Test of Silver Spring Networks NIC 451

To: FCC 47 CFR Part15.247 & IC RSS-210

Test Report Serial No.: SSNT92-U2A Rev A

TEST REPORT

FROM

MiCOM Labs

Test of Silver Spring Networks NIC 451

To FCC 47 CFR Part15.247 & IC RSS-210

Test Report Serial No.: SSNT92-U2A Rev A

This report supersedes: None

Manufacturer: Silver Spring Networks
555 Broadway Street
Redwood City
California 94063, USA

Product Function: Machine to machine communication

Copy No: pdf **Issue Date:** 27th April 2015

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
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Pleasanton, CA 94566 USA
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A2LA ACCREDITED
TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION, LISTINGS & RECOGNITION

TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard 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

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 28th day of February 2014.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2015

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

RECOGNITION

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

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2 4143A-3
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	RCB 210
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

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

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

**NB – Notified Body

PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

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

Industry Canada – Certification Body
CAB Identifier – US0159

Europe – Notified Body
Notified Body Identifier - 2280

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

DOCUMENT HISTORY

Document History		
Revision	**Date**	**Comments**
Draft		
Rev A	27th April 2015	Initial release.

1. TEST RESULT CERTIFICATE

Manufacturer:	Silver Spring Networks 555 Broadway Street Redwood City California 94063, USA	Tested By:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California, 94566, USA
EUT:	Network Interface Card (NIC)	Phone:	+1 925 462 0304
Model:	NIC 451-0523-10	Fax:	+1 925 462 0306
S/N:	Radiated 00:13:50:07:00:00:03:CD		
Test Date(s):	18th March 2015	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part15.247 & 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:

A2LA ACCREDITED
TESTING CERT #2381.01

Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

Ref.	Publication	Year	Title
(i)	FCC 47 CFR Part 15.247	2014	CFR Title 47 Part 15.247 – Radio Frequency Devices; Subpart C – Intentional Radiators
(ii)	KDB 558074 D01	June 6,2014	DTS Meas Guidance v03r02 Guidance for performing compliance measurements on Digital Transmission Systems (DTS) operating under section 15.247.
(iii)	KDB 558074 D02	June 5,2014	DTS Part 15.247 Old Rule. Guidance for performing compliance measurements on Digital Transmission Systems (DTS) operating under section 15.247.
(iv)	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
(v)	ANSI C63.4	2014	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
(vi)	CISPR 22	2008	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
(vii)	ICES-003	Issue 5 2012	Spectrum Management and Telecommunications; Interference-Causing Equipment Standard. Information Technology Equipment (ITE) – Limits and methods of measurement.
(viii)	RSS-210 Annex 8	2010	Radio Standards Specification 210; License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
(ix)	RSS-Gen	2014	General Requirements and Information for the Certification of Radiocommunication Equipment
(x)	FCC 47 CFR Part 2.1033	2014	FCC requirements and rules regarding photographs and
(xi)	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(xii)	M 3003	Edition 3 Nov. 2012	Expression of Uncertainty and Confidence in Measurements
(xiii)	A2LA	April 2014	Reference to A2LA Accreditation Status – A2LA Advertising Policy

2.2. 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.

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the Silver Spring Networks NIC 451 to FCC Part 15.247 and Industry Canada RSS-210 regulations
Applicant:	As Manufacturer
Manufacturer:	Silver Spring Networks 555 Broadway Street Redwood City California 94063, USA
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton, California 94566 USA
Test report reference number:	SSNT92-U2A Rev A
Standard(s) applied:	FCC 47 CFR Part15.247 & IC RSS-210
Date EUT received:	8th October 2013
Dates of test (from - to):	18th March 2015
No of Units Tested:	Two
Type of Equipment:	Network Interface Card (NIC)
Manufacturers Trade Name:	Silver Spring Networks
Model:	NIC 451-0523-10
Location for use:	Indoor/Outdoor
Declared Frequency Range(s):	902 – 928 MHz
Type of Modulation:	900 MHz: FSK & GFSK
Declared Nominal Output Power:	902-928 MHz :+30 dBm
EUT Modes of Operation:	FHSS
Transmit/Receive Operation:	Transceiver, Simplex
Rated Input Voltage:	Nominal Voltage 4 Vdc
Operating Temperature Range:	-40ºC to +85ºC (client declared range)
ITU Emission Designator(s):	900 MHz 100 kbps 200 kHz BW GFSK: 120KF1D 900 MHz 100 kbps 300 kHz BW FSK: 205KF1D 900 MHz 150 kbps 300 kHz BW GFSK: 169KF1D 900 MHz 300 kbps 400 kHz BW GFSK: 319KF1D
EUT Dimensions:	2.75” diameter by 0.75” high
EUT Weight :	50 grams
Primary function of equipment:	Machine to machine communication over 900 MHz FHSS

3.2. Scope of Test Program

The scope of the test program was to test the Silver Spring Networks NIC 451 in the frequency ranges 902 - 928 MHz against the emissions requirements of FCC 47 CFR Part 15.247 and Industry Canada RSS-210 specifications.

This product was previously tested by MiCOM Silver Spring Networks NIC 451 in the frequency ranges 902 - 928 MHz against FCC 47 CFR Part 15.247 and Industry Canada RSS-210 specifications with results reported in MiCOM test report SSNT69-U2 Rev B published in November 2013. The product now uses new integral and external antennas. The scope of this test program is limited to performing radiated emissions testing.

Product Description
The following product description was provided by the manufacturer.

The Silver Spring Networks NIC 451 is a network interface card (NIC) designed to fit inside existing photocell products as a retrofit to provide communication and control for street lights. The NIC 451 is designed to be integrated into LED fixtures and control nodes, and provides advanced functionality for controlling external devices such as dimmable electronic ballasts and LED fixtures. The NIC uses industry standard interfaces (such as 1-10V or DALI) to control these devices. An optional GPS chip can be added to provide accurate location and time and/or real-time clock (RTC) can be provided with backup battery/super caps to keep time, even when the NIC has lost power

3.3. Product Description

The following product model information was declared by the manufacturer.

The manufacturer declared that the variant tested represents the worst case covering all of the available options.

Models	FCC ID	IC ID	900MHz Mesh	2.4GHz Mesh	Int Ant	Ext Ant	GPS	RTC	1-10V Dimmer
NIC 451-0101	OWS-NIC451	5975A-NIC451	X		X				
NIC 451-0102	OWS-NIC451	5975A-NIC451	X			X			
NIC 451-0103	OWS-NIC451	5975A-NIC451	X		X	X			
NIC 451-0501	OWS-NIC452	5975A-NIC452	X	X	X				
NIC 451-0502	OWS-NIC452	5975A-NIC452	X	X		X			
NIC 451-0503	OWS-NIC452	5975A-NIC452	X	X	X	X			
NIC 451-0103-03	OWS-NIC451	5975A-NIC451	X		X	X		X	
NIC 451-0103-04	OWS-NIC451	5975A-NIC451	X		X	X		X	X
NIC 451-0101-03	OWS-NIC451	5975A-NIC451	X		X			X	
NIC 451-0102-03	OWS-NIC451	5975A-NIC451	X			X		X	
NIC 451-0503-03	OWS-NIC452	5975A-NIC452	X	X	X	X		X	
NIC 451-0121-05	OWS-NIC451	5975A-NIC451	X		X		X		
NIC 451-0123-05	OWS-NIC451	5975A-NIC451	X		X	X	X		
NIC 451-0523-05	OWS-NIC452	5975A-NIC452	X	X	X	X	X		
NIC 451-0523-10	OWS-NIC452	5975A-NIC452	X	X	X	X	X	X	X

Antenna Options

The NIC 451 (NIC 451-0523-10) has two antenna options; integral and external. Both options were tested.

The NIC 451 (NIC 451-0523-10) was tested with the following modulations and data rates. Results for the external antenna are included in this report.

Frequency Band	Modulation	Data Rate / Bandwidth
902 – 928 MHz	FSK	100 kBit/s / 300 kHz
	GFSK	100 kBit/s / 200 kHz
	GFSK	150 kBit/s / 300 FSK
	GFSK	300 kBit/s / 400 kHz

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

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	Network Interface Card	Silver Spring Network	NIC 451-0523-10	Radiated 00:13:50:07:00:00:03:CD
Support	Laptop	IBM	ThinkPad	None

3.5. Antenna Details

Antenna type (dipole, chip, etc)	Frequency Band (MHz)	Antenna Gain (dBi)	Manufacturer	Internal/ External	Model No.
Omni-directional	870 - 930	1	World Products	Internal	WPANT10061-S1C
	2400 - 2500	1			
Omni-directional	860 - 960	2.5	World Products	External	WPANT30088-S1A
	2400 - 2500	4.5			

3.6. Cabling and I/O Ports

Number and type of I/O ports

1. NONE

3.7. Test Configurations

Test configurations

Frequency Band	Modulation	Data Rate (kBit/s)	Channel Center Frequency (MHz)
902 – 928 MHz	FSK	100	902.3, 915.2, 927.5
	GFSK	100	902.2, 915.2, 927.8
	GFSK	150	902.3, 915.2, 927.5
	GFSK	300	902.4, 915.6, 927.6

3.8. Equipment Modifications

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

1. NONE

3.9. Deviations from the Test Standard

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

1. NONE

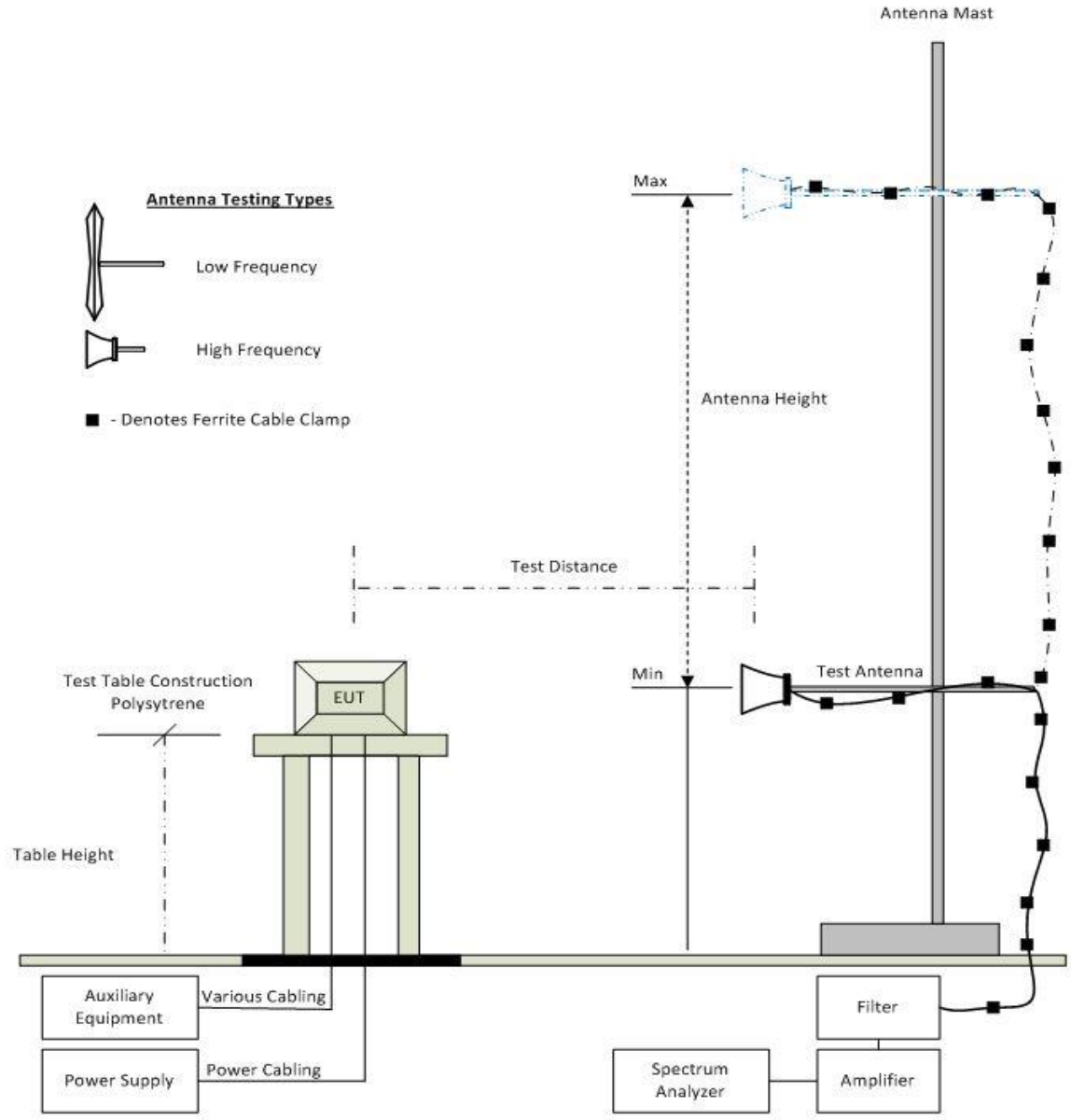
4. TEST EQUIPMENT CONFIGURATION(S)

Radiated Testing

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

6.7 Radiated Spurious Emissions (1 – 10 GHz)
6.8 Radiated Digital Emissions (0.03 – 1 GHz)

Radiated Emission Measurement Setup



Radiated Emission Test Setup

Assets Utilized for Radiated Emission Testing

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
158	Barometer/Thermometer	Control Company	4196	E2846	04 Dec 2015
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CY101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	31 Jul 2015
301	5470 to 5725 MHz Notch Filter	Microtronics	RBC50704	001	08 Oct 2015
302	5150 to 5350 MHz Notch Filter	Microtronics	BRC50703	002	08 Oct 2015
303	5725 to 5875 MHz Notch filter	Microtronics	BRC50705	003	08 Oct 2015
310	SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001	30 Oct 2015
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	14 Aug 2015
342	2.4 GHz Notch Filter	EWT	EWT-14-0203	H1	08 Oct 2015
343	5.15 GHz Notch Filter	EWT	EWT-14-0200	H1	08 Oct 2015
344	5.35 GHz Notch Filter	EWT	EWT-14-0201	H1	08 Oct 2015
345	5.46 GHz Notch Filter	EWT	EWT-14-0202	H1	08 Oct 2015
377	Band Rejection Filter 5150 to 5880MHz	Microtronics	BRM50716	034	08 Oct 2015
396	2.4 GHz Notch Filter	Microtronics	BRM50701	001	07 Oct 2015
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	23 Oct 2015
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	10 Oct 2015
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	30 May 2015
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
416	Gigabit ethernet filter	ETS-Lingren	Gigafoil 260366	None	Not Required
502	Test Software for Radiated Emissions	EMISoft	Vasona	Version 5 Build 59	Not Required
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used

5. TEST SUMMARY

List of Measurements

The following table represents the list of emission 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**	Radiated Emissions above 1 GHz	Transmitter	Radiated	Complies	6.1
15.247(d) **15.205** **15.209** **A8.5** **8.9**	Radiated Emissions below 1 GHz		Radiated	Complies	6.2
15.207 **8.8**	Conducted	AC Wireline Conducted Emissions	Conducted	Test not applicable EUT is dc powered	6.3

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3: *Section 3.8 - Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

6. TEST RESULTS

6.1. Radiated Spurious Emissions

Transmitter Radiated Spurious Emissions; 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
Industry Canada RSS-Gen §8.10

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

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

Field Strength Calculation

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

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

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

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

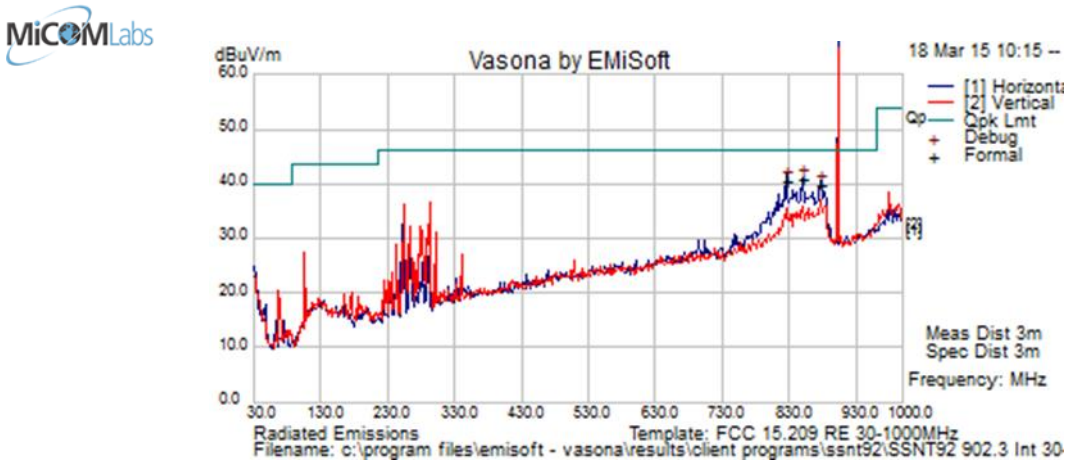
Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

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

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

6.1.1. Integral Antenna - Radiated Spurious Emissions

Test Freq.	902.3 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	30-1000 MHz	**Rel. Hum.(%)**	43
Power Setting	49	**Press. (mBars)**	1005
Antenna	Integral	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, INT Antenna WPANT10061-S1C		
Test Notes 2			



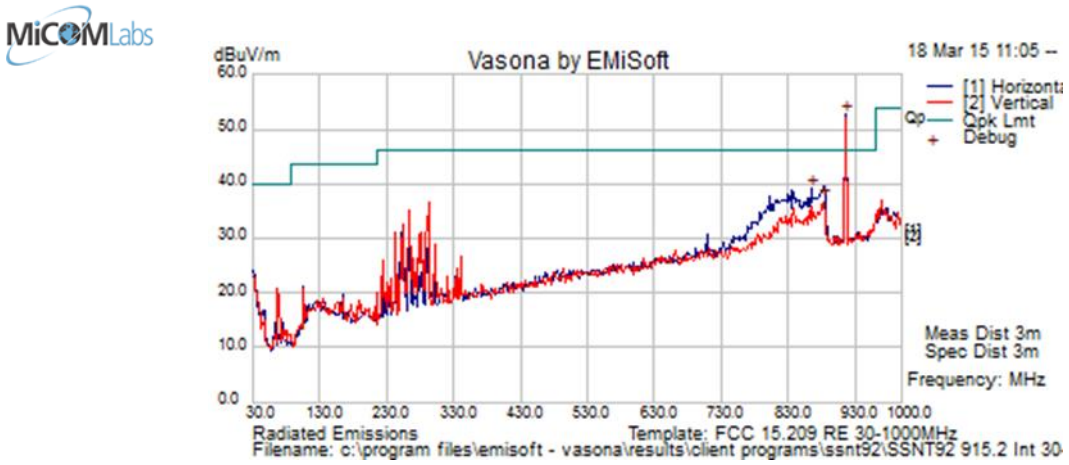
Formally measured emission peaks

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
902.806	69.1	6.3	-7.6	67.8	Peak [Scan]	H						FUND
824.284	42.5	6.2	-8.1	40.6	Quasi Max	H	101	251	46	-5.43	Pass	
850.339	42.5	6.3	-8.1	40.7	Quasi Max	H	99	227	46	-5.31	Pass	
876.280	41.6	6.3	-8.0	39.8	Quasi Max	H	165	259	46	-6.16	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Test Freq.	915.3 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	30-1000 MHz	**Rel. Hum.(%)**	43
Power Setting	60	**Press. (mBars)**	1005
Antenna	Integral	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, INT Antenna WPANT10061-S1C		
Test Notes 2			



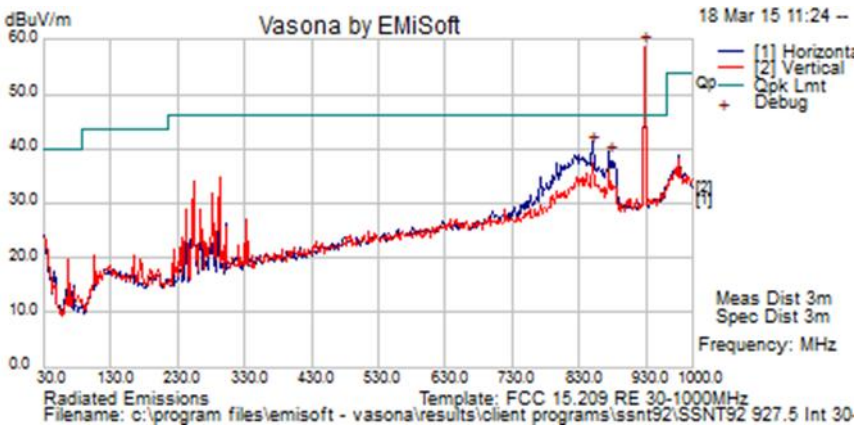
Formally measured emission peaks

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
916.413	53.8	6.4	-7.6	52.6	Peak [Scan]	H						FUND
882.252	38.8	6.3	-8.0	37.0	Quasi Max	H	156	259	46	-8.96	Pass	
864.172	40.8	6.3	-8.1	38.9	Peak [Scan]	H	98	361	46	-7.08	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Test Freq.	927.5 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	30-1000 MHz	**Rel. Hum.(%)**	43
Power Setting	60	**Press. (mBars)**	1005
Antenna	Integral	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, INT Antenna WPANT10061-S1C		
Test Notes 2			



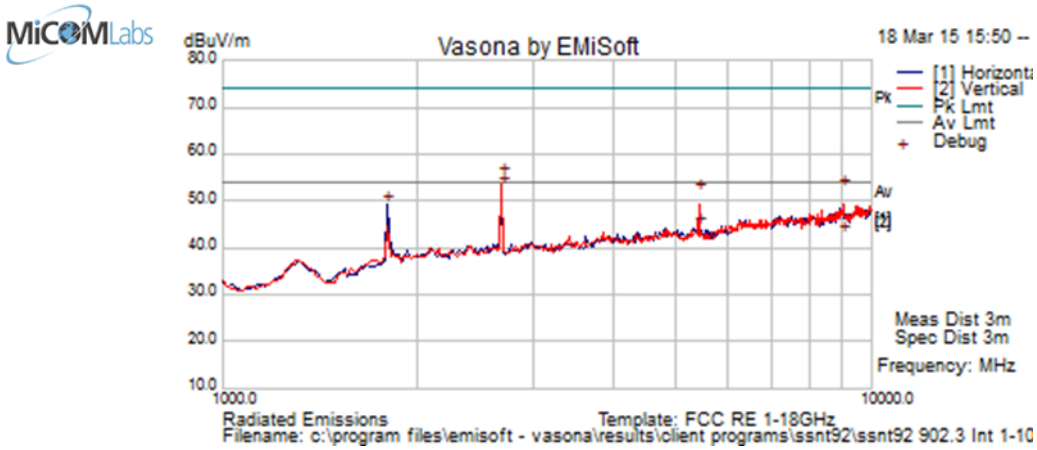
Formally measured emission peaks

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
928.076	59.7	6.4	-7.3	58.8	Peak [Scan]	V						FUND
849.504	42.2	6.3	-8.1	40.4	Quasi Max	H	99	271	46	-5.65	Pass	
875.495	40.4	6.3	-8.0	38.7	Quasi Max	H	152	272	46	-7.35	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Test Freq.	902.3 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	1-10 GHz	**Rel. Hum.(%)**	43
Power Setting	49	**Press. (mBars)**	1005
Antenna	Integral	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, INT Antenna WPANT10061-S1C		
Test Notes 2			

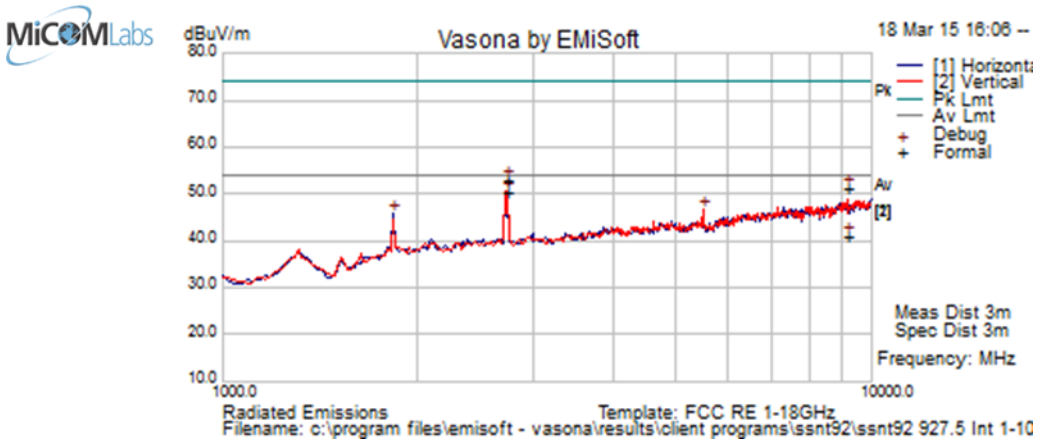


Formally measured emission peaks

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
2706.864	60.2	4.2	-11.4	53.0	Average Max	V	99	81	54	-1.02	Pass	RB
2706.864	62.4	4.2	-11.4	55.2	Peak Max	V	99	81	74	-18.85	Pass	RB
5413.727	56.6	6.0	-11.2	51.5	Peak Max	V	112	139	74	-22.53	Pass	RB
5413.727	49.6	6.0	-11.2	44.4	Average Max	V	112	139	54	-9.57	Pass	RB
9022.946	41.5	8.1	-6.9	42.8	Average Max	V	108	85	54	-11.3	Pass	RB
9022.946	51.2	8.1	-6.9	52.5	Peak Max	V	108	85	74	-21.6	Pass	RB
1793.587	59.6	3.4	-13.8	49.2	Peak [Scan]	H						NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

Test Freq.	915.3 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	1-10 GHz	**Rel. Hum.(%)**	43
Power Setting	49	**Press. (mBars)**	1005
Antenna	Integral	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, INT Antenna WPANT10061-S1C		
Test Notes 2			

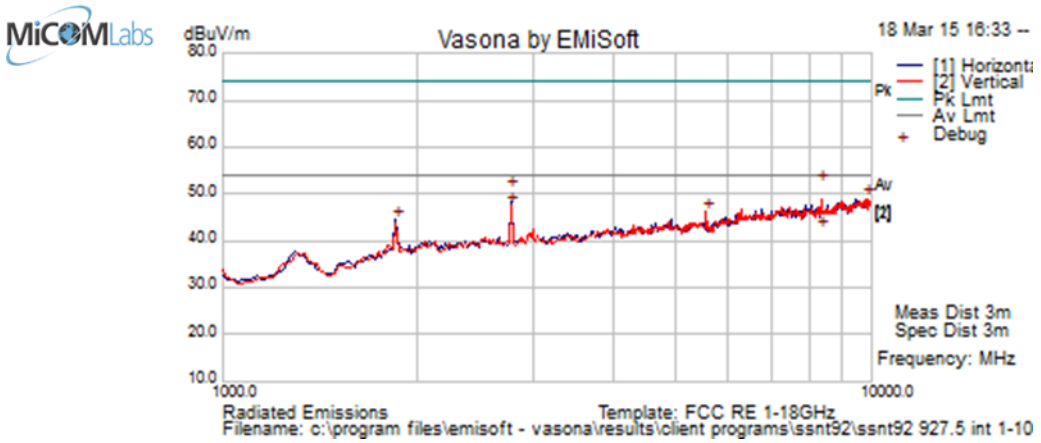


Formally measured emission peaks

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
2745.604	57.5	4.2	-11.4	50.4	Average Max	H	201	138	54	-3.63	Pass	
2745.604	60.0	4.2	-11.4	52.8	Peak Max	H	201	138	74	-21.16	Pass	
9151.854	40.1	8.2	-7.2	41.1	Average Max	V	123	295	54	-12.9	Pass	
9151.854	50.3	8.2	-7.2	51.3	Peak Max	V	123	295	74	-22.71	Pass	
5489.919	51.5	6.1	-11.2	46.4	Peak [Scan]	V	122	295	54	-7.6	Pass	
1830.335	55.8	3.4	-13.5	45.7	Peak [Scan]	H	100	-1	54	-8.3	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

Test Freq.	927.5 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	1-10 GHz	**Rel. Hum.(%)**	43
Power Setting	60	**Press. (mBars)**	1005
Antenna	Integral	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, INT Antenna WPANT10061-S1C		
Test Notes 2			



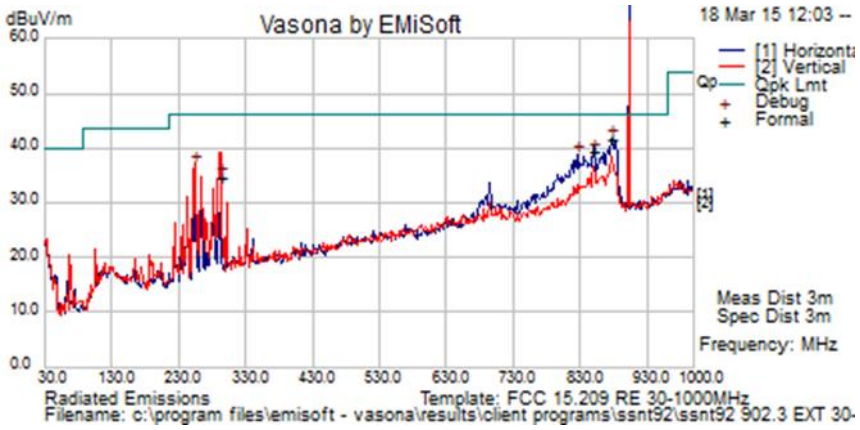
Formally measured emission peaks

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
2782.559	57.8	4.2	-11.3	50.7	Peak Max	H	192	135	74	-23.28	Pass	RB
2782.559	54.5	4.2	-11.3	47.4	Average Max	H	192	135	54	-6.57	Pass	RB
8347.230	41.5	7.8	-7.1	42.2	Average Max	V	105	143	54	-11.83	Pass	RB
8347.23	51.6	7.8	-7.1	52.3	Peak Max	V	105	143	74	-21.7	Pass	RB
9837.675	46.4	8.6	-6.0	49.0	Peak [Scan]	V	100					NRB
1847.804	54.6	3.4	-13.5	44.6	Peak [Scan]	H	98					NRB
5562.256	51.4	6.1	-11.2	46.3	Peak [Scan]	V	98					NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

6.1.2. External Antenna - Radiated Spurious Emissions

Test Freq.	902.3 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	30-1000 MHz	**Rel. Hum.(%)**	43
Power Setting	60	**Press. (mBars)**	1005
Antenna	External	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, EXT Antenna WPANT30088-S1A		
Test Notes 2			



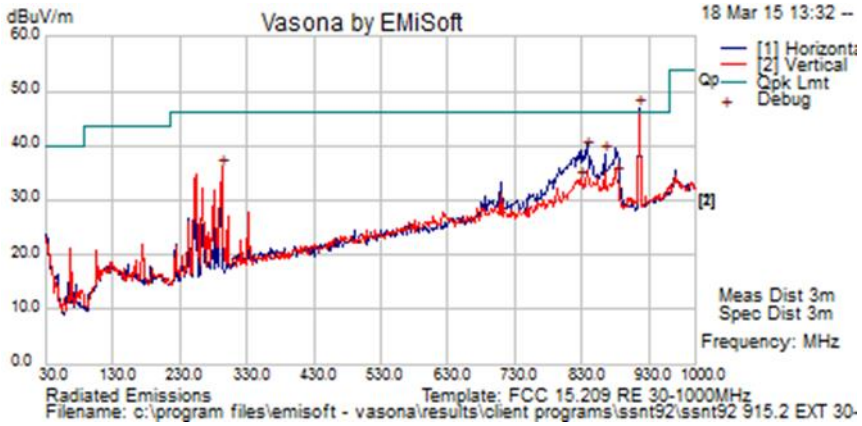
Formally measured emission peaks

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
902.806	67.2	6.3	-7.6	66.0	Peak [Scan]	H						FUND
876.289	43.3	6.3	-8.0	41.6	Quasi Max	H	99	105	46	-4.45	Pass	
850.309	41.0	6.3	-8.1	39.2	Quasi Max	H	99	43	46	-6.82	Pass	
292.596389	47.5	4.7	-17.5	34.7	Quasi Max	V	120	293	46	-11.32	Pass	
825.115	40.7	6.2	-8.1	38.7	Peak [Scan]	H	98	361	46	-7.28	Pass	
253.254	51.5	4.5	-19.0	37.0	Peak [Scan]	H	98	361	46	-9.01	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Test Freq.	915.2 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	30-1000 MHz	**Rel. Hum.(%)**	43
Power Setting	60	**Press. (mBars)**	1005
Antenna	External	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, EXT Antenna WPANT30088-S1A		
Test Notes 2			



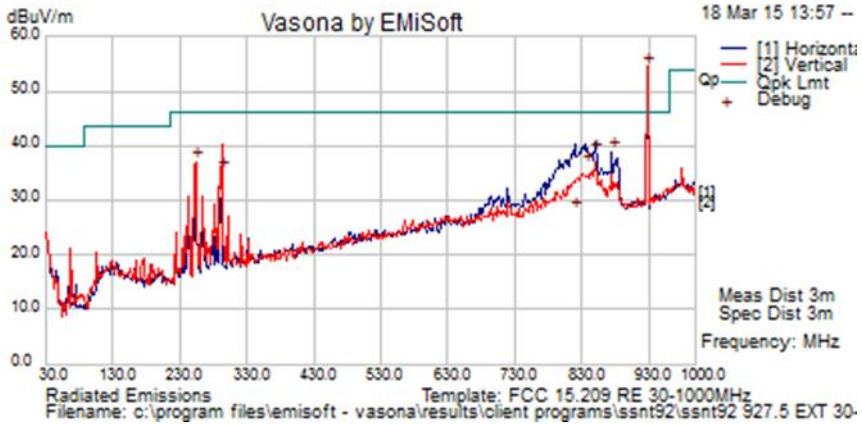
Formally measured emission peaks

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
916.413	47.9	6.4	-7.6	46.7	Peak [Scan]	H						FUND
837.179	41.3	6.2	-8.3	39.2	Quasi Max	H	172	332	46	-6.85	Pass	
881.375	35.9	6.3	-8.0	34.1	Quasi Max	H	165	131	46	-11.87	Pass	
828.823	35.5	6.2	-8.1	33.5	Quasi Max	H	103	362	46	-12.46	Pass	
863.791	40.0	6.3	-8.1	38.1	Peak [Scan]	H	98	361	46	-7.89	Pass	
292.474	48.6	4.7	-17.5	35.8	Peak [Scan]	V	98	361	46	-10.19	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Test Freq.	927.5 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	30-1000 MHz	**Rel. Hum.(%)**	43
Power Setting	60	**Press. (mBars)**	1005
Antenna	External	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, EXT Antenna WPANT30088-S1A		
Test Notes 2			



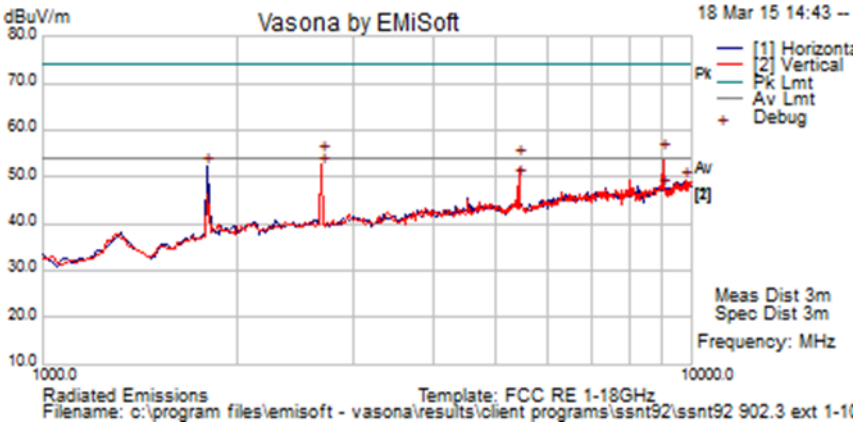
Formally measured emission peaks

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
928.076	55.5	6.4	-7.3	54.6	Peak [Scan]	V						FUND
849.524	40.4	6.3	-8.1	38.5	Quasi Max	H	102	42	46	-7.48	Pass	
292.565	48.1	4.7	-17.4	35.3	Quasi Max	H	98	-1	46	-10.7	Pass	
819.077	30.4	6.1	-8.3	28.2	Quasi Max	H	273	30	46	-17.83	Pass	
836.581	38.4	6.2	-8.3	36.3	Quasi Max	H	99	-1	46	-9.71	Pass	
875.563	40.6	6.3	-8.0	38.9	Peak [Scan]	H	98	361	46	-7.13	Pass	
253.533	51.6	4.5	-19.0	37.1	Peak [Scan]	V	98	361	46	-8.9	Pass	

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Test Freq.	902.3	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	1-10 GHz	**Rel. Hum.(%)**	43
Power Setting	49	**Press. (mBars)**	1005
Antenna	External	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, EXT Antenna WPANT30088-S1A		
Test Notes 2			

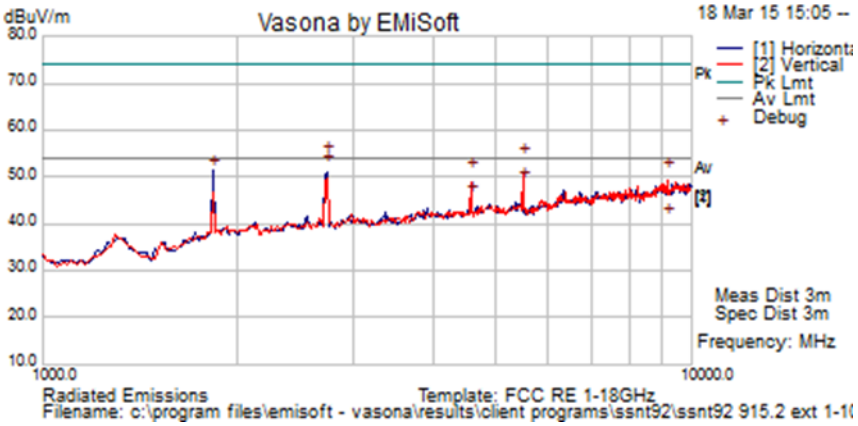


Formally measured emission peaks

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
2706.826	62.0	4.2	-11.4	54.7	Peak Max	V	99	86	74	-19.26	Pass	RB
2706.826	59.5	4.2	-11.4	52.3	Average Max	V	99	86	54	-1.73	Pass	RB
5413.727	59.1	6.0	-11.2	54.0	Peak Max	V	112	124	74	-20.03	Pass	RB
5413.727	54.6	6.0	-11.2	49.4	Average Max	V	112	124	54	-4.59	Pass	RB
9023.021	46.0	8.1	-6.9	47.2	Average Max	V	108	257	54	-6.8	Pass	RB
9023.021	53.7	8.1	-6.9	54.9	Peak Max	V	108	257	74	-19.1	Pass	RB
1793.587	62.5	3.4	-13.8	52.1	Peak [Scan]	H						NRB
9765.531	46.9	8.6	-6.2	49.2	Peak [Scan]	V						NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

Test Freq.	915.2 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	1-10 GHz	**Rel. Hum.(%)**	43
Power Setting	49	**Press. (mBars)**	1005
Antenna	External	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, EXT Antenna WPANT30088-S1A		
Test Notes 2			

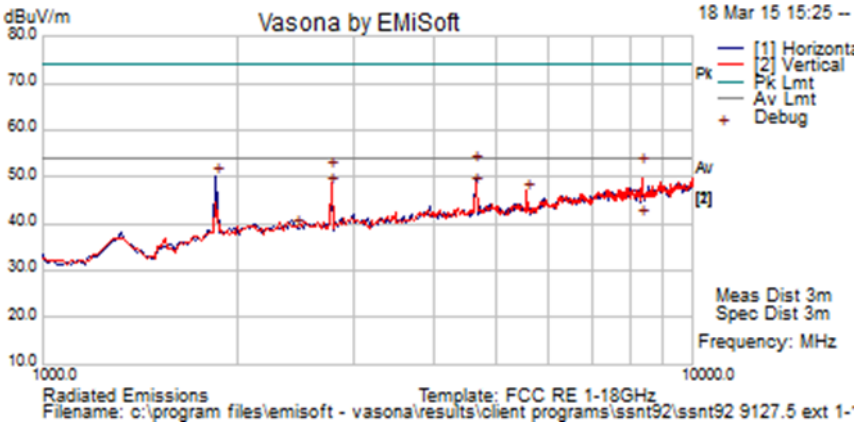


Formally measured emission peaks

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
2745.604	61.7	4.2	-11.4	54.5	Peak Max	H	112	141	74	-19.48	Pass	RB
2745.604	59.5	4.2	-11.4	52.3	Average Max	H	112	141	54	-1.69	Pass	RB
4575.921	57.1	5.5	-11.4	51.3	Peak Max	V	122	136	74	-22.75	Pass	RB
4575.921	51.9	5.5	-11.4	46.0	Average Max	V	122	136	54	-7.97	Pass	RB
5491.045	59.1	6.1	-11.2	54.0	Peak Max	V	99	82	74	-19.98	Pass	RB
5491.045	54.1	6.1	-11.2	49.0	Average Max	V	99	82	54	-4.97	Pass	RB
9151.916	50.4	8.2	-7.2	51.4	Peak Max	V	100	168	74	-22.6	Pass	RB
9151.916	40.3	8.2	-7.2	41.3	Average Max	V	100	168	54	-12.7	Pass	RB
1829.659	61.7	3.4	-13.5	51.5	Peak [Scan]	H						NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

Test Freq.	927.5 MHz	**Engineer**	JMH
Variant	300 KHz, 100 KBit/s	**Temp (ºC)**	18
Freq. Range	1-10 GHz	**Rel. Hum.(%)**	43
Power Setting	49	**Press. (mBars)**	1005
Antenna	External	**Duty Cycle (%)**	100%
Test Notes 1	NIC 451-0523-05, MAC: 00:13:50:07:00:00:03:CD, EXT Antenna WPANT30088-S1A		
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
2782.503	58.2	4.2	-11.3	51.1	Peak Max	V	149	254	74	-22.88	Pass	RB
2782.503	54.8	4.2	-11.3	47.7	Average Max	V	149	254	54	-6.26	Pass	RB
4637.425	58.1	5.5	-11.3	52.3	Peak Max	H	100	43	74	-21.69	Pass	RB
4637.425	53.4	5.5	-11.3	47.7	Average Max	H	100	43	54	-6.34	Pass	RB
8347.194	51.3	7.8	-7.1	52.1	Peak Max	V	161	131	74	-21.95	Pass	RB
8347.194	40.4	7.8	-7.1	41.1	Average Max	V	161	131	54	-12.87	Pass	RB
5564.054	51.8	6.1	-11.2	46.7	Peak [Scan]	V	99	-1	54	-7.3	Pass	RB
1847.695	60.0	3.4	-13.5	50.0	Peak [Scan]	H						NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band; RB = Restricted Band. Limits per 15.205

Specification

Limits

FCC Part 15 Subpart C §15.247(d)

Industry Canada §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 a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

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'	0287, 0335, 0338, 0158, 0134, 0304, 0311, 0315, 0310, 0312

6.2. Radiated Emissions – Digital Emissions (0.03-1 GHz)

FCC, Part 15 Subpart C §15.205/ §15.209
Industry Canada RSS-Gen §8.9

Test Procedure

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

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

Field Strength Calculation

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

$$FS = R + AF + CORR$$

where:

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

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

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

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

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

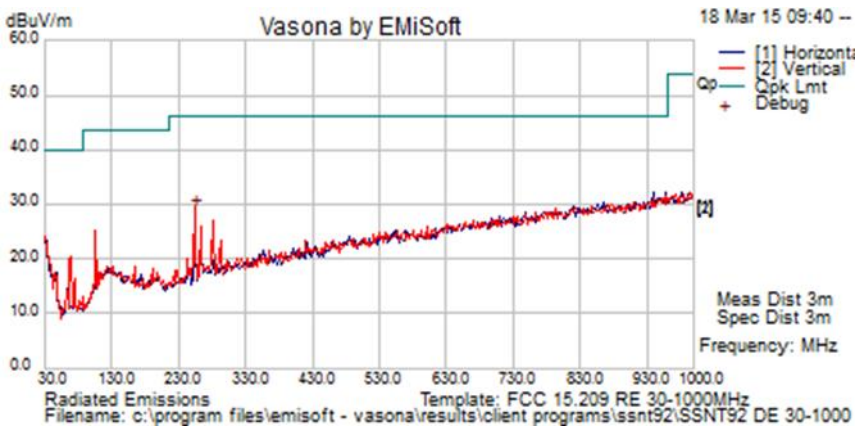
40 dBμV/m = 100μV/m

6.2.1. Radiated Digital Emissions

Integral Antenna - Radiated Spurious Emissions

GPS turned on

EUT	NIC 451-0523-10	**Engineer**	JMH
Variant	Digital Emissions	**Temp (ºC)**	18
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	43
Standard Limit	FCC Class B	**Press. (mBars)**	1005
Support Equip	None		
Test Notes	MAC: 00:13:50:07:00:00:03:CD, INT Antenna WPANT10061-S1C, GPS ON		



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
253.771	43.4	4.5	-19.0	28.9	Peak [Scan]	V	99	-1	46	-17.1	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	TRNS= Transient Emission, Brbnd= Broadband emission

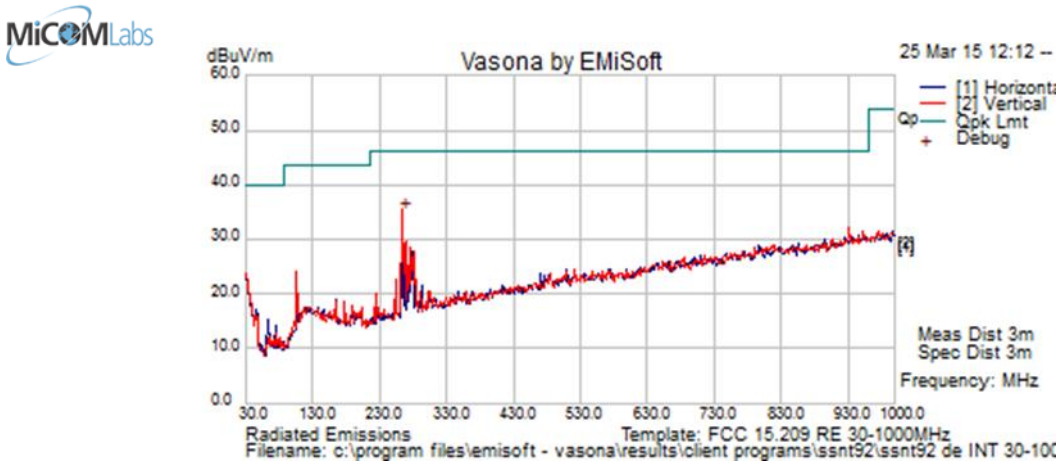
NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Integral Antenna - Radiated Spurious Emissions

RTC turned on

RTC – real time clock

EUT	NIC 451-0503-10	**Engineer**	JMH
Variant	Digital Emissions	**Temp (ºC)**	20
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	42
Standard Limit	FCC Class B	**Press. (mBars)**	1011
Support Equip	None		
Test Notes	MAC: 00:13:50:07:00:00:03:CD, INT Antenna WPANT10061-S1C, RTC ON		



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
265.256	48.2	4.6	-17.7	35.100	Peak [Scan]	V	98	361	46.0	-10.9	Pass	

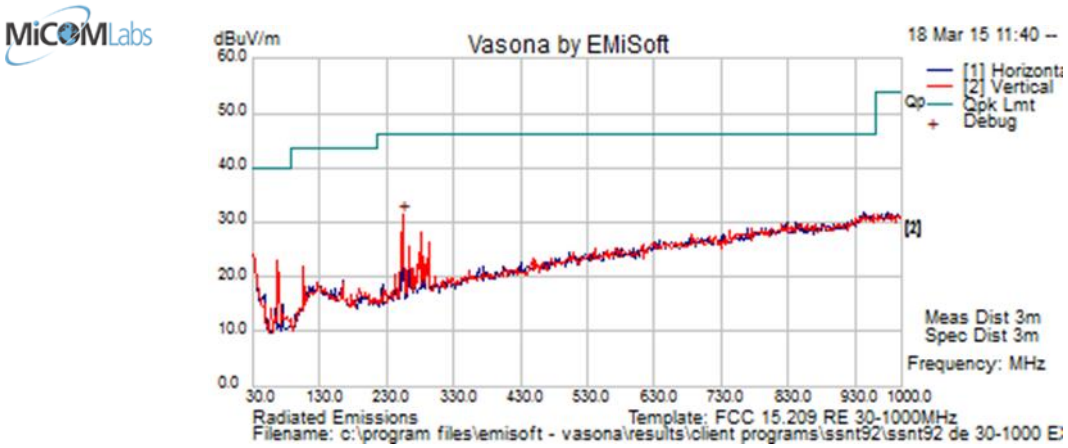
Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	TRNS= Transient Emission, Brbnd= Broadband emission

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

External Antenna - Radiated Spurious Emissions

GPS turned on

EUT	NIC 451-0523-10	**Engineer**	JMH
Variant	Digital Emissions	**Temp (ºC)**	18
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	43
Standard Limit	FCC Class B	**Press. (mBars)**	1005
Support Equip	None		
Test Notes	MAC: 00:13:50:07:00:00:03:CD, EXT Antenna WPANT30088-S1A, GPS ON		



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
253.653	45.8	4.5	-19.0	31.270	Peak [Scan]	V	98	361	46.0	-14.7	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	TRNS= Transient Emission, Brbnd= Broadband emission

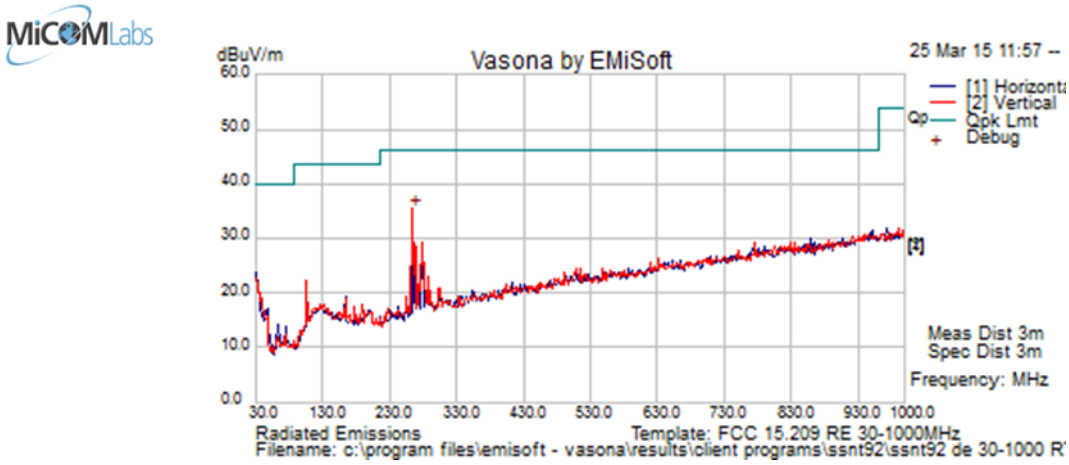
NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

External Antenna - Radiated Spurious Emissions

RTC turned on

RTC – real time clock

EUT	NIC 451-0503-10	**Engineer**	JMH
Variant	Digital Emissions	**Temp (ºC)**	20
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	42
Standard Limit	FCC Class B	**Press. (mBars)**	1011
Support Equip	None		
Test Notes	MAC: 00:13:50:07:00:00:03:CD, EXT Antenna WPANT30088-S1A, RTC ON		



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
265.174	48.5	4.6	-17.7	35.380	Peak [Scan]	V	100	361	46.0	-10.6	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	TRNS= Transient Emission, Brbnd= Broadband emission

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

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 §8.9** Limit Matrix

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

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

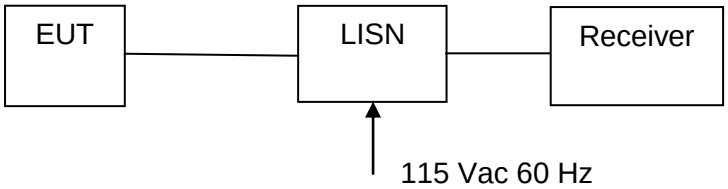
6.3. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

NOTE: Test not applicable EUT is dc powered

FCC, Part 15 Subpart C §15.207
Industry Canada RSS-Gen §8.8

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)

Specification

Limit

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

RSS-Gen §8.8
A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in Table 3.

§15.207 (a) and **RSS-Gen §8.8** Limit Matrix
The lower limit applies at the boundary between frequency ranges

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

* Decreases with the logarithm of the frequency

Laboratory Measurement Uncertainty for Conducted Emissions

Measurement uncertainty	±2.64 dB

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