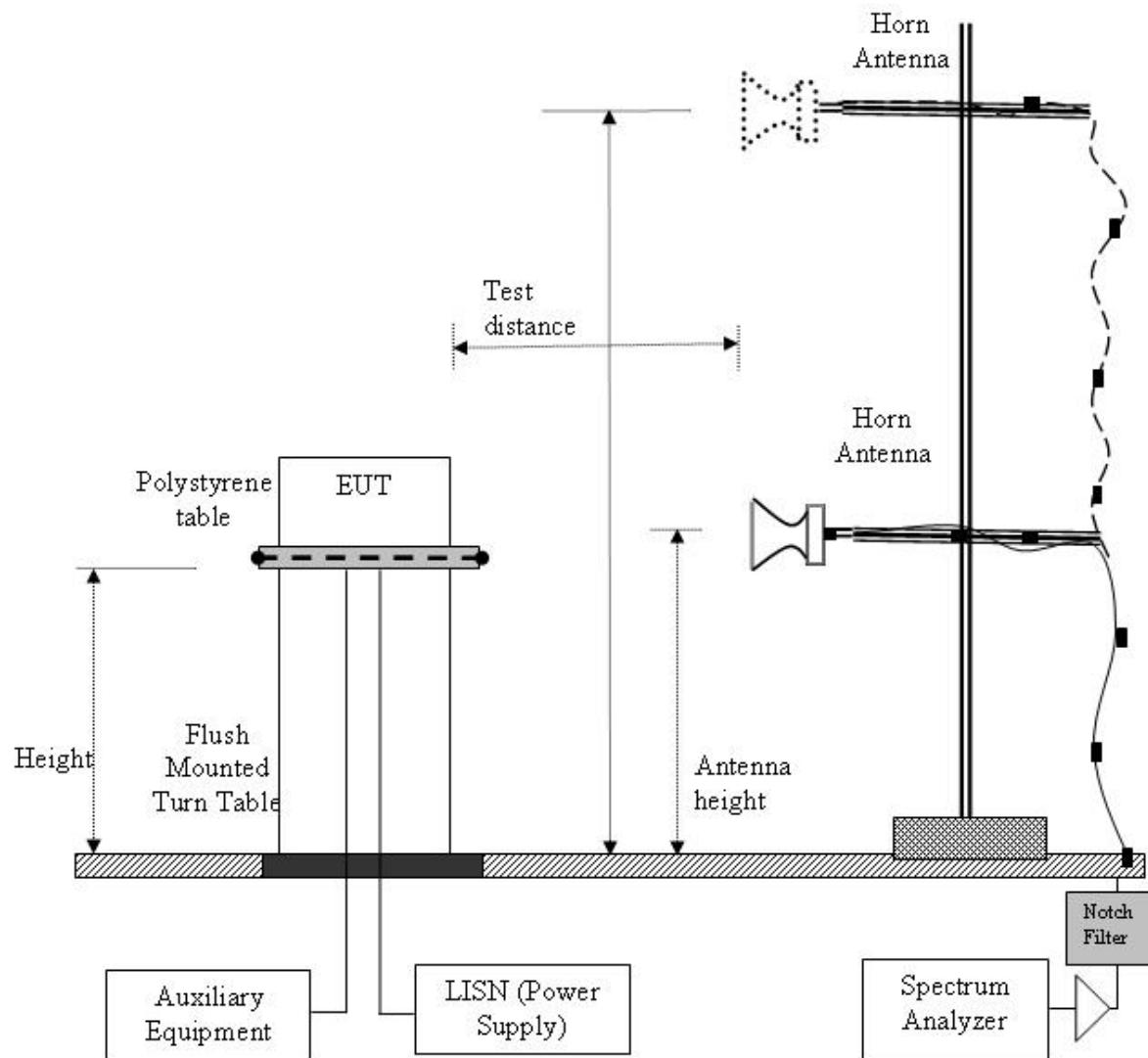
Conversion between dB μ V/m (or dB μ V) and μ V/m (or μ V) are done as:

$$\text{Level (dB}\mu\text{V/m)} = 20 * \text{Log (level (\mu V/m))}$$

$$40 \text{ dB}\mu\text{V/m} = 100 \mu\text{V/m}$$

$$48 \text{ dB}\mu\text{V/m} = 250 \mu\text{V/m}$$

Test Measurement Set Up > 1 GHz



Transmitter Spurious Emission measurement test configuration

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Issue Date: 12th December 2012
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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 (μ V/m) | Field Strength (dB μ V/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 |

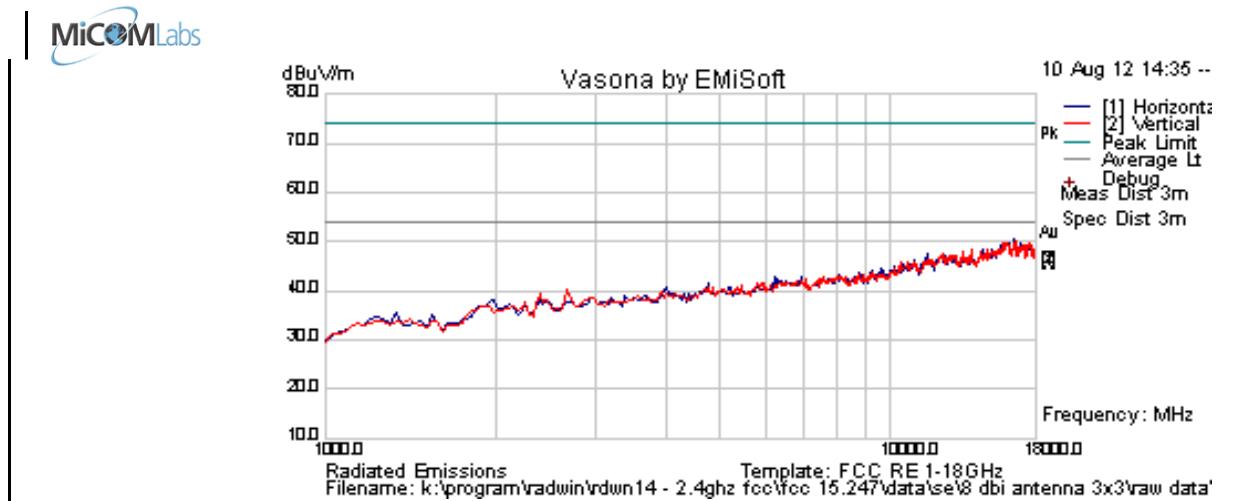
Traceability:

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

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Receiver Radiated Spurious Emissions above 1 GHz

| | | | |
|----------------------|--------------------------------|-----------------------|------|
| Test Freq. | N/A | Engineer | JMH |
| Variant | Receive in Test Utility | Temp (°C) | 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 | | | | | | | | | | | |

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5.2.1. 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 51.5dB μ V; 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:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3dB\mu V/m$$

Conversion between dB μ V/m (or dB μ V) and μ V/m (or μ V) is done as:

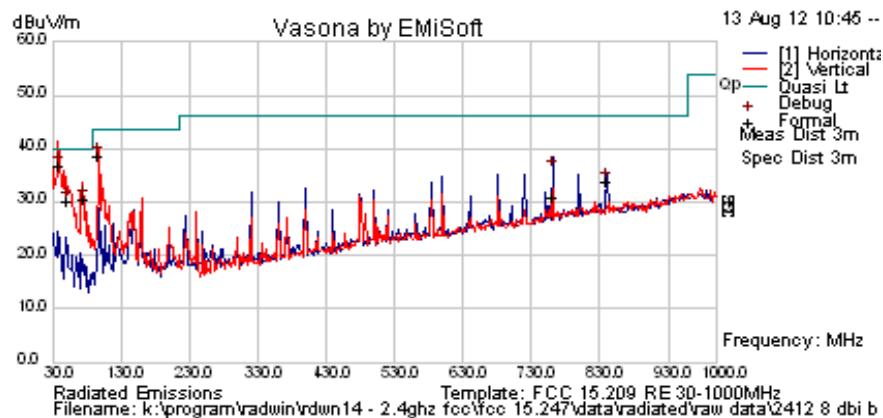
$$\text{Level (dB}\mu\text{V/m)} = 20 * \text{Log} (\text{level (}\mu\text{V/m)})$$

$$40 \text{ dB}\mu\text{V/m} = 100\mu\text{V/m}$$

$$48 \text{ dB}\mu\text{V/m} = 250\mu\text{V/m}$$

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| | | | |
|----------------------|-------------------|-----------------------|------|
| Test Freq. | 2437 MHz | Engineer | JMH |
| Variant | Digital Emissions | Temp (°C) | 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 | | | | | | | | | | | | |

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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 (μ V/m) | Field Strength (dB μ V/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 |

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Title: AP0127450, AP0127460
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: RDWN14-U1 Rev A
Issue Date: 12th December 2012
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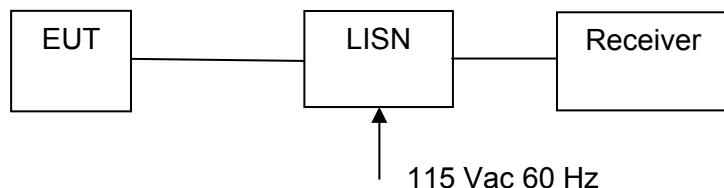
5.2.2. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

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

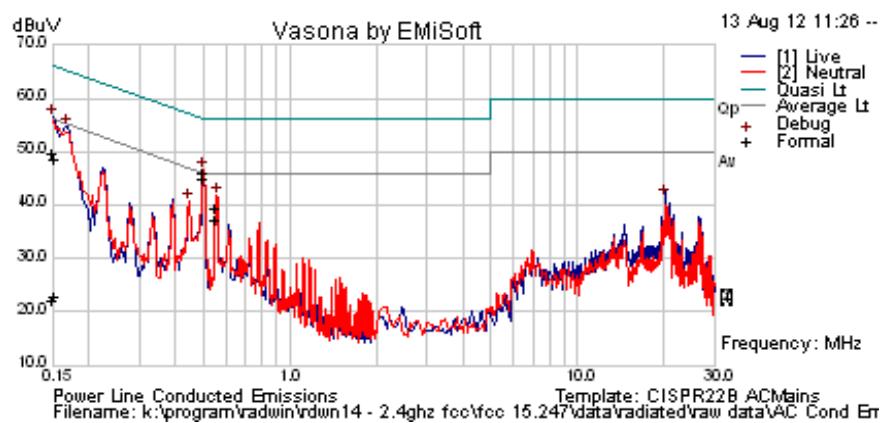
Measurement Results for AC Wireline Conducted Emissions (150 kHz – 30 MHz)

Ambient conditions.

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

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| | | | |
|----------------------|--------------------|-----------------------|------|
| Test Freq. | N/A | Engineer | JMH |
| Variant | AC Line Emissions | Temp (°C) | 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

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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 $\mu\Omega$ 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 (dB μ V) | |
|-----------------------------|------------------------------|-----------|
| | 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 |
|-------------------------|---------------|

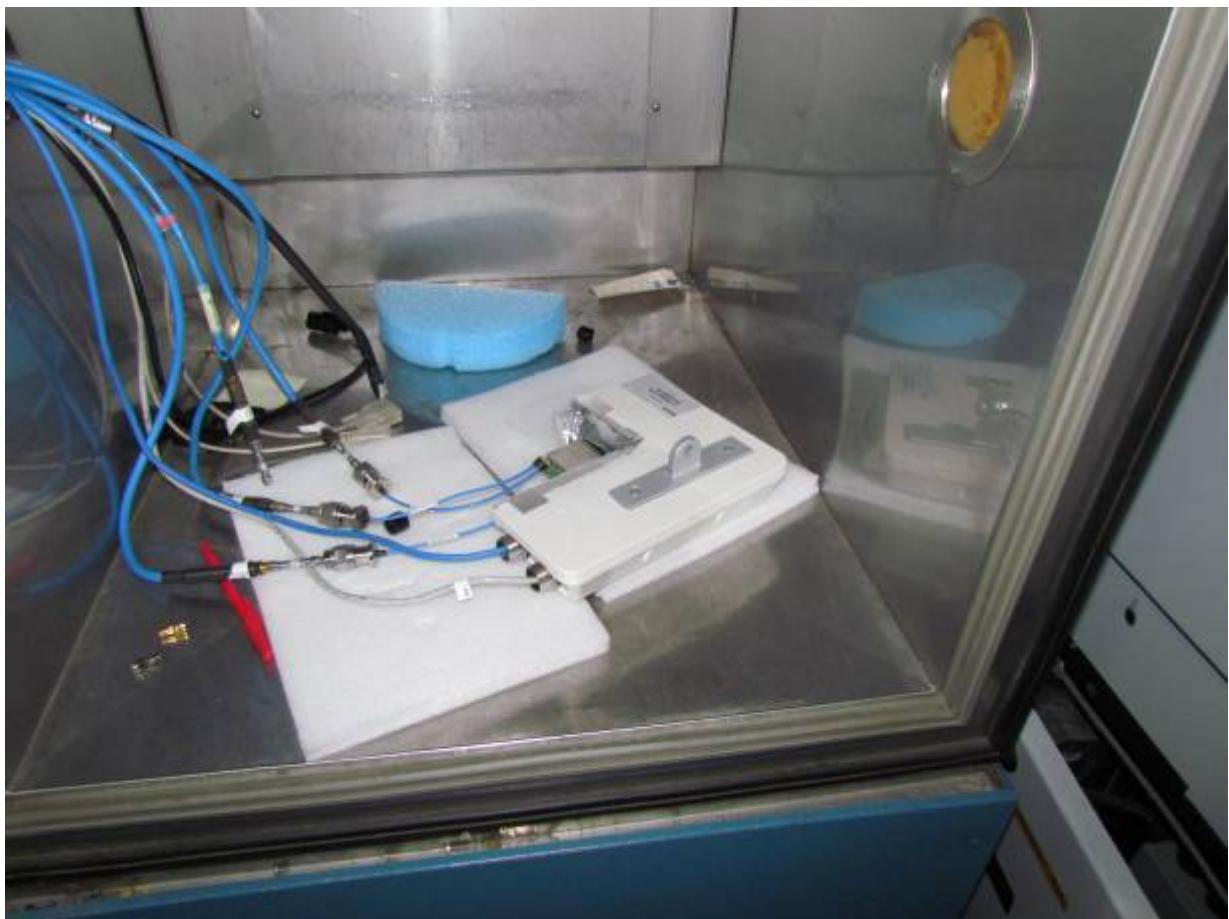
Traceability

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

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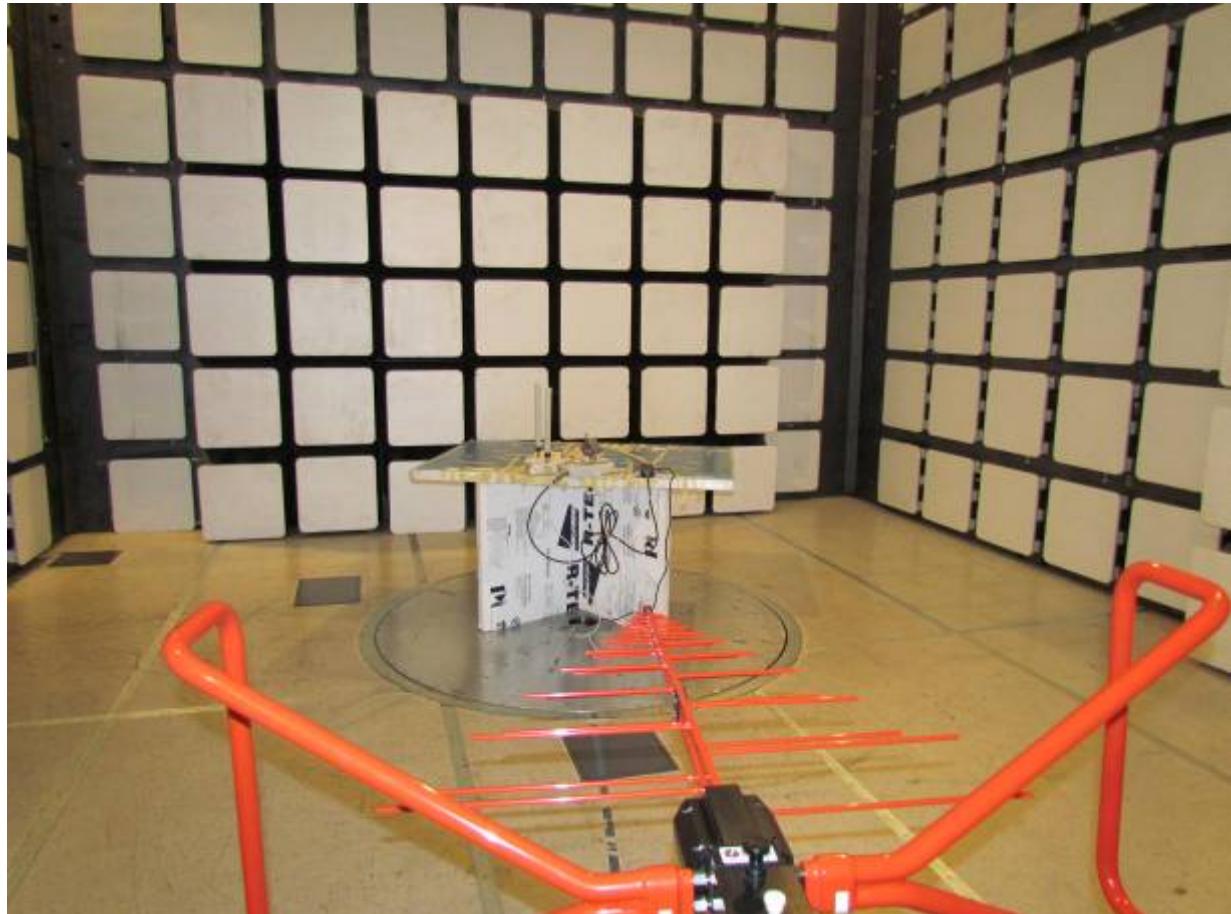
6. PHOTOGRAPHS

6.1. Conducted Test Setup



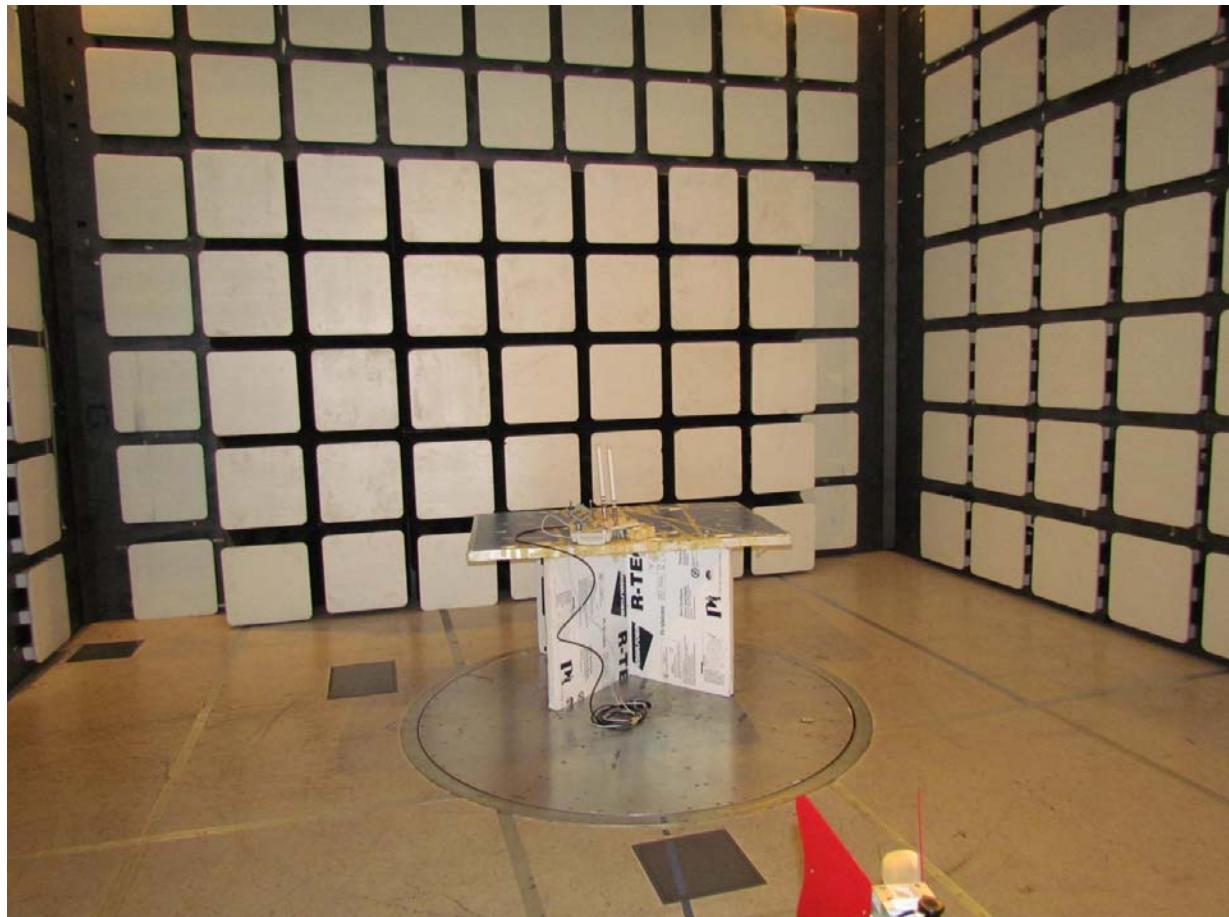
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6.2. Test Setup - Digital Emissions below 1 GHz



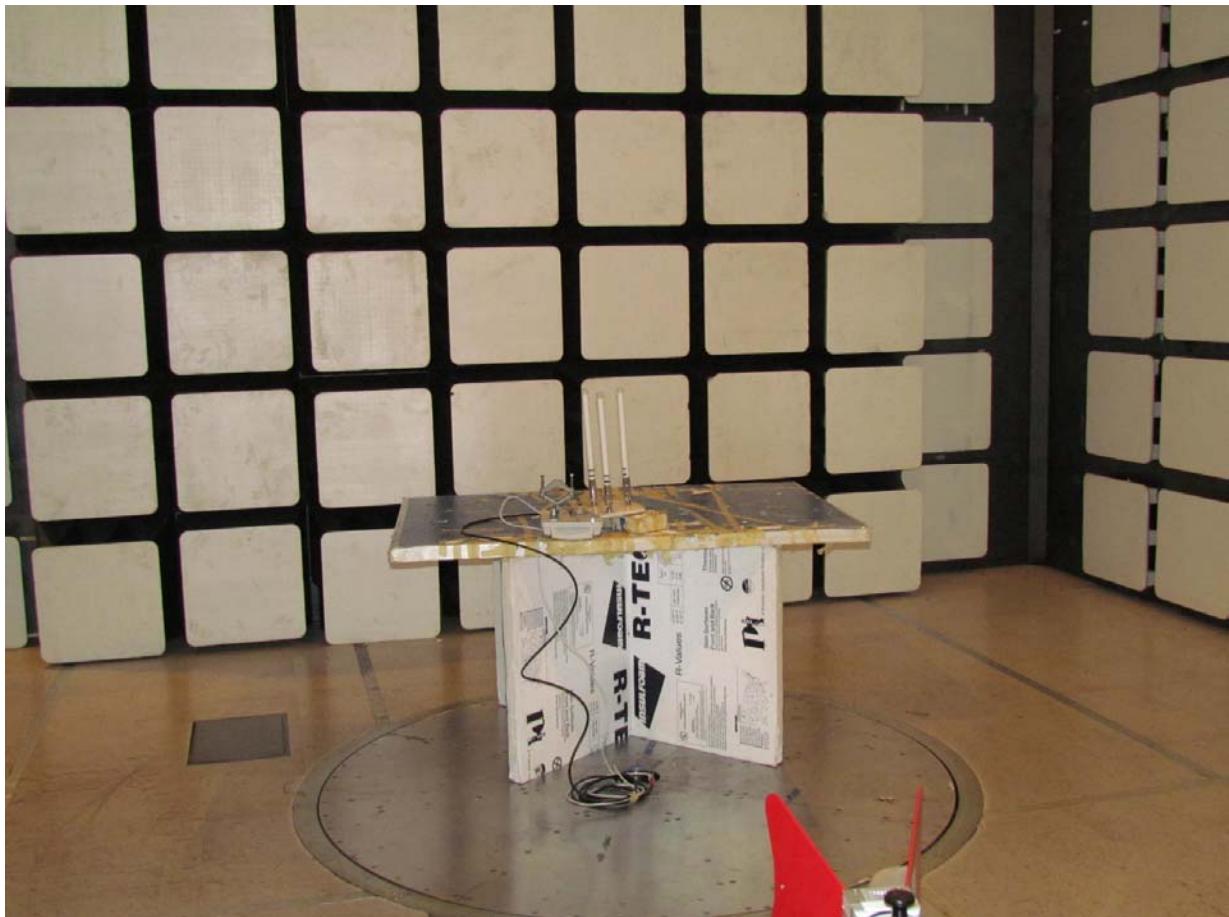
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6.3. Radiated Emissions Test Setup >1 GHz 6.3 dBi Antenna



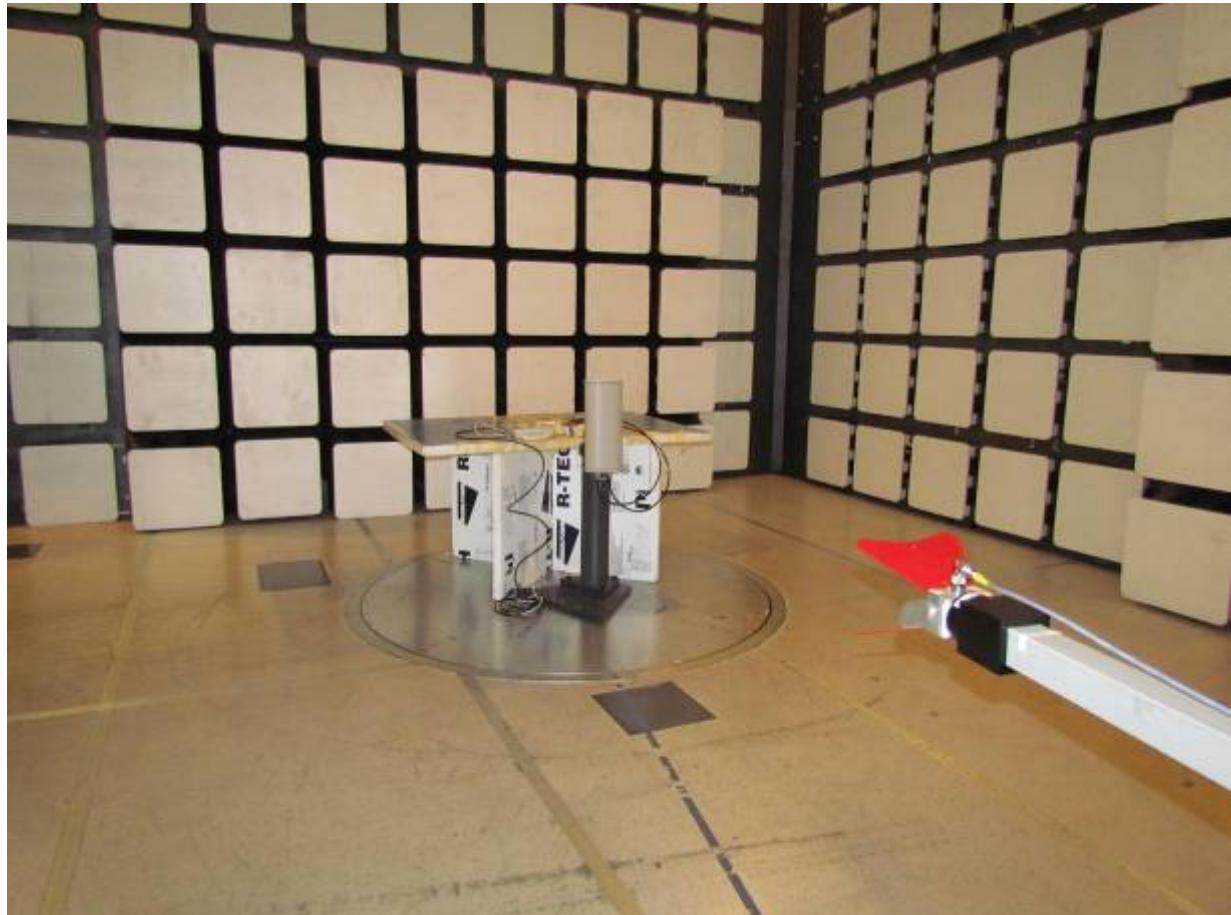
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6.4. Radiated Emissions Test Setup >1 GHz 8 dBi Antenna



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6.5. Radiated Emissions Test Setup >1 GHz 9 dBi Sector Antenna



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To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: RDWN14-U1 Rev A
Issue Date: 12th December 2012
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7. TEST EQUIPMENT

| Asset # | Instrument | Manufacturer | Part # | Serial # | Calibration Due Date |
|----------------|----------------------------|----------------------|-----------------------|-----------------|-----------------------------|
| 0070 | Power Meter | Hewlett Packard | 437B | 3125U11552 | 28 th Nov 12 |
| 0117 | Power Sensor | Hewlett Packard | 8487D | 3318A00371 | 15 th Nov 12 |
| 0223 | Power Meter | Hewlett Packard | EPM-442A | US37480256 | 15 th Nov 12 |
| 0374 | Power Sensor | Hewlett Packard | 8485A | 3318A19694 | 29 th Nov 12 |
| 0158 | Barometer /Thermometer | Control Co. | 4196 | E2846 | 8 th Dec 12 |
| 0193 | EMI Receiver | Rhode & Schwartz | ESI 7 | 838496/007 | 2 nd Dec 12 |
| 0287 | EMI Receiver | Rhode & Schwartz | ESIB40 | 100201 | 16 th Nov 12 |
| 0338 | 30 - 3000 MHz Antenna | Sunol | JB3 | A052907 | 8 th Nov 12 |
| 0335 | 1-18 GHz Horn Antenna | EMCO | 3117 | 00066580 | 7 th Nov 12 |
| 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 |

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