EMISSIONS TEST REPORT FOR A LOW POWER TRANSMITTER

I. GENERAL INFORMATION

Requirement:	FCC
Test Requirements:	FCC Part 15
Applicant:	Silver Spring Networks 575 Broadway Street Redwood City, CA 94063
FCC ID:	OWS-NIC511
IC:	5975A-NIC511
Model No.:	NIC311x
Add External Antenna:	Amphenol monopole with integral cable (22ft RG174)

II. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

The Silver Spring Networks (SSN) NIC514 is a radio module for electric power meter communications use. The board incorporates a 900 MHz frequency hopping i210 Mesh radio.

The product has been certified with an internal sheet metal antenna. The board has been modified to make provision for connecting an optional external antenna. The modification consists of the addition of a diplexer and an antenna switch.

III. TEST DATES AND TEST LOCATION

Testing was performed on various dates between 13-23 October 2009. 900 MHz radiated emissions tests were performed at:

Compliance Certification Services 47173 Benicia Street Fremont, CA 94538

Antenna port conducted tests were performed at Silver Spring Networks.

J.M. Cohen____

T.N. Cokenias EMC Consultant/Agent for Silver Spring Networks

28 January 2010

15.203 Antenna connector requirement

The EUT has a new antenna port connector for an optional external antenna.

Antenna description	Mfr.	Model No.	Gain
Internal antenna	SSN	n/a	4 dBi at 915 MHz
External Monopole whip antenna	Amphenol	n/a	5 dBi at 915 MHz

TEST PROCEDURES

All tests were performed in accordance with the applicable procedures called out in the following documents, unless otherwise noted:

FCC 47CFR15

RSS-210 Issue 7: Low power license exempt radio frequency devices (July 2007) RSS-212: Test Facilities and Test Methods for Radio Equipment

ANSI C63.4 – 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

Tests were performed at three frequencies:

900 MHz FHSS

Channel 0 (LOW) – 902.3 MHz Channel 43 (MID) -915.2 MHz Channel 82 (HIFH) – 926.9 MHz

Test Equipment

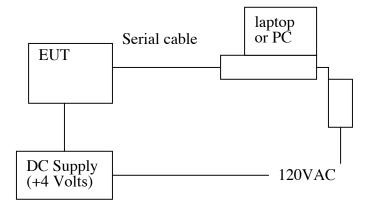
Compliance Certification Services:

TEST EQUIPMENT LIST									
Description	Manufacturer	Model	Asset Number	Cal Due					
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	01/05/10					
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	01/14/10					
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	12/16/09					
Antenna, Horn, 18 GHz	EMCO	3115	C00945	01/29/10					
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	02/04/10					
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/06/09					
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/29/09					
LISN, 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/29/09					

Silver Spring Networks:

Equipment	Mfr	Model	Serial No.	Cal Date
Spectrum analyzer	Agilent	E44053	MY45113391	07/23/10
Spectrum analyzer	Agilent	EXA	MY48030147	07/23/10
Spectrum Analyzer	HP	8562B	2712A00113	09/25/10

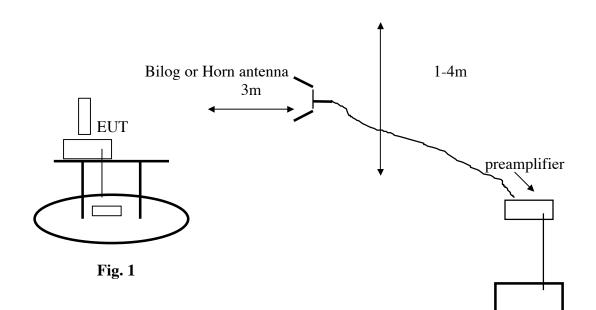
Test Set-up Diagram



Support Equipment

Equipment	Mfr	Model	Asset No.
DC Power Supply	Agilent	E3610A	2844
Laptop PC	Dell	PP01L	TW-0791UH1280-
			OC9-6558
AC/DC adapter	CUI Inc.	DSA-60W-20	2607HB

FREQUENCY HOPPING SPREAD SPECTRUM RADIO EMISSIONS



Test Procedures

Radiated emissions generated by the transmitter portion of the EUT were measured.

1. The EUT was placed on a wooden table resting on a turntable on the test site. The search antenna was placed 3m from the EUT. The EUT antenna was mounted in the with the EUT TX antenna pointed directly to the search antenna.

2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.

- 3. Emissions were investigated to the 10th harmonic of the fundamental.
 - 4. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

Test Results: Worst-case results are presented. Refer to data sheets below. Restricted band emissions meet 54 dBuV/m. Other undesired emissions from the transmitter meet the -20 dBc requirement in 15.247(d).

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505 (1)	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	
13.36 - 13.41	322 - 335.4		

15.205 Restricted Frequency Bands

15.209 General Field Strength Limits

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

Radiated Emissions Above 1 GHz

Report No. 10PRO003

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber

Company: Silver Springs Networks Project: 09U12834 Date: 10/13/09 Test Engineer: Doug Anderson Configuration: EUT with External Antenna and Support Console PC Mode: Normal

GHz 2807700 07700 Read Pk dBuV MHz 50.4 43.6 44.4 44.5 41.9 50.2	12' c 12' ca 12' ca dBuV 46.8 30.2 35.2 37.1	able 2 able 228 AF dB/m 29.1	3008A0	05(🖵	Pre-amp 20' cal 20' cab	ble 22	• 807500	HP	HPF F_1.5GHz	orn > 18	eject Filte	RBW	Measurements V=VBW=1MHz
2807700 07700 Read Pk dBuV MHz 50.4 43.0 43.6 44.4 48.5 41.9	12' c 12' ca 12' ca dBuV 46.8 30.2 35.2 37.1	able 2 ble 228 AF dB/m 29.1	28070 07600 CL	500 	20' cabl	le 2280	807500	HP		Re	-	r <u>Peak</u> RBW	V=VBW=1MHz
2807700 07700 Read Pk dBuV MHz 50.4 43.0 43.6 44.4 48.5 41.9	Read Avg. dBuV 46.8 30.2 35.2 37.1	AF dB/m 29.1	07600 CL	- Amp	20' cabl	le 2280	807500	HP		Re	-	RBW	V=VBW=1MHz
Read Pk dBuV MHz 50.4 43.0 43.6 44.4 48.5 41.9	Read Avg. dBuV 46.8 30.2 35.2 37.1	AF dB/m 29.1	07600 CL	- Amp	20' cabl	le 2280		HP		Re	-	RBW	V=VBW=1MHz
Read Pk dBuV <u>MHz</u> 50.4 43.0 43.6 44.4 48.5 41.9	Read Avg. dBuV 46.8 30.2 35.2 37.1	AF dB/m 	CL	Amp	D Corr		7500	HP	-1.5GHz	_		Auono	
dBuV <u>MHz</u> 50.4 43.0 43.6 44.4 48.5 41.9	dBuV 46.8 30.2 35.2 37.1	dB/m 	-	· ·		Flfr							<u>ge Measurements</u> MHz ; VBW=10Hz
50.4 43.0 43.6 44.4 48.5 41.9	30.2 35.2 37.1					dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
50.4 43.0 43.6 44.4 48.5 41.9	30.2 35.2 37.1												
43.0 43.6 44.4 48.5 41.9	30.2 35.2 37.1												
43.6 44.4 48.5 41.9	35.2 37.1		4.1	-35.2	0.0	0.6	49.0	45.4	74	54	-25.0	-8.6	V
44.4 48.5 41.9	37.1	31.3 32.5	4.8 5.6	-34.9 -34.8	0.0	0.6	44.8 47.5	32.0 39.1	74	54 54	-29.2 -26.5	-22.0	v v
48.5 41.9		33.4	6.2	-34.8	0.0	0.6	47.5	42.4	74	54	-20.5	-14.9	v
	41.6	36.2	7.7	-34.6	0.0	0.7	58.5	51.7	74	54	-15.5	-2.3	v
50.2	29.6	36.8	8.2	-34.8	0.0	0.7	52.8	40.5	74	54	-21.2	-13.5	V
50.4	46.6	29.1	4.1	-35.2	0.0	0.6	48.9	45.3	74	54	-25.1	-8.7	н
43.3	31.5	32.5	5.6	-34.8	0.0	0.6	47.2	35.4	74	54	-26.8	-18.6	Н
42.4 44.1	29.6 33.6	33.4	6.2 7.7	-34.9	0.0	0.5	47.7 54.1	34.9 43.6	74 74	54 54	-26.3 -19.9	-19.1 -10.4	<u>н</u> н
44.1	33.0	36.2	7.7	-34.0	0.0	0.7	54.1	43.0	/4	54	-19.9	-10.4	<u> </u>
5.2MHz													
50.0	45.5	20.2		25.0			40.4	14.2	= 4				*7
													V V
48.0	41.7	36.3	7.8	-34.6	0.0	0.7	58.1	51.9	74	54	-15.9	-2.1	v
49.9	45.7	29.3	41	-35.2	0.0	0.6	48.6	44.5	74	54	-25.4	-9.5	н
44.3	36.3	32.6	5.6	-34.8	0.0	0.6	48.2	40.2	74	54	-25.8	-13.8	Н
44.6	35.2	36.3	7.8	-34.6	0.0	0.7	54.8	45.4	74	54	-19.2	-8.6	Н
MII 2													
50.0	46.2	29.4	4.2	-35.2	0.0	0.6	48.9	45.1	74	54	-25.1	-8.9	V
													V V
43.9	31.9	36.4	7.8	-34.6	0.0	0.0	52.8	42.2	74	54	-21.2	-11.8	v
50.4	44.8	20.4	10	25.0		0.6	40.2	47.7	= 1				
													H H
43.3	31.4	36.4	7.8	-34.6	0.0	0.0	53.6	41.6	74	54	-20.9	-12.4	Н
		I	I	I	<u> </u>					<u> </u>	<u> </u>		
Measuremen	t Frequency			Amp	Preamp G	ain				Avg Lim	Average Fi	ield Strength Li	mit
Distance to A	Antenna			D Corr						Pk Lim			
				Avg						Avg Mar			1
	tor			Peak			Field Streng	th		Pk Mar	Margin vs.	Peak Limit	
Cable Loss				HPF	High Pass	Filter							
	50.9 46.2 44.2 48.0 49.9 44.3 44.6 1000000000000000000000000000000000000	50.9 47.5 46.2 40.2 48.0 41.7 49.9 45.7 44.3 36.3 44.6 35.2 WHz 50.0 50.0 46.2 42.4 30.1 45.9 40.4 45.9 40.4 43.1 34.2 43.3 31.4 50.4 46.7 43.3 31.4 9 9 40.4 43.3 43.3 31.4	50.9 47.5 29.3 46.2 40.2 32.6 48.0 41.7 36.3 49.9 45.7 29.3 44.3 36.3 32.6 44.4 35.2 36.3 44.6 35.2 36.3 44.6 35.2 36.3 44.4 30.1 31.5 45.9 40.4 32.6 42.4 30.1 31.5 45.9 40.4 32.6 43.1 34.4 36.4 50.4 46.7 29.4 43.3 31.4 36.4 50.4 46.7 29.4 43.3 31.4 36.4 43.3 31.4 36.4 43.3 31.4 36.4 43.3 31.4 36.4 43.3 31.4 36.4 45.2 43.3 31.4 45.2 43.3 31.4 45.3 43.3 31.4	S0.9 47.5 29.3 4.1 46.2 40.2 32.6 5.6 48.0 41.7 36.3 7.8 49.9 45.7 29.3 4.1 44.3 36.3 32.6 5.6 44.6 35.2 36.3 7.8 41.7 36.3 32.6 5.6 44.6 35.2 36.3 7.8 41.4 36.3 32.6 5.6 44.6 35.2 36.3 7.8 112 1 1 4.2 50.0 46.2 29.4 4.2 42.4 30.1 31.5 4.9 45.9 40.4 32.6 5.7 43.1 34.2 32.6 5.7 43.3 31.4 36.4 7.8 133 31.4 36.4 7.8 143.3 31.4 36.4 7.8 153 1 34.2 3.4.1 143.3	S0.9 47.5 29.3 4.1 -35.2 46.2 40.2 32.6 5.6 -34.8 48.0 41.7 36.3 7.8 -34.6 49.9 45.7 29.3 4.1 -35.2 44.3 36.3 32.6 5.6 -34.8 44.6 35.2 36.3 7.8 -34.6 44.6 35.2 36.3 7.8 -34.6 44.6 35.2 36.3 7.8 -34.6 9 45.7 29.3 4.1 -35.2 44.6 35.2 36.3 7.8 -34.6 9 45.9 40.4 32.6 5.7 -34.8 42.6 31.9 36.4 7.8 -34.6 50.4 46.7 29.4 4.2 -35.2 43.1 34.2 32.6 5.7 -34.8 43.3 31.4 36.4 7.8 -34.6 9 45.9 44.2 -35.2 <td>S0.9 47.5 29.3 4.1 -35.2 0.0 46.2 40.2 32.6 5.6 -34.8 0.0 48.0 41.7 36.3 7.8 -34.6 0.0 49.9 45.7 29.3 4.1 -35.2 0.0 44.3 36.3 32.6 5.6 -34.8 0.0 44.3 36.3 32.6 5.6 -34.8 0.0 44.6 35.2 36.3 7.8 -34.6 0.0 44.6 35.2 36.3 7.8 -34.6 0.0 44.6 35.2 36.3 7.8 -34.6 0.0 9 45.9 40.4 32.6 5.7 -34.8 0.0 45.9 40.4 32.6 5.7 -34.8 0.0 42.6 31.9 36.4 7.8 -34.6 0.0 43.1 34.2 32.6 5.7 -34.8 0.0 43.3 31.4 36.4</td> <td>S0.9 47.5 29.3 4.1 -35.2 0.0 0.6 46.2 40.2 32.6 5.6 -34.8 0.0 0.6 48.0 41.7 36.3 7.8 -34.6 0.0 0.7 49.9 45.7 29.3 4.1 -35.2 0.0 0.6 44.3 36.3 32.6 5.6 -34.8 0.0 0.7 49.9 45.7 29.3 4.1 -35.2 0.0 0.6 44.3 36.3 32.6 5.6 -34.8 0.0 0.7 44.6 35.2 36.3 7.8 -34.6 0.0 0.7 WHz 0.0 0.6 45.9 40.4 32.6 5.7 -34.8 0.0 0.6 45.9 40.4 32.6 5.7 -34.8 0.0 0.6 43.1 34.2 32.6 5.7 -34.8 0.0</td> <td>S0.9 47.5 29.3 4.1 -35.2 0.0 0.6 49.6 46.2 40.2 32.6 5.6 -34.8 0.0 0.6 50.2 48.0 41.7 36.3 7.8 -34.6 0.0 0.7 58.1 49.9 45.7 29.3 4.1 -35.2 0.0 0.6 48.6 44.3 36.3 32.6 5.6 -34.8 0.0 0.6 48.2 44.6 35.2 36.3 7.8 -34.6 0.0 0.7 54.8 44.6 35.2 36.3 7.8 -34.6 0.0 0.7 54.8 42.4 30.1 31.5 4.9 -34.9 0.0 0.6 48.9 42.6 31.9 36.4 7.8 -34.8 0.0 0.6 49.9 43.1 34.2 5.7 -34.8 0.0 0.6 49.3 43.1 34.2 25.6 7.3 -34.8 0.0<!--</td--><td>S0.9 47.5 29.3 4.1 -35.2 0.0 0.6 49.6 46.3 46.2 40.2 32.6 5.6 -34.8 0.0 0.6 49.2 44.1 48.0 41.7 36.3 7.8 -34.6 0.0 0.7 58.1 51.9 49.9 45.7 29.3 4.1 -35.2 0.0 0.6 48.6 44.5 44.3 36.3 32.6 5.6 -34.8 0.0 0.6 48.2 40.2 44.6 35.2 36.3 7.8 -34.6 0.0 0.7 54.8 45.4 44.6 35.2 36.3 7.8 -34.6 0.0 0.7 54.8 45.1 42.4 30.1 31.5 4.9 -34.9 0.0 0.6 44.5 32.2 45.9 40.4 32.6 5.7 -34.8 0.0 0.6 49.9 44.4 42.6 31.9 36.4 7.8 -</td><td>S0.9 47.5 29.3 4.1 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Radiated Emissions Below 1 GHZ

All radio emissions below 1GHz, except for the fundamental were more than 20 dB below limit.

PEAK OUTPUT POWER

PEAK POWER LIMIT

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

\$15.247 (b) (2) For frequency hopping systems operating in the 902-928 MHz band, employing at least 50 hopping channels: 1 watt; and employing less than 50 hopping channels, but at least 25 hopping channels: 0.25 watt.

15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 4 dBi, therefore the power limit is 30 dBm.

TEST PROCEDURE

The transmitter output was connected to a spectrum analyzer and the analyzer bandwidth was set to a value greater than the 20 dB bandwidth of the EUT.

Note: Power measurements were made at the external antenna connector port on the radio board.

RESULTS

No non-compliance noted:

Channel	Frequency	P out
Low	902.3	29.01
Mid	914.9	28.94
High	926.9	28.76

OUTPUT POWER LOW CHANNEL

Agilent Spectrum Analy	yzer - Swept SA						
Marker 1 902.29	00000000 MI		ENSE:INT	Avg Type Avg Hold:	ALIGNAUTO : Log-Pwr >100/100	02:04:18 PM Oct 23, 2009 TRACE 1 2 3 4 5 6 TYPE M	Save As
	INPUC KF P	Gain:Low Atten: 3		Ext Gain:	-11.3 dB		Save
10 dB/div Ref 34	.30 dBm				MI	kr1 902.29 MHz 29.012 dBm	Save
			♦ 1				File/Folder
24.3							List
14.3				\mathbf{h}			File name:
4.30							
-5.70							Save As
-15.7				۸	•		type:
25.7					www.www.		🔥 Up One
35.7							Dp One
35.7							
45.7							Create New Folde
55.7							
Center 902.300 M						Spop 40 00 MHz	Cance
Res BW 1.0 MHz		#VBW 3.0 MH	z		Sweep	Span 10.00 MHz 1.00 ms (1001 pts)	
SG					STATUS	5	

OUTPUT POWER MID CHANNEL

L 50 Q larker 1 915.2400			SENSE:INT	Avg Type:	LIGN AUTO	02:05:01 PM Oct 23, 20 TRACE 1 2 3 4	
larker 1 915.2400	input: RF PNO	D: Fast Trig: Fr in:Low Atten: 3	ee Run	Avg Hold:> Ext Gain: -1	100/100		
dB/div Ref 34.30	dBm				Mki	1 915.24 MH 28.935 dBr	z Sa n
24.3							File/Fol
4.3							File nar
5.7							Save ty
5.7 5.7 Uidwarayaw	and an and the second sec				and the second second	Mar grander the hader day	
5.7							Create N Fol
enter 915.200 MHz Res BW 1.0 MHz		#VBW 3.0 MH	z		Sweep 1	Span 10.00 MH .00 ms (1001 pt	tz s)

OUTPUT POWER HIGH CHANNEL

L 50 Ω		AC SENSE:INT	ALIGN AUTO	02:05:48 PM Oct 23, 2009	Save As
larker 1 926.86000	put: RF PNO: Fast IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>100/100 Ext Gain: -11.3 dB	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	
dB/div Ref 34.30	dBm		Mk	r1 926.86 MHz 28.757 dBm	Sav
24.3					File/Folde
1.30					File name
5.7					Save A type
5.7	Award and a second second			and a second with the second	👌 Up Or Lev
5.7					Create Ne Fold
enter 926.900 MHz Res BW 1.0 MHz	#VBV	V 3.0 MHz	Sweep	Span 10.00 MHz I.00 ms (1001 pts)	Canc

MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

			. ,		
Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)	
(A) Lim	hits for Occupational	I/Controlled Exposu	res		
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/f 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 6	
(B) Limits	for General Populati	on/Uncontrolled Exp	posure		
0.3–1.34 1.34–30	614 824 <i>/</i> f	1.63 2.19/f	*(100) *(180/f ²)	30 30	

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)-Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)	
30–300	27.5	0.073	0.2	30	
300–1500 1500–100,000			f/1500 1.0	30 30	

f = frequency in MHz
 * = Plane-wave equivalent power density NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occu-pational/controlled limits apply provided he or she is made aware of the potential for exposure.
 NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be ex-posed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Silver Spring Networks FCC ID: OWS-NIC511 Model: NIC311x

CALCULATIONS

Given

$$E = \sqrt{(30 * P * G)} / d$$

and

$$S = E^{2}/3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

- d = Distance in meters
- S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

 $d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P(mW) = P(W) / 1000 and d(cm) = 100 * d(m)

yields

 $d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$ $d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cmP = Power in mWG = Numeric antenna gain $S = Power Density in mW/cm^2$

Substituting the logarithmic form of power and gain using:

 $P(mW) = 10^{(HW)} - 10^{(HW)}$ and $G (numeric) = 10 \wedge (G (dBi) / 10)$ yields $d = 0.282 * 10^{(P+G)} / 20) / \sqrt{S}$ d = MPE distance in cm

Equation (1)

where

P = Power in dBmG = Antenna Gain in dBi $S = Power Density Limit in mW/cm^2$

Equation (1) and the measured peak power is used to calculate the MPE distance.

Silver Spring Networks FCC ID: OWS-NIC511 Model: NIC311x

LIMITS

From §1.1310 Table 1 (B), S = 0.6 mW/cm^2

RESULTS

No non-compliance noted:

	Joinphan		L.							
Silver Spring N	letworks									
FCC ID: OWS-										
IC: 5975A- N	C514									
Utility Meter V	VLAN Transcei	ver	2.4 GHz			Calculate mW/cm	2 here. Enter fr	equency in MHz		
RF Hazard Dist	ance Calculati	on				Calculation of Limi	L ts from 1.1310 T	able 1		
									Controlled	Uncontrolled
									Ave 6 min	Ave 30 min
mW/cm2 from	Table1:	0.60	(E: 61 V/m)			F(MHz)	Actual F, MHz		Occ, mW/c2	Gen, mW/cm2
						0.3-3	0.5		100.0	100.0
Max RF Power	TX Antenna	MPE distance	S, mW/cm@	Comment		3.0 - 30.0	5		180.0	36.0
P, dBm	G, dBi	cm	at 20 cm			30.0-300	55		1.0	0.2
						300-1500	902		3.0	0.60
29.0	5.0	18.3	0.50			1500-100000	5555		5.0	1.0
						Entry D(mM)	E		E and a land Mark	
						Enter P(mW)	Equivalent dBm		Equivalent Wat	LS
Basis of Calcu						64	10.1	18.1	64.6	
Basis of Calcu	ations:					04	18.1	10.1	04.0	
E^2/3770 = S	mW/cm2									
E, V/m = (Pwat)		5/d motors								
d = ((Pwatts*G	*30)/3770*S)	1.57 d, meters	Pwatts*Ggain = 1	0∆(PdBm-30+G	HBi)/10)					
S@20cm = 20			i watto ogani – i							
NOTE: For mo	bile or fixed lo	cation transmi	itters, minimum se	paration distan	ce is for ECC	compliance is 20 cr	n.			
			distance is less				.,			
	Saloalacióno					1				
			1	1		1	1		1	
									1	
									1	
		1	1						1	

MPE Distance: 18.3 cm

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

CONDUCTED SPURIOUS EMISSIONS

LIMITS

\$15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in \$15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in \$15.205(a), must also comply with the radiated emission limits specified in \$15.209(a) (see \$15.205(c)).

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

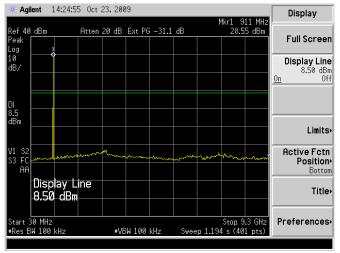
RESULTS

No non-compliance noted:

Report No. 10PRO003

Silver Spring Networks FCC ID: OWS-NIC511 Model: NIC311x

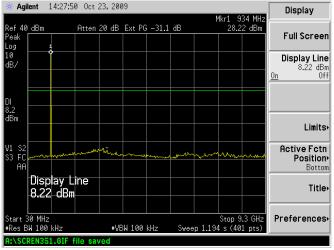
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL

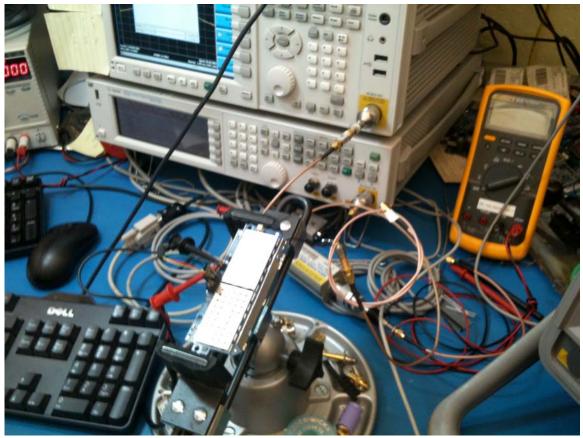
🔆 Agilent	14:26:1	0 Oct	23, 200	19						Display
			00 ID	F . D		15	1		11 MHz	· · ·
Ref 40 dBm Peak Log	1	Htten	20 dB	Ext Pt	-31.1	dB		27.5	5 dBm	Full Screen
10 dB/	^									Display Line 7.55 dBm On Off
										On Off
DI 7.6 dBm										
										Limits,
V1 S2 S3 FC AA	Junow	an a	moul	and the second s	1	an a	~~~^	Vinden	and the second star	Active Fctn Position Bottom
Dis 7.5	play L 5 dBm	ine								Title
Start 30 MH							4.4.0		.3 GHz	Preferences.
*Res BW 100 A:\SCREN39		ile sav		W 100	KHZ	2Mee	p I.194	4 s (40	1 pts)	

SPURIOUS EMISSIONS, HIGH CHANNEL

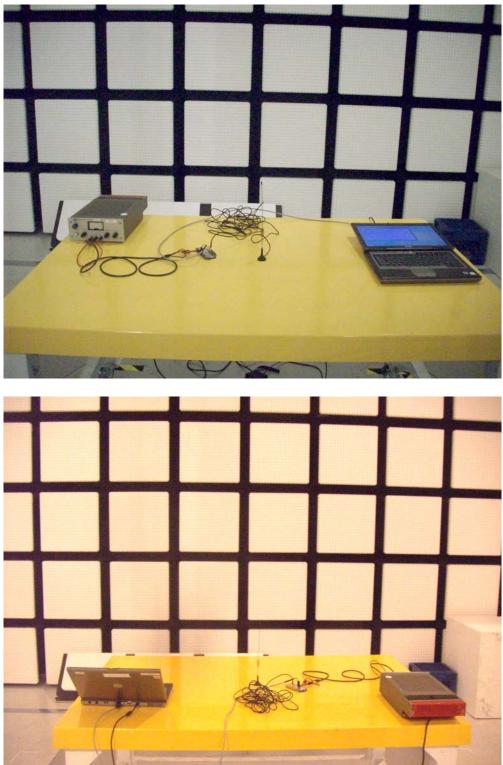


SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP, SILVER SPRING NETWORKS



RADIATED RF MEASUREMENT SETUP, CCS



END OF REPORT

Report Revision History

Revision No.	Revision Description	Pages Revised	Revised by	Date
-	Original Issue		T. Cokenias	01/23/2010