

**CLASS 2 PERMISSIVE CHANGE**  
**TEST REPORT FOR**  
**902-928 MHZ FREQUENCY HOPPING RADIO MODULE**

**FCC ID: OWS-NIC506**

**MODEL NO.: eBRIDGE**

**REPORT NUMBER: 09PRO015SUPP**

**ISSUE DATE: 9 NOVEMBER 2009**

*Prepared for*

**SILVER SPRING NETWORKS INC.**  
**575 BROADWAY STREET**  
**REDWOOD CITY CA 94063**

*Prepared by*

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## EMISSIONS TEST REPORT FOR A LOW POWER TRANSMITTER

### I. GENERAL INFORMATION

Requirement: FCC  
Test Requirements: FCC Part 15  
Industry Canada RSS-210, RSS-Gen

Applicant: Silver Spring Networks  
575 Broadway Street  
Redwood City, CA 94063

**FCC ID:** OWS-NIC506  
**IC:** 5975A-NIC506  
**Model No.:** 205-000026

### II. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

The Silver Spring Networks (SSN) NIC506 model 205-000026 is a radio module used for electric power meter communications. The NIC506 is a 902-928 MHz frequency hopping radio.

### III. TEST DATES AND TEST LOCATION

Testing was performed on 13 October and 22 October 2009, in response to a request from the TCB reviewer for a class 2 permissive change for the referenced FCC ID. Harmonic 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.



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

9 November 2009

### 15.203 Antenna connector requirement

The EUT uses an external mount omni-directional antenna.

Antenna description	Gain
Monopole omni	6 dBi

### 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.

### Test Equipment

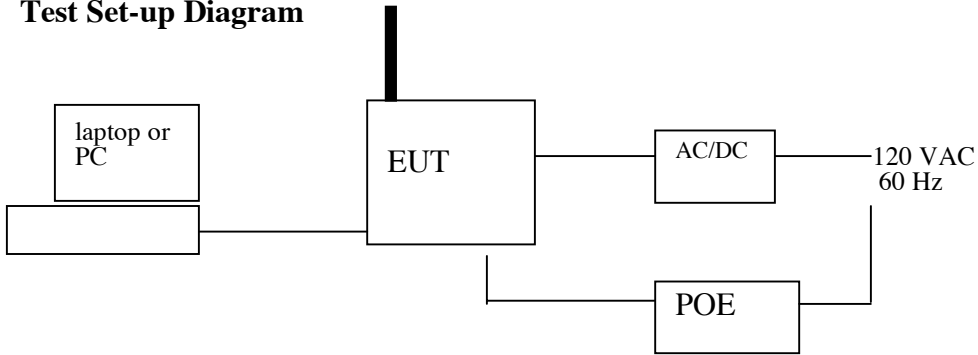
Compliance Certification Services:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset Number	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	01/05/10
Antenna, Horn, 18 GHz	EMCO	3115	C00945	01/29/10
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	02/04/10

Silver Spring Networks:

Equipment	Mfr	Model	Serial No.	Cal Due
Spectrum analyzer	Agilent	E44053	MY45113391	07/23/10
Spectrum analyzer	Agilent	EXA	MY48030147	07/23/10
Spectrum analyzer	HP	8562B	2712A001139	09/25/10

### Test Set-up Diagram



### Support Equipment

Description	Manufacturer	Model No.	Serial/Asset No.
Laptop computer	Dell	Latitude D620	C01095
Laptop power supply	Lite-On	LA65N50-00	-
POE adapter	Sonic Wall	MNH-01-SSG-5535	101-500-158-50
AC/12VDC adapter	Hon-Kwang	D12-10	-

## TEST RESULTS

### Radiated Test Set-up, 1-9.3 GHz

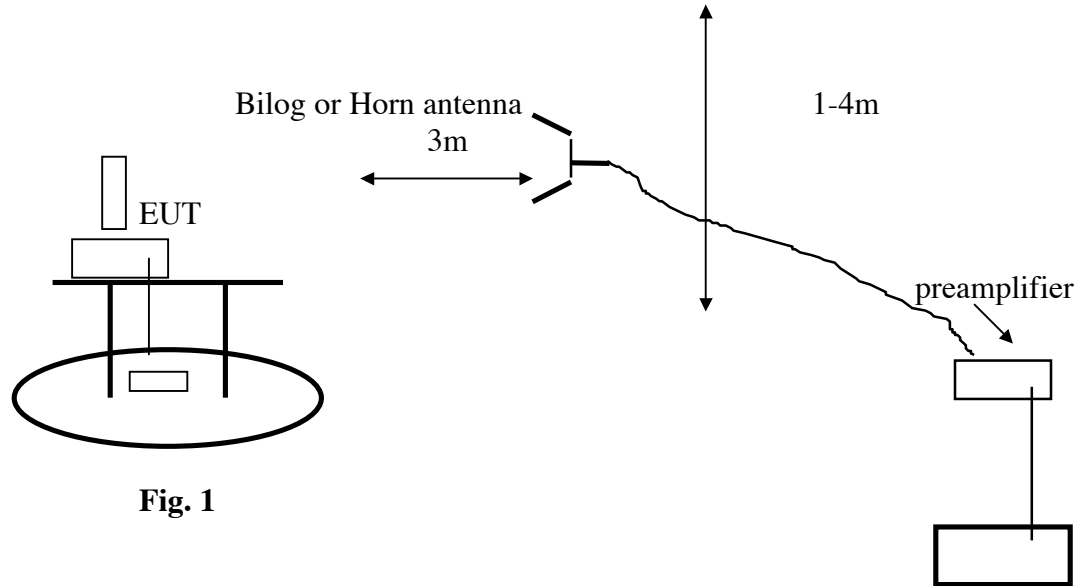


Fig. 1

### 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.
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 (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**

NOTE: Spurious radiated emissions limits for a 15.247 frequency hopping radio, except for emissions at restricted band frequencies, must be at least -20 dBc below the field strength at the fundamental frequency, when measured in a 100 kHz bandwidth.

The maximum output power of the EUT is 29.62 dBm. The antenna gain is 6 dBi.

$E, \text{ dBuV/m at } 3\text{m} = (95.24 + \text{eirp}), \text{ dBuV/m} = 95.24 + 29.62 + 6 = 130.9 \text{ dBuV/m}$

$130.9 \text{ dBuV/m} - 20 = 110.9 \text{ dBuV/m}$  limit for spurious emissions not in restricted bands.

High Frequency Measurement  
 Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen  
 Date: 10/13/09  
 Project #: 09U12834  
 Company: Silver Spring Network  
 EUT Description: eBridge radio 900 MHz FHSS  
 EUT M/N: FCC ID: OWS-NIC506  
 Test Target: FCC15  
 Mode Oper: Constant Transmit

f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter	

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant.High cm	Table Angle Degree	Notes
E-Birdage 914.7MHz															
1.829	3.0	59.3	27.0	3.3	-35.5	0.0	0.3	54.4	110.9	-56.5	V	P	102.8	352.6	-20 dBc Vert
1.829	3.0	58.2	27.0	3.3	-35.5	0.0	0.3	53.3	110.9	-57.6	V	A	102.8	352.6	-20 dBc Vert
E-Birdage 914.7MHz															
2.744	3.0	50.1	29.3	4.1	-35.2	0.0	0.6	48.9	74.0	-25.1	V	P	102.8	352.6	Vert
2.744	3.0	47.5	29.3	4.1	-35.2	0.0	0.6	46.2	54.0	-7.8	V	A	102.8	352.6	Vert
E-Birdage 914.7MHz															
3.659	3.0	43.6	31.4	4.9	-34.9	0.0	0.6	45.6	74.0	-28.4	V	P	102.8	352.6	Vert
3.659	3.0	37.4	31.4	4.9	-34.9	0.0	0.6	39.4	54.0	-14.6	V	A	102.8	352.6	Vert
E-Birdage 914.7MHz															
1.829	3.0	51.6	27.0	3.3	-35.5	0.0	0.3	46.7	104.0	-27.3	H	P	100.0	153.7	-20 dBc Hori
1.829	3.0	48.5	27.0	3.3	-35.5	0.0	0.3	43.6	104.0	-10.4	H	A	100.0	153.7	-20 dBc Hori
E-Birdage 914.7MHz															
2.744	3.0	42.1	29.3	4.1	-35.2	0.0	0.6	40.9	74.0	-33.1	H	P	100.0	153.7	Hori
2.744	3.0	30.7	29.3	4.1	-35.2	0.0	0.6	29.5	54.0	-24.5	H	A	100.0	153.7	Hori
E-Birdage 914.7MHz															
2.744	3.0	41.8	29.3	4.1	-35.2	0.0	0.6	40.6	74.0	-33.4	H	P	100.0	153.7	Hori
2.744	3.0	32.6	29.3	4.1	-35.2	0.0	0.6	31.4	54.0	-22.6	H	A	100.0	153.7	Hori
E-Birdage 914.7MHz															
3.659	3.0	42.0	31.4	4.9	-34.9	0.0	0.6	44.0	74.0	-30.0	H	P	100.0	153.7	Hori
3.659	3.0	32.7	31.4	4.9	-34.9	0.0	0.6	34.6	54.0	-19.4	H	A	100.0	153.7	Hori
E-Birdage 914.7MHz															
4.574	3.0	38.6	32.6	5.6	-34.8	0.0	0.6	42.6	74.0	-31.4	H	P	100.0	153.7	Hori
4.574	3.0	26.7	32.6	5.6	-34.8	0.0	0.6	30.7	54.0	-23.3	H	A	100.0	153.7	Hori

Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.



**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 6 dBi, therefore the power limit is 30 dBm.

**TEST PROCEDURE**

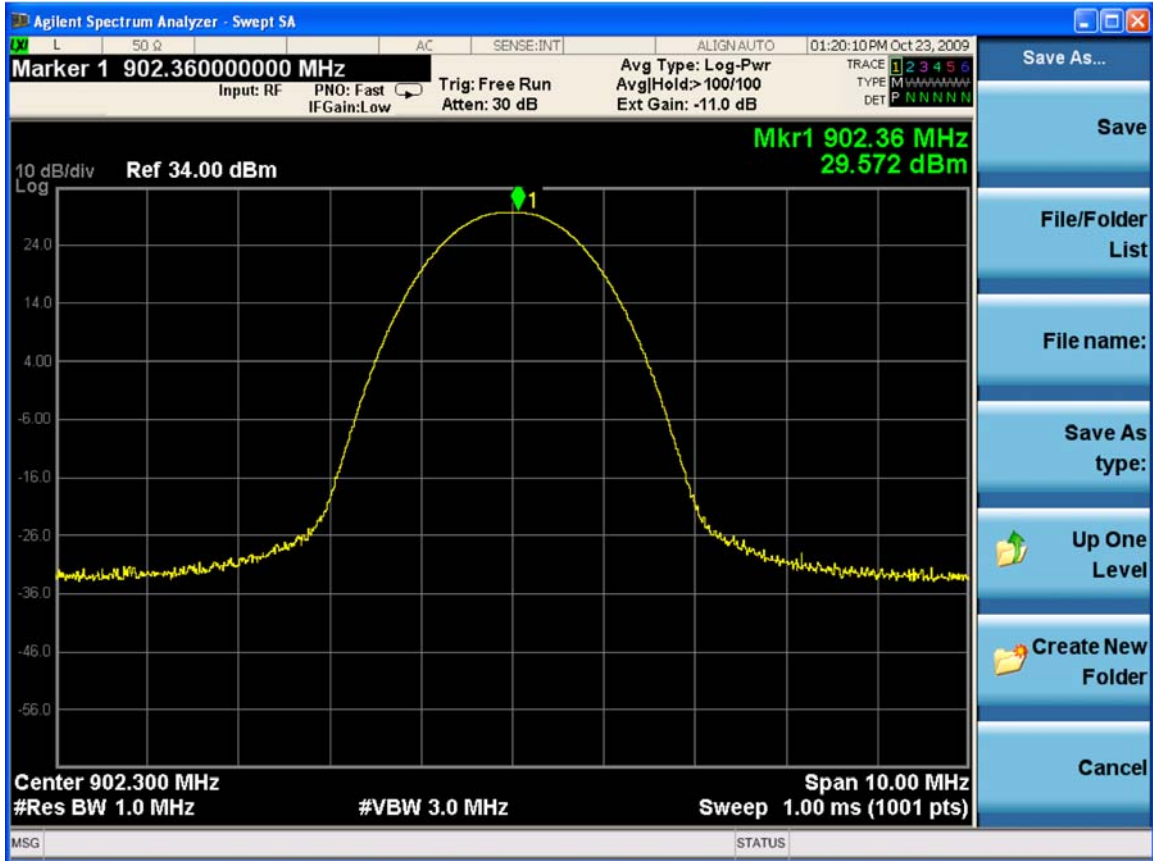
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

**RESULTS**

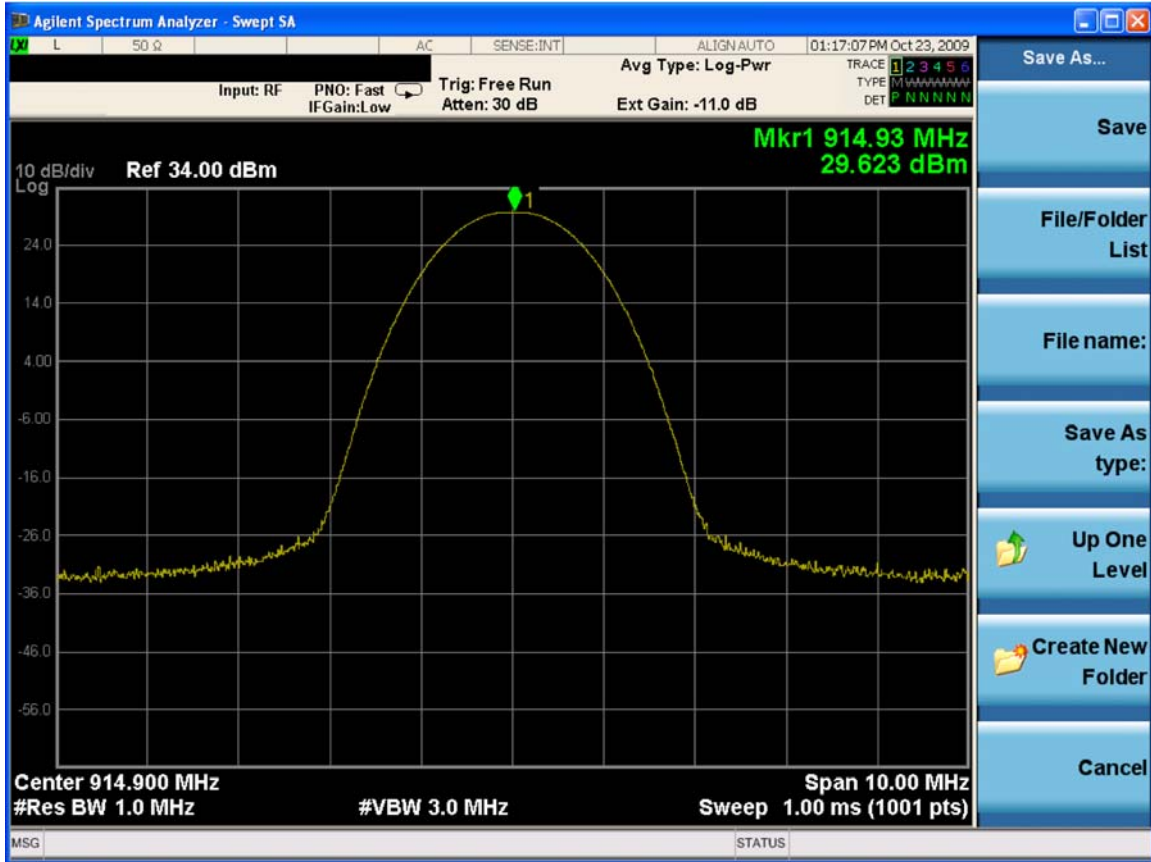
No non-compliance noted:

<b>Channel</b>	<b>Frequency</b>	<b>P out</b>
Low	902.3	29.57
Mid	914.9	29.62
High	926.9	28.95

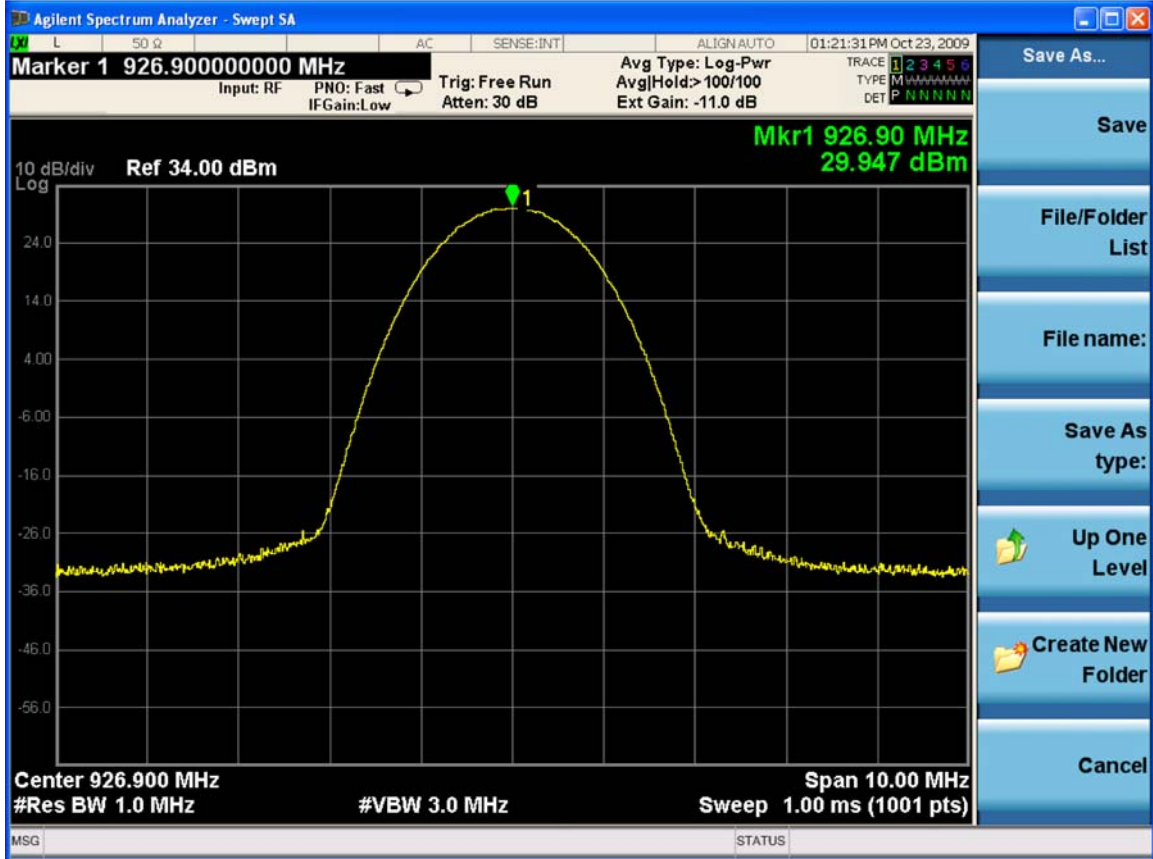
**OUTPUT POWER LOW CHANNEL**



**OUTPUT POWER MID CHANNEL**



**OUTPUT POWER HIGH CHANNEL**



## **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**

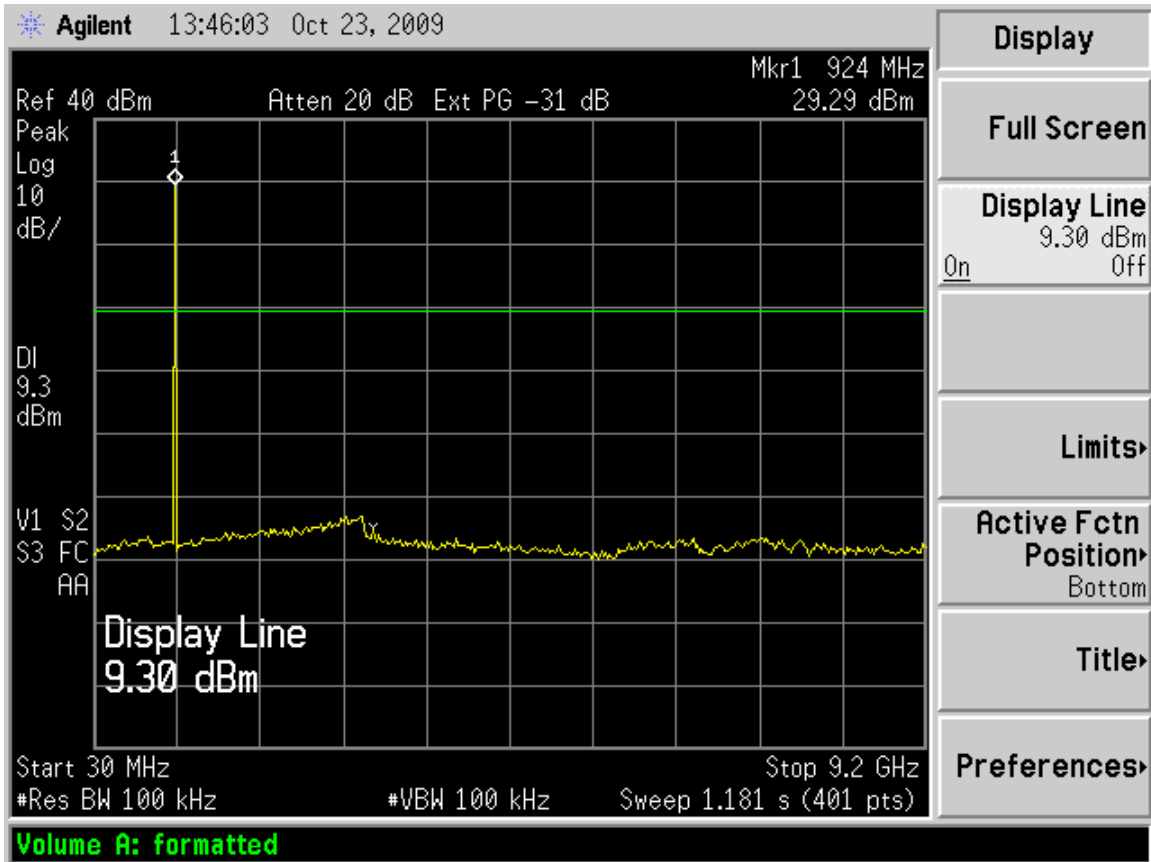
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

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

### **RESULTS**

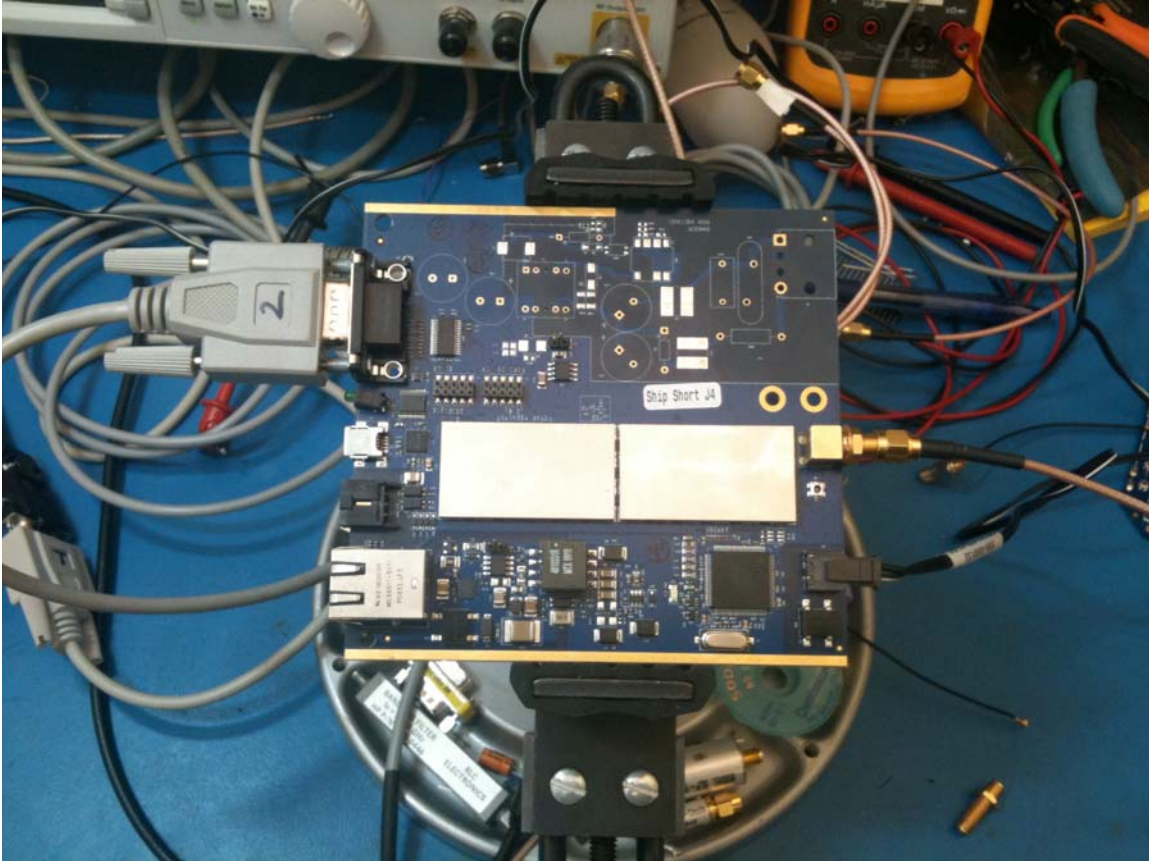
No non-compliance noted:

**SPURIOUS EMISSIONS, MID CHANNEL**

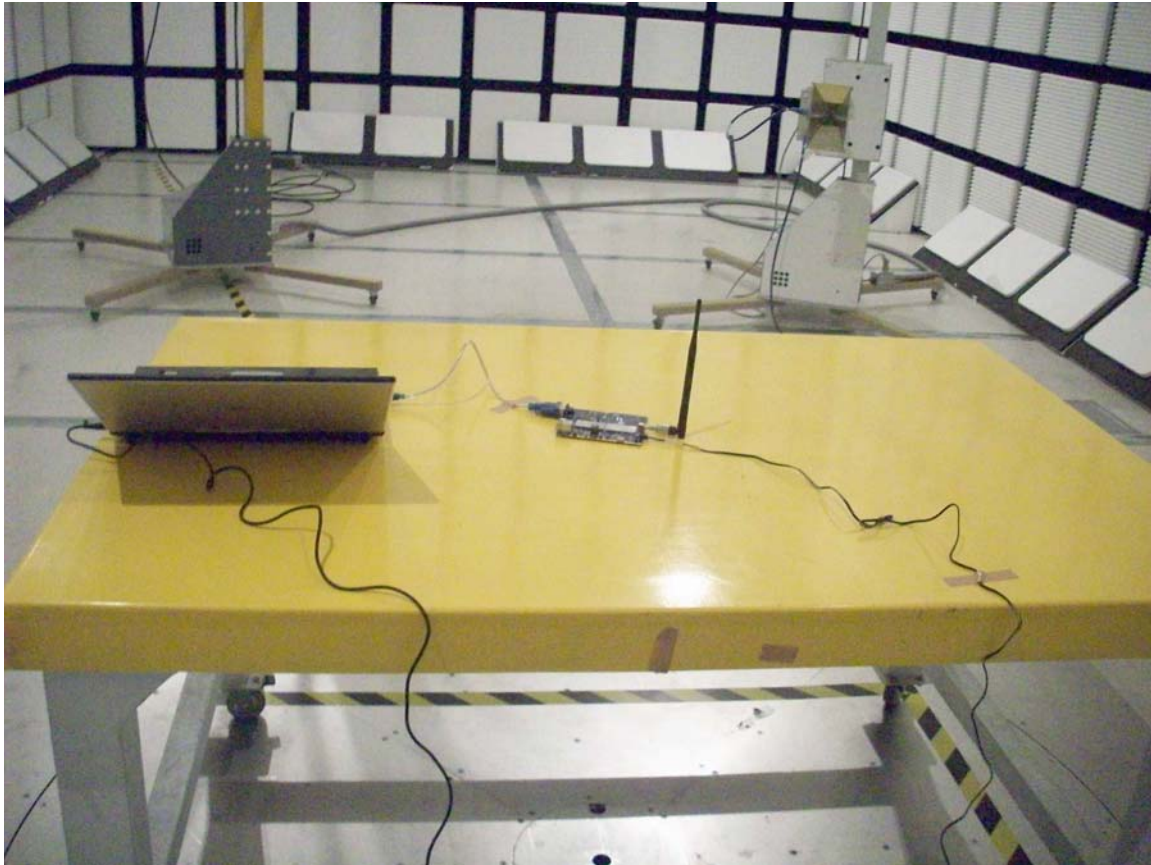


## SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP, SILVER SPRING NETWORKS



**RADIATED RF MEASUREMENT SETUP**



**END OF REPORT**

**Report Revision History**

Revision No.	Revision Description	Pages Revised	Revised by	Date
-	Original Issue		T. Cokenias	11/3/09
1	Add E-field calculation at fundamental		T. Cokenias	11/9/09