### EMISSIONS TEST REPORT FOR A LOW POWER TRANSMITTER

### I. GENERAL INFORMATION

Requirement:	FCC
Test Requirements:	FCC Part 15
Applicant:	Silver Spring Networks
Applicant.	575 Broadway Street
	Redwood City, CA 94063
	Redwood City, CA 94005
FCC ID:	OWS-NIC514
IC:	5975A-NIC514
Model No.:	340-040304
Add External Antennas:	WP Wireless "Flex" Antenna (900MHz/2.4 GHz dual band)

### **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 and a 2.4GHz 802.15.4 Zigbee Home Area Network (HAN radio.

The product has been certified with an internal dual band 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 22 October – 23 November 2009. 900 MHz and 2.4 GHz 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

23 January 2010

### 15.203 Antenna connector requirement

The EUT has an internal antenna and an external antenna port.

Antenna description	Mfr.	Model No.	Gain
Internal dual band	SSN	n/a	4 dBi at 915 MHz
antenna			1 dBi at 2.4 GHz
(original antenna)			
Flex Antenna	WP	WPIANTUGMLR120006A1	3 dBi at 915 MHz
(new antenna)	Wireless		3 dBi at 2.4 GHz

### **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.

For each radio, tests were performed at three frequencies:

2.4 GHz HAN Radio

Channel 11 (LOW) – 2405.8 MHz Channel 18 (MID) – 2440.8 MHz Channel 26 (HIGH) – 2480.9 MHz

900 MHz FHSS

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

# **Test Equipment**

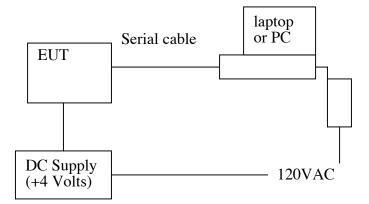
Compliance Certification Services:

TEST EQUIPMENT LIST							
Description Manufacturer Model Asset Cal Date Cal Due							
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	08/24/09	08/24/10		
Antenna, Horn, 18 GHz	EMCO	3115	C00945	01/29/09	01/29/10		
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	02/04/09	02/04/10		
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR	CNR		

# 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

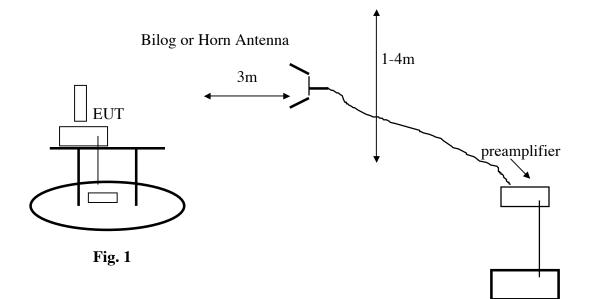


# Support Equipment

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

# 2.4 GHz HAN Radio Emissions Test Results

# TEST RESULTS Radiated Test Set-up, 30-25 GHz



### **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  $10^{th}$  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).

### **15.205 Restricted Frequency Bands**

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		

# 15.209 General Field Strength Limits

Frequency Field Strength (MHz) (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

### **2.4 GHz HAN Band edge Radiated Restricted Band Spurious Emissions** Low Channel, Vertical, Peak Detector

🔆 Agilent 10:45:	29 Nov 23, 2009		RT	Freq/Channel
<b>Ref 100 dB</b> µ∨ #Peak	#Atten 0 dB		Mkr1 2.367 87 GHz 55.53 dBµ∀	Center Freq 2.3500000 GHz
Log 10 dB/				Start Freq 2.31000000 GHz
32 dB DI			1.	Stop Freq 2.39000000 GHz
<b>74.0</b> dBµ√ 4−∞1−4−−44mm# LgAv	unter and an and a second and a s	an talang an talah galan sa	assand and a start and a start and the second	CF Step 8.0000000 MHz <u>Auto Ma</u>
V1 S2 S3 FC AA				Freq Offset 0.00000000 Hz
×(f): FTun Swp				Signal Track On <u>Off</u>
Start 2.310 00 GH;		BW 1 MHz	Stop 2.390 00 GHz Sweep 1 ms (601 pts)	

# Low Channel, Vertical, Average Detector

🔆 Agilent 10:46:4	40 Nov 23, 2009		R	T Freq/Channel
<b>Ref 100 dB</b> µ∨ #Peak	#Atten 0 dB		Mkr1 2.390 00 G 43.01 dB	Contor Frod
Log 10 dB/ Offst				Start Freq 2.31000000 GHz
32 dB DI				Stop Freq 2.39000000 GHz
54.0 dBµ∨ LgAv				CF Ste 8.00000000 MHz <u>Auto M</u>
V1 S2 S3 FC AA				Freq Offset 0.00000000 Hz
≈(f): FTun Swp				Signal Track On <u>O</u>
Start 2.310 00 GHz #Res BW 1 MHz		VBW 10 Hz	Stop 2.390 00 G Sweep 6.238 s (601 pts	
Copyright 2000-200	9 Agilent Technolog	jies		

# Low Channel, Horizontal, Peak Detector

🔆 Agilent 11:23	3:27 Nov 23, 2009			RT	Freq/Channel
Ref 100 dBµ∨	#Atten 0 dB		Mkr1 2	2.371 47 GHz 56.20 dBµ∨	Center Freq 2.3500000 GHz
#Peak Log					
10 dB/					Start Freq 2.3100000 GHz
Offst					2.51000000 0112
32 dB DI			1_		Stop Freq 2.39000000 GHz
<b>74.0</b> dBµ∨ LgAv	and have not a second state of the second state of	New Marine States and S	there are the second way	-alife-aliceTotanart-advace	CF Step 8.0000000 MHz
					<u>Auto Ma</u>
V1 S2 S3 FC					Freq Offset 0.00000000 Hz
×(f):					Oi and Transla
FTun					Signal Track On Off
Swp					<u>on</u>
Start 2.310 00 GH				.390 00 GHz	
#Res BW 1 MHz		/BW 1 MHz	Sweep 1	ns (601 pts)	)
Copyright 2000-20	09 Agilent Technolog	ies			

# Low Channel, Horizontal, Average Detector

	12 Nov 23, 2009			RT	Freq/Channel
<b>Ref 100 dB</b> µ∨ #Peak	#Atten 0 dE	8	Mkr1 2.387 42.8	87 GHz 6 dBµ∨	Center Freq 2.3500000 GHz
Log 10 dB/ Offst					Start Freq 2.31000000 GHz
32 dB DI					Stop Freq 2.39000000 GHz
54.0 dBµ∨ LgAv					CF Step 8.00000000 MHz <u>Auto Mar</u>
V1 S2 S3 FC AA					Freq Offset 0.00000000 Hz
×(f): FTun Swp					Signal Track <sup>On <u>Off</u></sup>
Start 2.310 00 GH; #Res BW 1 MHz	2	#VBW 10 Hz	Stop 2.390 Sweep 6.238 s (60		
Copyright 2000-200	9 Agilent Technol	logies			

# High Channel, Vertical, Peak Detector

🔆 Agilent 11:13:04	Nov 23, 2009			RT	Freq/Channel
<b>Ref 100 dB</b> μ∨ #Peak	#Atten 0 dB		Mkr1 2.483 50 64.	0 0 GHz 05 dBµ∨	Center Freq 2.49175000 GHz
Log					
10 dB/					Start Freq 2.48350000 GHz
Offst					
32.4 dB DI					Stop Freq 2.5000000 GHz
74.0 dBµ∨	normation required had	anganta ana ang kana sa kana s		Munkalmank	CF Step 1.6500000 MHz
LgAv					Auto Ma
V1 S2 S3 FC					Freq Offset 0.00000000 Hz
×(f):					
FTun					Signal Track
Swp					On <u>Of</u>
Start 2.483 500 0 GH			Stop 2.500 00		
#Res BW 1 MHz		3W 1 MHz	Sweep 1 ms (	601 pts)	
Copyright 2000-2009 /	Agilent Technologie	es			

# High Channel, Vertical, Average Detector

* Agilent 11:12:0	06 Nov 23, 2009	6		RT	Freq/Channel
<b>Ref 100 dB</b> µ∨ #Peak	#Atten 0 dB		Mkr1 2.4	483 500 0 GHz 53.43 dBµ∀	Center Freq 2.49175000 GHz
Log 10 dB/					Start Freq 2.48350000 GHz
Offst 32.4 dB DI					Stop Freq 2.5000000 GHz
54.0 1 dBµ∨ LgAv					CF Step 1.6500000 MHz <u>Auto Ma</u>
V1 S2 S3 FC					Freq Offset 0.00000000 Hz
≈(f): FTun Swp					Signal Track On <u>Off</u>
Start 2.483 500 0 G #Res BW 1 MHz		VBW 10 Hz		500 000 0 GHz 87 s (601 pts)	
Copyright 2000-2009	3 Agilent Technolo	gies			

# High Channel, Horizontal, Peak Detector

🔆 Agilent 11:17:42	Nov 23, 2009			RT	Freq/Channel
<b>Ref 100 dB</b> µ∨ #Peak	#Atten 0 dB		Mkr1 2.483 8 63	02 5 GHz .13 dBµ∨	Center Freq 2.49175000 GHz
Log 10 dB/ Offst					Start Freq 2.48350000 GHz
32.4 dB 1 DI \$					Stop Freq 2.50000000 GHz
74.0 dBµ∨ LgAv	Marine Construction and the construction of th	wether and the stand of the sta		l-the-sharpetitest-share	CF Step 1.65000000 MHz <u>Auto Mar</u>
V1 S2 S3 FC AA					Freq Offset 0.00000000 Hz
×(f): FTun Swp					Signal Track <sup>On <u>Off</u></sup>
Start 2.483 500 0 GH #Res BW 1 MHz		W 1 MHz	Stop 2.500 0 Sweep 1 ms		
Copyright 2000-2009	Agilent Technologies	8			

# High Channel, Horizontal, Average Detector

🔆 Agilent 11:18:20	) Nov 23, 2009		R	T Freq/Channel
<b>Ref 100 dB</b> µ∨ #Peak	#Atten 0 dB		Mkr1 2.483 500 0 GF 51.77 dB	Contor Eron
Log 10 dB/				Start Freq 2.48350000 GHz
Offst 32.4 dB				Stop Freq 2,5000000 GHz
DI 54.0 1 dBµ∨ ¢ LgAv				CF Step 1.65000000 MHz
V1 S2 S3 FC				Freq Offset 0.00000000 Hz
AA ≊(f): FTun Swp				Signal Track On <u>Of</u>
Start 2.483 500 0 GH #Res BW 1 MHz		W 10 Hz	Stop 2.500 000 0 GF Sweep 1.287 s (601 pts)	
Copyright 2000-2009	Agilent Technologies	3		

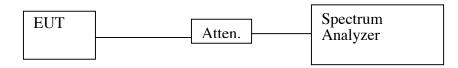
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tion: EU s 2.4 GH <u>oment:</u> rn 1-18 v: 6717 @ ncy Cables able 22 ble 228 Dist (m)	T / Support P z Band Tx GHz 23m • 2807700 07700 • Read Pk	Pre-an T144 N 12' c 12' ca Read Avg.	nplifer liteq 30 able 2 ble 228	08A009 28076 07600	31	20' cal		-		Н	orn > 18(	GHz	-	
rn 1-18 N: 6717 @ able 2 ble 228 Dist (m)	2807700 07700 - Read Pk	T144 N 12' c 12' ca Read Avg.	niteq 30 able 2:	08A009 28076 07600	31	20' cal		-		Н	orn > 180	GHz	-	
N: 6717 @ ncy Cables able 2 ble 228 Dist (m)	2807700 07700 - Read Pk	T144 N 12' c 12' ca Read Avg.	niteq 30 able 2:	08A009 28076 07600	31	20' cal		-		Н	orn > 180	GHz	-	
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able 228 ble 228 Dist (m)	07700 Read Pk	12' ca Read Avg.	ıble 228	07600	i00 -		ble 22							
ble 228 Dist (m)	07700 Read Pk	12' ca Read Avg.	ıble 228	07600	00 -		ble 22						n	
Dist (m)	Read Pk	Read Avg.			-		- 2200			HPF	_	eject Filte	RI	ak Measurements BW=VBW=1MHz
(m)		0	AF			20 Cab	10 2200	-			- R	_001		<u>rage Measurements</u> =1MHz ; VBW=10Hz
	upu (		dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
iel: Ch. II			ub/m				ub		uDu V/III	ubu v/m	ubu v/m		ui D	((()))
3.0	48.2 47.6	37.7 36.2	33.0 39.0	5.8 9.7	-36.5 -35.4	0.0	0.0	50.6 60.9	40.0 49.5	74 74	54 54	-23.4 -13.1	-14.0 -4.5	H, ATS112 = 0 H, ATS112 = 0
3.0	53.4	42.9	33.0	5.8	-36.5	0.0	0.0	55.7	45.3	74	54	-18.3	-8.7	V, ATS112 = 0
3.0	48.3	37.7	39.0	9.7	-35.4	0.0	0.0	61.6	51.0	74	54	-12.4	-3.0	V, ATS112 = 6
el: Ch. 18	(2440.8 MHz)													
3.0	48.0	37.8	33.1	5.8	-36.5	0.0	0.0	50.5	40.3	74	54	-23.5	-13.7	H, ATS112 = 0
3.0	54.8	44.1	33.1	5.8	-36.5	0.0	0.0	57.3	46.5	74	54	-16.7	-7.5	V, ATS112 = 0
3.0	45.8	33.9	35.3	7.3	-36.2	0.0	0.0	52.2	40.3	74	54	-21.8	-13.7	V, ATS112 = 0
5.0	55.0	40.0	39.0	9.8	-35.4	0.0	0.0	69.0	53.5	/4	54	-5.0	-0.5	V, ATS112 = 7
nel: Ch. 2	6 (2480.9 MHz	)												
3.0	52.1	41.8	33.2	5.9	-36.5	0.0	0.0	54.7	44.4	74	54	-19.3	-9.6	H, ATS112 = 0
3.0	43.7	31.3	35.5	7.3	-36.2	0.0	0.0	50.3 59.0	37.9	74	54 54	-23.7	-16.1	H, ATS112 = 0 H, ATS112 = 0
3.0	56.5	46.1	33.2	5.9	-36.5	0.0	0.0	59.1	48.8	74	54	-14.9	-5.2	V, ATS112 = 0
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f	Measuremen	t Frequency			Amp	Preamp G	ain				Avg Lim	Average Fi	ield Strength	Limit
					D Corr						Pk Lim			
	-	U			Avg						Avg Mar	U	U	nit
		tor						Field Streng	th		Pk Mar	Margin vs.	Peak Limit	
	3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	3.0         48.2           3.0         47.6           3.0         53.4           3.0         53.4           3.0         53.4           3.0         48.3           el: Ch. 18 (2440.8 MHz)           3.0         48.0           3.0         48.0           3.0         45.8           3.0         55.6           9         11           3.0         45.5           3.0         45.5           3.0         43.7           3.0         45.5           3.0         45.5           3.0         48.4           3.0         49.5           3.0         49.5           8         F           f         Measuremen           Dist         Distance to A           Antenna Fac         Anturna Fac	3.0         47.6         36.2           3.0         53.4         42.9           3.0         48.3         37.7	3.0         48.2         37.7         33.0           3.0         47.6         36.2         39.0           3.0         47.6         36.2         39.0           3.0         53.4         42.9         33.0           3.0         48.3         37.7         39.0           3.0         53.4         42.9         33.0           3.0         48.3         37.7         39.0           3.0         48.3         37.7         39.0           48.0         37.7         39.0         39.0           41.0         30.0         45.8         33.1           3.0         55.6         40.0         39.0           41.8         33.2         33.0         55.6           3.0         52.1         41.8         33.2           3.0         45.5         34.6         39.0           3.0         45.5         34.6         39.0           3.0         56.5         46.1         33.2           3.0         49.5         37.4         39.0           3.0         49.5         37.4         39.0           8         5         40.92/27         8           f	3.0         48.2         37.7         33.0         5.8           3.0         47.6         36.2         39.0         9.7           3.0         53.4         42.9         33.0         5.8           3.0         48.3         37.7         39.0         9.7           3.0         53.4         42.9         33.0         5.8           3.0         48.3         37.7         39.0         9.7	3.0         48.2         37.7         3.0         5.8         -36.5           3.0         47.6         36.2         39.0         9.7         -35.4           3.0         47.6         36.2         39.0         9.7         -35.4           3.0         53.4         42.9         33.0         5.8         -36.5           3.0         48.3         37.7         39.0         9.7         -35.4           4         30.0         5.8         -36.5	30         48.2         37.7         33.0         5.8         -36.5         0.0           3.0         47.6         36.2         39.0         9.7         -35.4         0.0           3.0         47.6         36.2         39.0         9.7         -35.4         0.0           3.0         53.4         42.9         33.0         5.8         -36.5         0.0           3.0         48.3         37.7         39.0         9.7         -35.4         0.0           48.0         37.7         39.0         9.7         -35.4         0.0           48.0         37.8         33.1         5.8         -36.5         0.0           3.0         48.0         37.8         33.1         5.8         -36.5         0.0           3.0         48.4         44.1         33.1         5.8         -36.5         0.0           3.0         45.8         33.9         35.3         7.3         -36.2         0.0           3.0         45.5         34.6         39.0         9.8         -35.4         0.0	3.0         48.2         37.7         33.0         5.8         -36.5         0.0         0.0           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0           48.0         37.8         33.1         5.8         -36.5         0.0         0.0           3.0         48.0         37.8         33.1         5.8         -36.5         0.0         0.0           3.0         45.8         33.9         35.3         7.3         -36.2         0.0         0.0           3.0         45.6         40.0         39.0         9.8         -35.4         0.0         0.0           3.0         43.7         31.3         35.5         7.3         -36.2	30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         50.6           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6           48.0         37.7         39.0         9.7         -35.4         0.0         0.0         61.6           3.0         48.0         37.8         33.1         5.8         -36.5         0.0         0.0         50.5           3.0         45.8         33.9         35.3         7.3         -36.5         0.0         0.0         57.3           3.0         45.8         44.1         33.1         5.8         -36.5         0.0         0.0         57.3           3.0         45.8         33.9         35.5         7.3         -36.2	30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         60.9         49.5           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9         49.5           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.9         49.5           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6         51.0           4         Ch.18         (240.8 MHz)         -	30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         50.6         40.0         74           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9         49.5         74           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         60.9         49.5         74           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6         51.0         74           3.0         48.0         37.8         33.1         5.8         -36.5         0.0         0.0         50.5         40.3         74           3.0         48.0         37.8         33.1         5.8         -36.5         0.0         0.0         57.3         46.5         74           3.0         45.8         33.9         35.3         73.3         -36.2         0.0         0.0         52.2         40.3         74 </td <td>30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         50.6         40.0         74         54           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9         49.5         74         54           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         60.9         49.5         74         54           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6         51.0         74         54           3.0         48.0         37.8         33.1         5.8         -36.5         0.0         0.0         57.3         46.5         74         54           3.0         48.8         44.1         33.1         5.8         -36.5         0.0         0.0         57.3         46.5         74         54           3.0         55.6         40.0         39.0         9.8<!--</td--><td>30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         60.6         40.0         74         54         -23.4           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9         49.5         74         54         -13.1           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54         -13.1           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54         -12.4           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6         51.0         74         54         -12.4           4: Ch. 18 (2440.8 MHz)         -</td><td>30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         60.9         49.5         74         54         -13.1         -4.5           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9         49.5         74         54         -13.1         -4.5           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54         -18.3         -8.7           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6         51.0         74         54         -12.4         -3.0           4: Ch. 18 (2408 MHz)         -         <td< td=""></td<></td></td>	30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         50.6         40.0         74         54           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9         49.5         74         54           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         60.9         49.5         74         54           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6         51.0         74         54           3.0         48.0         37.8         33.1         5.8         -36.5         0.0         0.0         57.3         46.5         74         54           3.0         48.8         44.1         33.1         5.8         -36.5         0.0         0.0         57.3         46.5         74         54           3.0         55.6         40.0         39.0         9.8 </td <td>30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         60.6         40.0         74         54         -23.4           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9         49.5         74         54         -13.1           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54         -13.1           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54         -12.4           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6         51.0         74         54         -12.4           4: Ch. 18 (2440.8 MHz)         -</td> <td>30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         60.9         49.5         74         54         -13.1         -4.5           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9         49.5         74         54         -13.1         -4.5           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54         -18.3         -8.7           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6         51.0         74         54         -12.4         -3.0           4: Ch. 18 (2408 MHz)         -         <td< td=""></td<></td>	30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         60.6         40.0         74         54         -23.4           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9         49.5         74         54         -13.1           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54         -13.1           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54         -12.4           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6         51.0         74         54         -12.4           4: Ch. 18 (2440.8 MHz)         -	30         48.2         37.7         33.0         5.8         -36.5         0.0         0.0         60.9         49.5         74         54         -13.1         -4.5           3.0         47.6         36.2         39.0         9.7         -35.4         0.0         0.0         60.9         49.5         74         54         -13.1         -4.5           3.0         53.4         42.9         33.0         5.8         -36.5         0.0         0.0         61.6         51.0         74         54         -18.3         -8.7           3.0         48.3         37.7         39.0         9.7         -35.4         0.0         0.0         61.6         51.0         74         54         -12.4         -3.0           4: Ch. 18 (2408 MHz)         - <td< td=""></td<>

## 2.4 GHz HAN Radio Radiated Emissions Below 1 GHz

All emissions from radio more than 20 dB below limit.

RF Power Output Test Requirement: FCC: 15.247(b) IC: RSS-210 Sec. 6.2.2(o)(iv)

### Test Setup



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

### **Test Procedures**

1. The EUT was configured on a test bench. RBW was set to a value higher than the 2.7 MHz 99% band width: RBW=3 MHz, VBW=5 MHz

2. The spectrum analyzer detector was set to PEAK and the highest value was recorded using the analyzer PEAK SEARCH function.

### **Test Results**

Refer to spectrum analyzer graphs. Reference level offset corrects for external attenuation and cable loss.

Channel	Frequency, MHz	Output Power, dBm
Low	2405.8	20.6
Mid	2440.8	20.8
High	2480.9	4.48

L 50 Q	AC	SENSE:INT	ALIGNAUTO	02:13:48 PM Oct 23, 2009	Save As
arker 1 2.405380	Input: RE PNO: East	rig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>100/100 Ext Gain: -11.9 dB	TRACE 123456 TYPE MWWWWWW DET P N N N N N	
dB/div Ref 34.30	dBm		Mkr	2.405 38 GHz 20.600 dBm	Sav
4.3		↓1			File/Fold Li
30					File nam
5.7					Save / typ
5.7					🏂 Up Or Lev
5.7					Create Ne Fold
enter 2.40500 GHz Res BW 3.0 MHz	#VBW 5.	0 MHz	Sweep	Span 20.00 MHz 1.00 ms (1001 pts)	Cano

# **Peak Output Power LOW Channel**

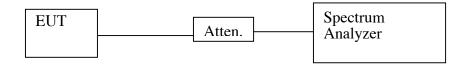
# **Peak Output Power MID Channel**

L 50 Ω		AC SENSE:INT	ALIGN AUTO	02:14:42 PM Oct 23, 2009	Save As
arker 1 2.439540	000000 GHz nput: RF PNO: Fast ( IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>100/100 Ext Gain: -11.9 dB	TRACE 123456 TYPE MUMMM DET PNNNNN	
dB/div Ref 34.30	dBm		Mkr	2.439 54 GHz 20.800 dBm	Sav
<sup>pg</sup>					File/Fold
4.3					Li
4.3					File nam
.30					
.70					Save A
5.7 Landleman handleman				and and a state of the second	typ
5.7					D Up Or
i.7					Lev
5.7					Create Ne
5,7					1 014
enter 2.44000 GHz				Span 20.00 MHz	Canc
Res BW 3.0 MHz	#VB	W 5.0 MHz	Sweep	.00 ms (1001 pts)	

# **Peak Output Power HIGH Channel**

Agilent Spectrum Analyzer - Swept S				
L 50 Ω larker 1 2.48048000000 Input: RF	O GHZ PNO: Fast IFGain:Low AC SENSE: Trig: Free Ru Atten: 30 dB	Avg Type: Log-Pwr		Save As
D dB/div Ref 34.30 dBm		Mk	r1 2.480 48 GHz 4.475 dBm	Sav
24.3				File/Folde
30	•	1		File nam
5.7 Lubert	July			Save A type
5.7			and a commentation of the constrainty of	🍏 Up Or Lev
5.7				Create Ne Fold
enter 2.48000 GHz Res BW 3.0 MHz	#VBW 5.0 MHz	Sweep	Span 20.00 MHz 1.00 ms (1001 pts)	Canc
G		STAT		

# **Test Setup**



### **Test Procedure**

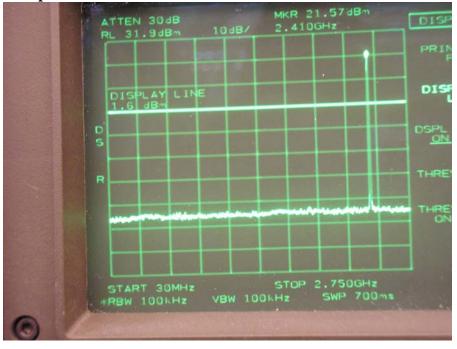
1. The EUT was configured on a test bench. The cable was connected between the EUT antenna port and the spectrum analyzer input port.

Spectrum analyzer RES BW was set to 100 kHz. While the transmitter broadcast a steady stream of digital data, the analyzer MAX HOLD function was used to capture the envelope of the transmission.

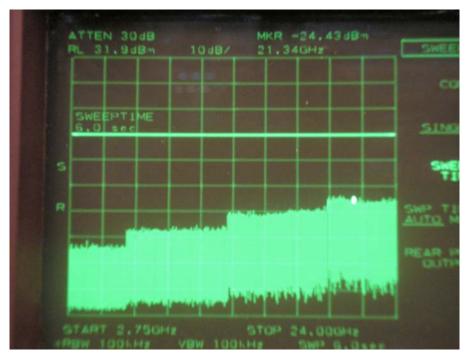
Readings were taken out to 10fo.

### **Test Results**

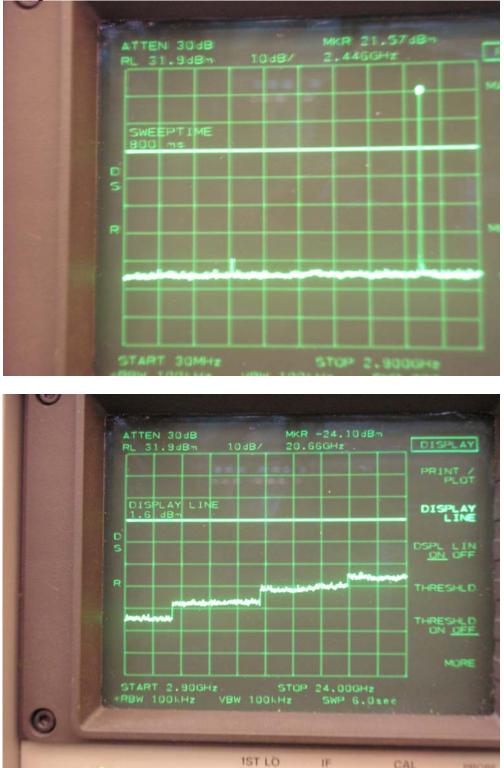
Refer to spectrum analyzer plots. Data shows out of band emissions are suppressed well below the -20 dBc minimum required by the Rules.



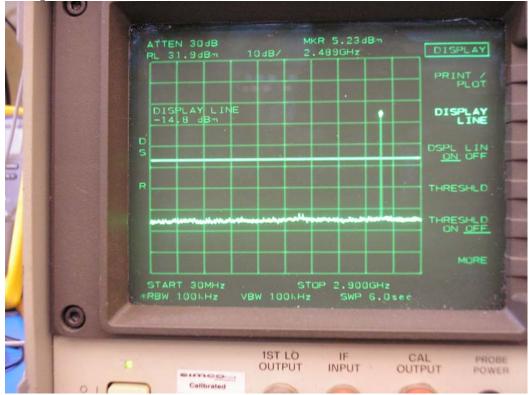
# **TX Spurious Emissions LOW Channel**

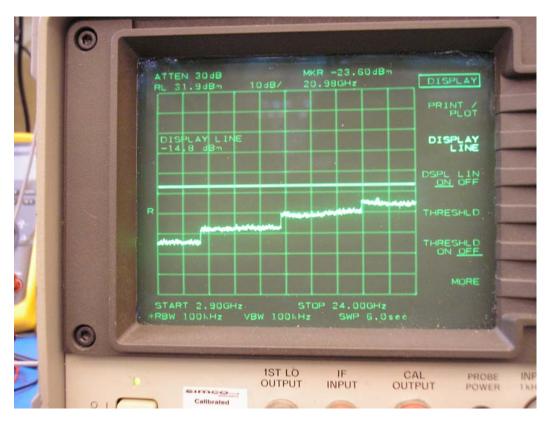


# **TX Spurious, MID Channel**







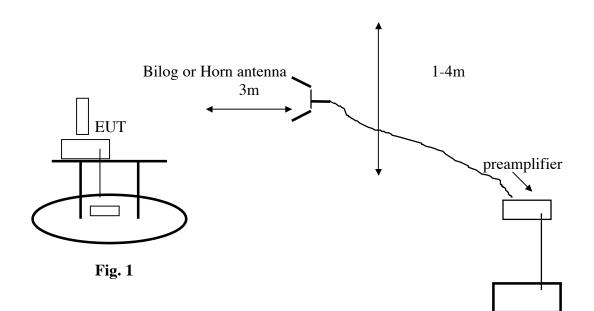


# **RF Exposure (MPE) Calculations**

Silver Spring	Networks									
Silver opring										
FCC ID: OWS	NIC514									
IC: 5975A- N	IIC514									
Utility Meter	WLAN Transcei	ver	2.4 GHz			Calculate mW/cm	2 here. Enter fi	equency in MH	z:	
PE Hoverd Die	tance Calculati					Calculation of Limi	to from 1 1210 T	able 1		
									Controlled	Uncontrolled
									Ave 6 min	Ave 30 min
mW/cm2 fror	n Table1:	1.00	(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
21.7	1.0	3.8	0.04			1500-100000	5555		5.0	1.0
						<b>-</b> - <b>- - - - - - - - -</b>			-	
						Enter P(mW)	Equivalent dBm	Enter dBm	Equivalent Wat	ts
Basis of Calcu	lations					64	18.1	18.1	64.6	
Dasis Of Calcu						07	10.1	10.1	04.0	
E^2/3770 = S	mW/cm2									
E. V/m = (Pwa	atts*Ggain*30)/	.5/d. meters								
	G*30)/3770*S)		Pwatts*Ggain = 1	0^(PdBm-30+G	idBi)/10)					
	log (MPE dist/									
				eparation distan	ce is for FCC	compliance is 20 cr	m,			
ever	n if calculations	indicate MPE	distance is less							

# FREQUENCY HOPPING SPREAD SPECTRUM RADIO EMISSIONS

### Silver Spring Networks FCC ID: OWS-NIC5514 Model: 340-040304 TEST RESULTS Radiated Test Set-up, 30 MHz - 9.3 GHz



### **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 10<sup>th</sup> harmonic of the fundamental.
  - 5. 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**

omplia		Frequency M ification Serv			hambe	er									
oject #: ate: 11/2 est Engiu	09U128 23/09 neer: Dou	prings Netwo 34 ug Anderson T / Support P		y											
ontinuou	us 900 M	Hz Band Tx													
est Equip															
	rn 1-18	-		nplifer			Pre-amp	olifer 26			H	orn >18	GHz		
	N: 6717 @ ency Cables		1144 N	liteq 30	08A005	931			-	_ L_				•	
3' c	able 2	2807700	12' c	able 2	28076	500	20' ca	ble 22	807500		HPF	Re	eject Filte		<mark>ak Measurements</mark> BW=VBW=1MHz
3' ca	able 228	07700	12' ca	ble 228	07600	-	20' cab	le 2280	7500			- R	_001	Ave	rage Measurements =1MHz ; VBW=10Hz
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
			uBuv	ub/m	uD	ub	uD	ub	ubu v/m	ubu v/m	uBu v/m	uBu v/III		ш	(1/11)
		(902.3 MHz)													
707 509	3.0	53.3 42.6	50.9 29.6	29.1 31.4	4.1 4.8	-37.4 -36.9	0.0	0.0	49.1 41.9	46.7 29.0	74 74	54 54	-24.9 -32.1	-7.3 -25.0	H, ATS112 = 60 H, ATS112 = 60
21	3.0	41.9	30.5	36.4	7.7	-36.2	0.0	0.0	49.8	38.4	74	54	-24.2	-15.6	H, ATS112 = 60
07	3.0	54.3	51.9	29.1	4.1	-37.4	0.0	0.0	50.1	47.7	74	54	-23.9	-6.3	V, ATS112 = 60
09 11	3.0	42.4 43.6	28.7 31.3	31.4 32.7	4.8	-36.9 -36.5	0.0	0.0	41.7 45.4	28.0 33.1	74 74	54 54	-32.3 -28.6	-26.0 -20.9	V, ATS112 = 60 V, ATS112 = 60
20	3.0	43.0	36.3	36.4	7.7	-36.2	0.0	0.0	52.7	44.2	74	54	-20.0	-20.9	V, ATS112 = 60
id Chanr	nel: Ch. 43	3 (915.2 MHz)													
746	3.0	53.1	50.2	29.2	4.1	-37.4	0.0	0.0	49.0	46.2	74	54	-25.0	-7.8	H, ATS112 = 60
661	3.0	41.8	28.8	31.5	4.9	-36.9	0.0	0.0	41.3	28.3	74	54	-32.7	-25.7	H, ATS112 = 60
576 237	3.0 3.0	41.6 43.2	29.0 34.3	32.8 36.5	5.6 7.8	-36.5 -36.3	0.0	0.0	43.5 51.2	30.9 42.3	74 74	54 54	-30.5 -22.8	-23.1 -11.7	H, ATS112 = 60 H, ATS112 = 60
746	3.0	52.0	49.1	29.2	4.1	-37.4	0.0	0.0	47.9	45.0	74 74	54 54	-26.1	-9.0 -23.4	V, ATS112 = 60
561 576	3.0	43.9 42.3	31.1 32.4	31.5 32.8	4.9 5.6	-36.9 -36.5	0.0	0.0	43.4 44.2	30.6 34.3	74	54	-30.6 -29.8	-23.4 -19.7	V, ATS112 = 60 V, ATS112 = 60
36	3.0	43.2	34.4	36.5	7.8	-36.3	0.0	0.0	51.2	42.4	74	54	-22.8	-11.6	V, ATS112 = 60
gh Chan	nel: Ch. 8	2 (926.9 MHz)													
/81	3.0	51.6	48.5	29.3	4.2	-37.4	0.0	0.0	47.7	44.6	74	54	-26.3	-9.4	H, ATS112 = 60
708	3.0	41.7	28.7	31.6	4.9	-36.8	0.0	0.0	41.4	28.4	74	54	-32.6	-25.6	H, ATS112 = 60
535 342	3.0 3.0	41.3 40.9	30.8 29.8	32.9 36.6	5.7 7.8	-36.5 -36.3	0.0 0.0	0.0 0.0	43.4 49.0	32.9 37.9	74 74	54 54	-30.6 -25.0	-21.1 -16.1	H, ATS112 = 60 H, ATS112 = 60
81	3.0	51.9	48.8	29.3	4.2	-37.4	0.0	0.0	48.0	44.9	74	54	-26.0	-9.1	V, ATS112 = 60
707	3.0	42.7	48.8	29.5 31.6	4.2	-37.4	0.0	0.0	48.0	31.4	74	54	-20.0	-9.1	V, A1S112 = 60 V, ATS112 = 60
535	3.0	42.8	35.1	32.9	5.7	-36.5	0.0	0.0	44.8	37.2	74	54	-29.2	-16.8	V, ATS112 = 60
342	3.0	40.8	29.3	36.6	7.8	-36.3	0.0	0.0	48.9	37.4	74	54	-25.1	-16.6	V, ATS112 = 60
v. 11.10.	08														
	f	Measuremen				Amp	Preamp G					Avg Lim		eld Strength	
		Distance to A				D Corr			to 3 meters			Pk Lim		Strength Lin	
		Analyzer Rea				Avg			rength @ 3			Avg Mar		Average Lin	nıt
	AF	Antenna Fac	tor			Peak			Field Streng	th		Pk Mar	Margin vs.	Peak Limit	
	CL	Cable Loss				HPF	High Pass	s Filter							

### 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 below 6 dBi, therefore the power limit is 30 dBm.

### TEST PROCEDURE

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

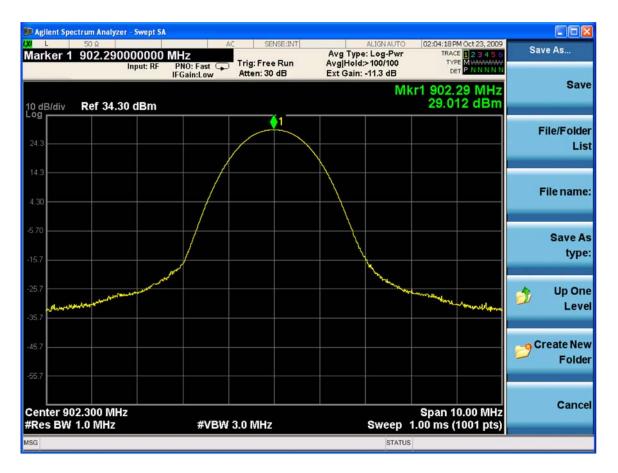
Note: Power measurements were at external antenna connector port on the radio board.

### **RESULTS**

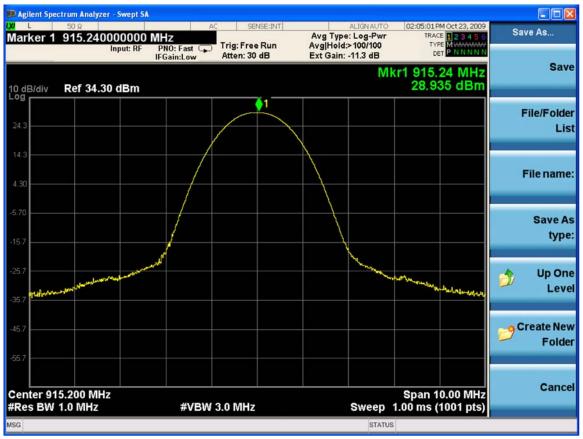
No non-compliance noted:

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

### **OUTPUT POWER LOW CHANNEL**



### **OUTPUT POWER MID CHANNEL**



# **OUTPUT POWER HIGH CHANNEL**

Agilent Spectrum Analyzer - L 50 Ω		AC SENSE:INT	ALIGNAUTO	02:05:48 PM Oct 23, 2009	
arker 1 926.8600			Avg Type: Log-Pwr Avg Hold:>100/100 Ext Gain: -11.3 dB	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N N	Save As
dB/div Ref 34.30	dBm		Mk	r1 926.86 MHz 28.757 dBm	Sav
4.3					File/Fold Li
.30					File nam
5.7					Save A typ
5.7 5.7 January Marine M	and the second			ware for a for the state of the	👌 Up Or Lev
5.7					Create Ne Fold
enter 926.900 MHz Res BW 1.0 MHz	#VBV	/ 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 <sup>2</sup> )	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)
30–300 300–1500	27.5	0.073	0.2 f/1500	30 30
1500-100,000			1.0	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.

### **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 cm P = Power in mW G = Numeric antenna gain S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and G (numeric) = 10 ^ (G (dBi) / 10)  $d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ 

Equation (1)

where

yields

d = MPE distance in cm P = Power in dBm G = 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.

### LIMITS

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

### **RESULTS**

No non-compliance noted:

non non	compila		••							
Silver Spring	Networks									
FCC ID: OWS	NICE14									
IC: 5975A- N			-							
IC: 5975A- N	16314									
Utility Meter	WLAN Transce	iver	2.4 GHz			Calculate mW/cm	2 here. Enter fr	equency in MHz	8	
RF Hazard Dis	tance Calculat	ion				Calculation of Limi	ts from 1.1310 T	able 1		
									Controlled	Uncontrolled
									Ave 6 min	Ave 30 min
mW/cm2 from	n 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
	í.					300-1500	902		3.0	0.60
29.0	3.0	14.5	0.32			1500-100000	5555		5.0	1.0
						Enter P(mW)	Equivalent dBm	Enter dBm	Equivalent Wat	ts
Basis of Calcu						64	10.1	18.1	64.6	
Basis of Calcu	lations:					64	18.1	18.1	64.6	
E^2/3770 = S	, mW/cm2									
E, V/m = (Pwa	, itts*Ggain*30)	^.5/d, meters								
	G*30)/3770*S		Pwatts*Ggain = 1	0^(PdBm-30+G	idBi)/10)					
S@20cm = 20	log (MPE dist/	20cm)								
				eparation distan	ce is for FCC	compliance is 20 cr	ή,			
ever	if calculations	indicate MPE	distance is less							

MPE Distance: 14.5 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

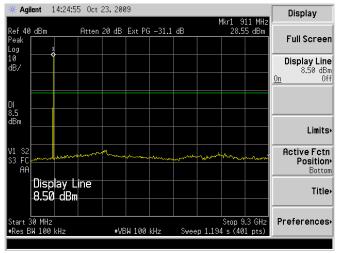
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

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

### <u>RESULTS</u>

No non-compliance noted:

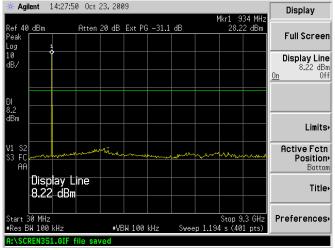
### SPURIOUS EMISSIONS, LOW CHANNEL



### SPURIOUS EMISSIONS, MID CHANNEL

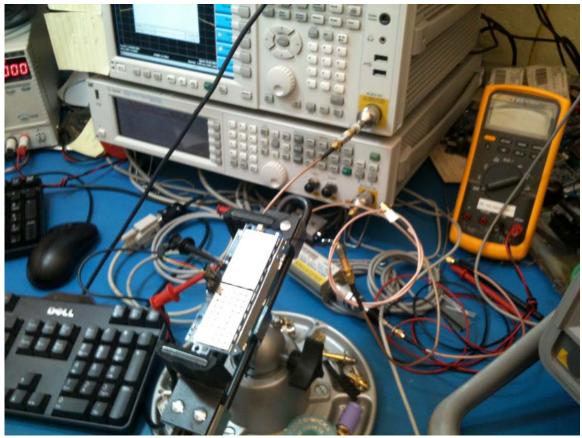
🔆 Agilent 🛛 14:2	26:10 Oct 2	3, 2009						Display
Ref 40 dBm		20 dB Ext	DC 21.1	-ID	Þ		11 MHz 5 dBm	
Peak	Htten a		<u>PG -31.1</u>	aB		27.5	5 dBm	Full Screen
10 dB/								Display Line 7.55 dBm
								<u>On</u> Off
DI								
dBm								Limits
V1 S2								Active Fctn
V1 S2 S3 FC	and a star and a star and a star a	hand		Juna	~~~~	Vindyn	and the second state	Position Bottom
Display	/ Line							
7.55 d	Bm							Title•
Start 30 MHz #Res BW 100 kHz		#VBW 10		Śwas	p 1.194		.3 GHz	Preferences.
A:\SCREN350.6			D® KH∠	Jwee	р <b>т.</b> 13 <sup>2</sup>	+ 5 (40.	ι μ(S)	

### 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