# 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-NIC515**
**IC: 5975A-NIC515**
**Model No.:** sBridge R1

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

The Silver Spring Networks (SSN) NIC515 is a 900 MHz frequency hopping spread spectrum radio module for electric power meter communications use.

## III. TEST DATES AND TEST LOCATION

Testing was performed on 31 March, 1 April, and 14 June 2010.
900 MHz radiated and AC line conducted emissions tests were performed at:

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538

All antenna port conducted tests were performed at Silver Spring Networks.

T.N. Cokenias 15 June 2010
EMC Consultant/Agent for Silver Spring Networks

### 15.203 Antenna connector requirement

The EUT uses an external omni-directional monopole antenna.

| Antenna description | Mfr. | Model No. | Gain |
|---|---|---|---|
| Omni monople | SSN | n/a | 3 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.

For each radio, 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

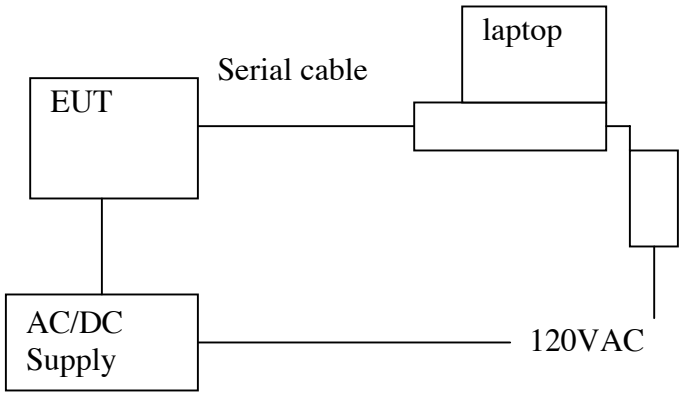
Compliance Certification Services:

| TEST EQUIPMENT LIST | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Asset Number** | **Cal Due** |
| Spectrum Analyzer, 26.5 GHz | Agilent / HP | E4440A | C01179 | 08/24/10 |
| Antenna, Bilog, 2 GHz | Sunol Sciences | JB1 | C01011 | 07/14/10 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00885 | 07/06/10 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00945 | 07/29/10 |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C01063 | 08/04/10 |

Silver Spring Networks:

| Equipment | Mfr | Model | Serial No. | Cal Date |
|---|---|---|---|---|
| Spectrum analyzer | Agilent | E44053 | MY45153391 | 07/23/10 |
| Spectrum analyzer | Agilent | EXA | MY48030147 | 07/23/10 |

## Test Set-up Diagram




## Support Equipment

| Equipment | Mfr | Model | Asset No. |
|---|---|---|---|
| EUT AC/DC adapter | V-Infinity | HK-C112-A12 | EPS120100UPS-P5P-KH |
| Laptop PC | Dell | PP01L | TW-0791UH1280-OC9-6558 |
| PC AC/DC adapter | CUI Inc. | DSA-60W-20 | 2607HB |

# FREQUENCY HOPPING SPREAD SPECTRUM RADIO EMISSIONS

**TEST RESULTS**

**Radiated Test Set-up, 30 MHz-9.3 GHz**

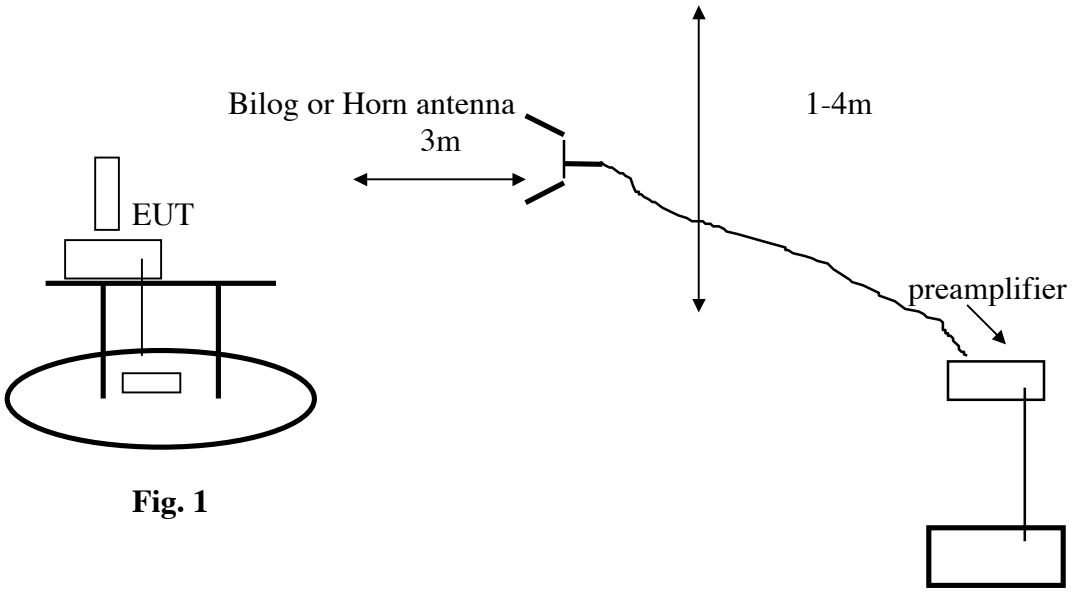



**Fig. 1**

**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 $10^{th}$ 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 (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

**High Frequency Measurement**
**Compliance Certification Services, Fremont 5m Chamber**

**Company: Silver Springs Networks**
**Project #: 10U13145**
**Date: 03/31/10**
**Test Engineer: Doug Anderson**
**Configuration: EUT and Support Peripherals**
**Mode: Continuous Tranmit**

**Test Equipment:**

| Horn 1-18GHz | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz |
|---|---|---|---|
| T73; S/N: 6717 @3m | T144 Miteq 3008A00931 | | |

FCC 15.205

Hi Frequency Cables

| 3' cable 22807700 | 12' cable 22807600 | 20' cable 22807500 | HPF | Reject Filter |
|---|---|---|---|---|
| 3' cable 22807700 | 12' cable 22807600 | 20' cable 22807500 | HPF_1.5GHz | |

**Peak Measurements**
RBW=VBW=1MHz
**Average Measurements**
RBW=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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Power=60 | | | | | | | | | | | | | | | |
| Channel 0: 902.3 MHz | | | | | | | | | | | | | | | |
| 2.707 | 3.0 | 52.6 | 49.5 | 29.1 | 4.1 | -37.4 | 0.0 | 0.6 | 48.9 | 45.9 | 74 | 54 | -25.1 | -8.1 | V |
| 3.609 | 3.0 | 54.6 | 52.3 | 31.4 | 4.8 | -36.9 | 0.0 | 0.6 | 54.5 | 52.2 | 74 | 54 | -19.5 | -1.8 | V |
| 4.511 | 3.0 | 44.3 | 33.9 | 32.7 | 5.6 | -36.5 | 0.0 | 0.6 | 46.6 | 36.3 | 74 | 54 | -27.4 | -17.7 | V |
| 5.414 | 3.0 | 45.2 | 37.5 | 33.8 | 6.2 | -36.3 | 0.0 | 0.5 | 49.4 | 41.7 | 74 | 54 | -24.6 | -12.3 | V |
| 2.707 | 3.0 | 52.1 | 49.0 | 29.1 | 4.1 | -37.4 | 0.0 | 0.6 | 48.5 | 45.3 | 74 | 54 | -25.5 | -8.7 | H |
| 3.609 | 3.0 | 51.1 | 47.5 | 31.4 | 4.8 | -36.9 | 0.0 | 0.6 | 51.0 | 47.4 | 74 | 54 | -23.0 | -6.6 | H |
| 5.414 | 3.0 | 44.0 | 35.9 | 33.8 | 6.2 | -36.3 | 0.0 | 0.5 | 48.2 | 40.1 | 74 | 54 | -25.8 | -13.9 | H |
| Power=60 | | | | | | | | | | | | | | | |
| Channel 43: 915.2 MHz | | | | | | | | | | | | | | | |
| 2.746 | 3.0 | 52.3 | 49.0 | 29.2 | 4.1 | -37.4 | 0.0 | 0.6 | 48.9 | 45.5 | 74 | 54 | -25.1 | -8.5 | V |
| 3.661 | 3.0 | 55.7 | 53.5 | 31.5 | 4.9 | -36.9 | 0.0 | 0.6 | 55.8 | 53.6 | 74 | 54 | -18.2 | -0.4 | V |
| 4.576 | 3.0 | 41.7 | 29.6 | 32.8 | 5.6 | -36.5 | 0.0 | 0.6 | 44.2 | 32.1 | 74 | 54 | -29.8 | -21.9 | V |
| 7.321 | 3.0 | 44.4 | 32.5 | 35.3 | 7.3 | -36.2 | 0.0 | 0.6 | 51.4 | 39.5 | 74 | 54 | -22.6 | -14.5 | V |
| 2.746 | 3.0 | 50.3 | 46.3 | 29.2 | 4.1 | -37.4 | 0.0 | 0.6 | 46.9 | 42.8 | 74 | 54 | -27.1 | -11.2 | H |
| 3.661 | 3.0 | 51.6 | 48.5 | 31.5 | 4.9 | -36.9 | 0.0 | 0.6 | 51.7 | 48.5 | 74 | 54 | -22.3 | -5.5 | H |
| Power=27 | | | | | | | | | | | | | | | |
| Channel 82: 926.9 MHz | | | | | | | | | | | | | | | |
| 2.781 | 3.0 | 48.5 | 43.4 | 29.3 | 4.2 | -37.4 | 0.0 | 0.6 | 45.2 | 40.1 | 74 | 54 | -28.8 | -13.9 | V (Power = 27) |
| 3.707 | 3.0 | 55.1 | 53.5 | 31.6 | 4.9 | -36.8 | 0.0 | 0.6 | 55.4 | 53.7 | 74 | 54 | -18.6 | -0.3 | V (Power = 27) |
| 4.634 | 3.0 | 41.9 | 31.1 | 32.9 | 5.7 | -36.5 | 0.0 | 0.6 | 44.5 | 33.7 | 74 | 54 | -29.5 | -20.3 | V (Power = 27) |
| 2.781 | 3.0 | 48.1 | 42.4 | 29.3 | 4.2 | -37.4 | 0.0 | 0.6 | 44.7 | 39.1 | 74 | 54 | -29.3 | -14.9 | H |
| 3.708 | 3.0 | 52.3 | 49.5 | 31.6 | 4.9 | -36.8 | 0.0 | 0.6 | 52.5 | 49.8 | 74 | 54 | -21.5 | -4.2 | H |

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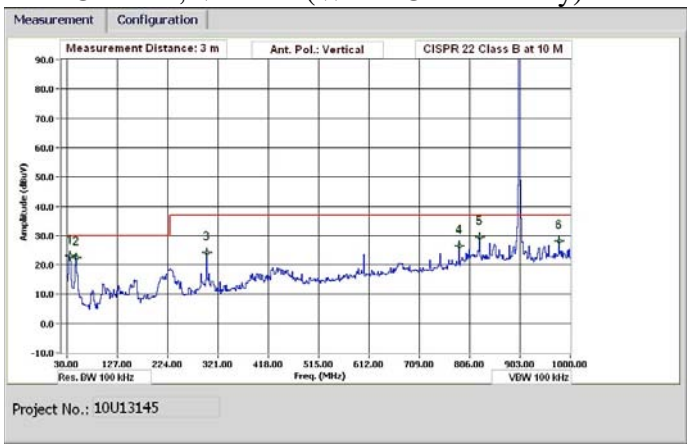
| | | | | | |
|---|---|---|---|---|---|
| f | Measurement Frequency | Amp | Preamp Gain | Avg Lim | Average Field Strength Limit |
| Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Pk Lim | Peak Field Strength Limit |
| Read | Analyzer Reading | Avg | Average Field Strength @ 3 m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

## Radiated Emissions Below 1 GHZ

Low Channel, Vertical (Worst Case Polarity)




Mid Channel, Vertical (Worst Case Polarity)


High Channel, Vertical (Worst Case Polarity)

## 20 dB Bandwidth

**LIMIT**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to approximately 5% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

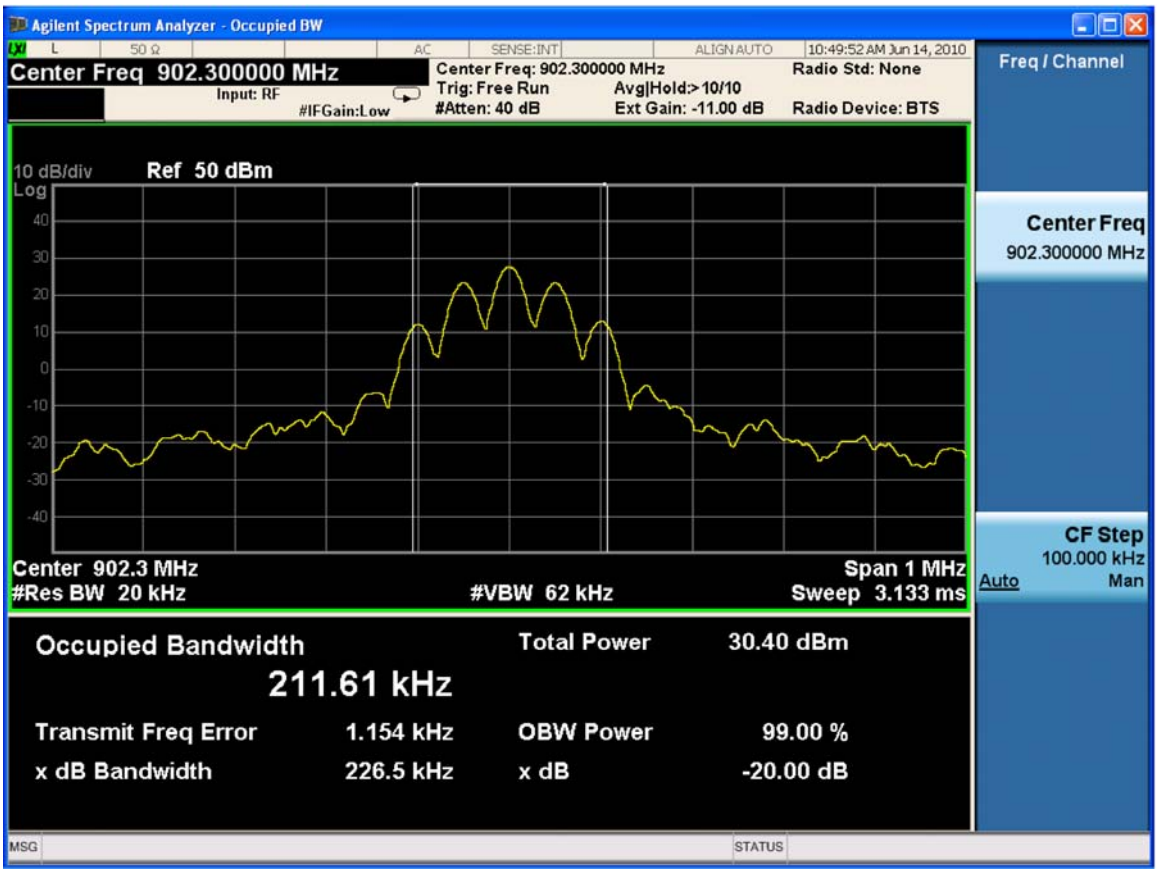
**RESULTS**

No non-compliance noted:

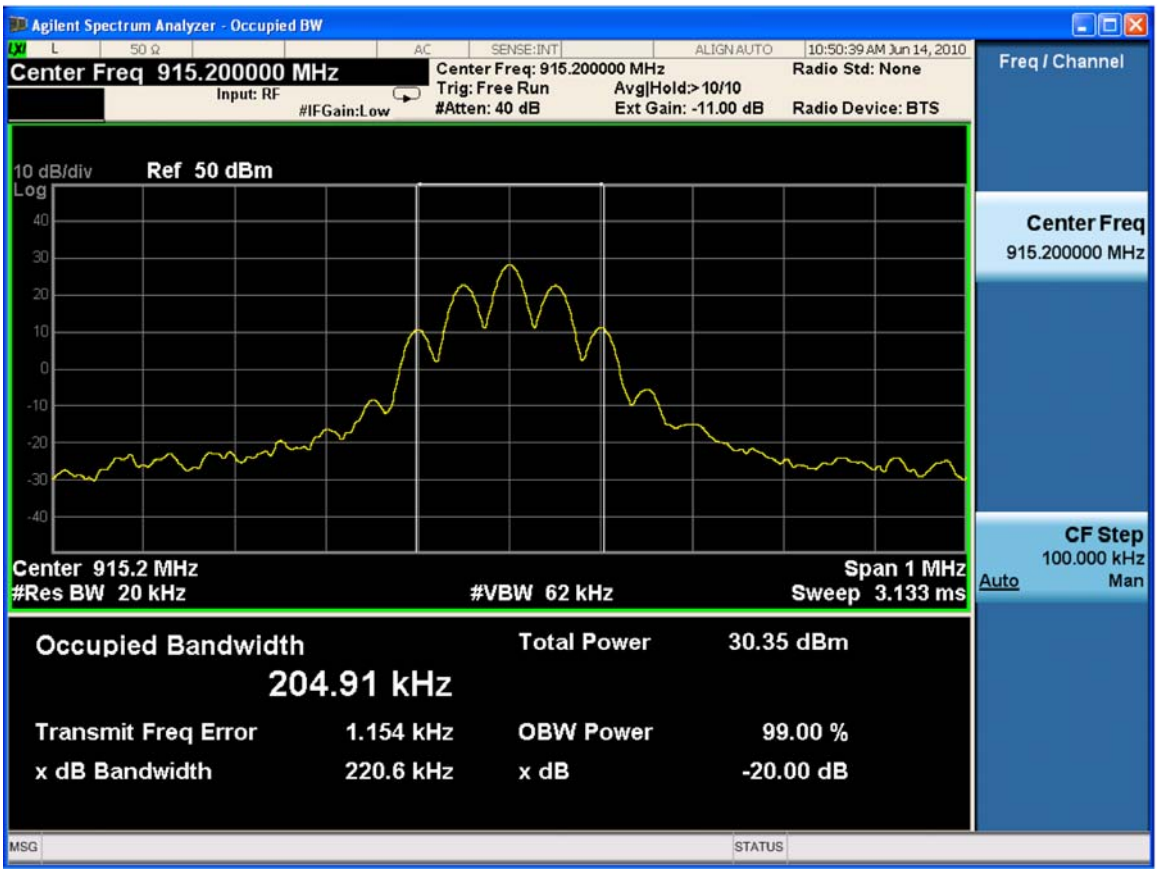
| Channel | Frequency (MHz) | 20 dB BW (kHz) | 99% Occupied BW (kHz) |
|---|---|---|---|
| Low | 902.3 | 226.5 | 212 |
| Middle | 915.2 | 220.6 | 205 |
| High | 926.9 | 204.1 | 193 |

Emission Designator: 212KF1D (maximum 99% BW: 212 kHz)

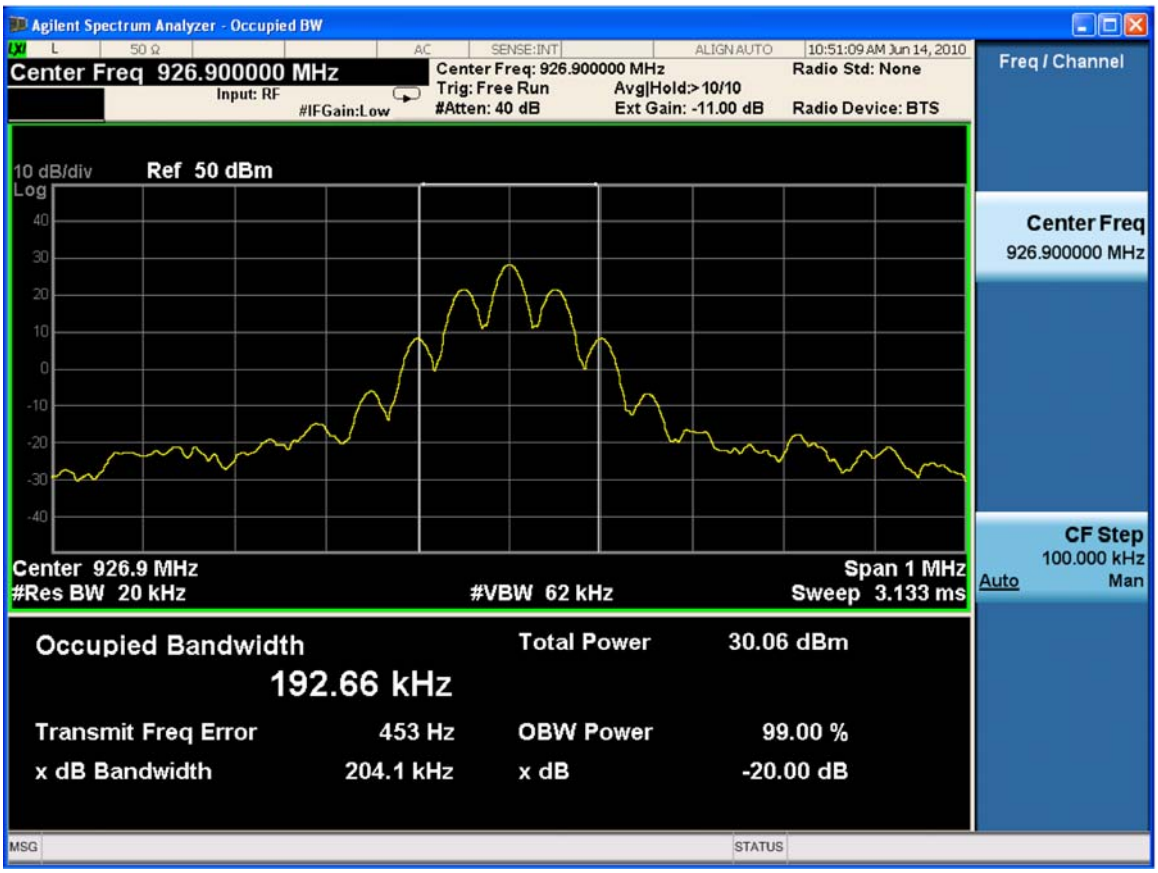
**99% and 20 dB BANDWIDTH LOW CHANNEL**



**99% and 20 dB BANDWIDTH MID CHANNEL**



**99% and 20 dB BANDWIDTH HIGH CHANNEL**



# HOPPING FREQUENCY SEPARATION

**LIMIT**

§15.247 (a) (1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

**TEST PROCEDURE**

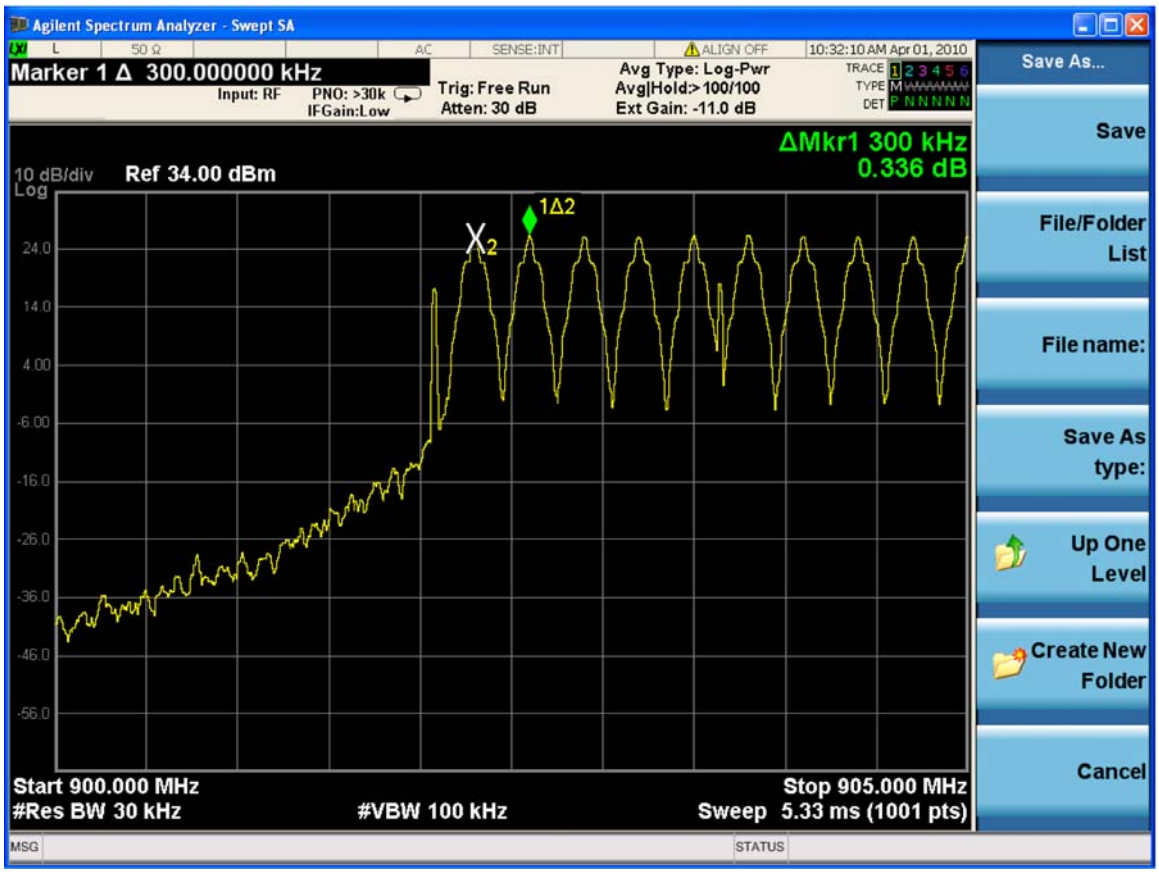
The transmitter output is connected to a spectrum analyzer. The RBW is set to 10 kHz and the VBW is set to 30 kHz. The sweep time is coupled.

**RESULTS**

No non-compliance noted:

The separation is 300 KHz.

**HOPPING FREQUENCY SEPARATION**



## NUMBER OF HOPPING CHANNELS

**LIMIT**

§15.247 (a) (1) (i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

**TEST PROCEDURE**

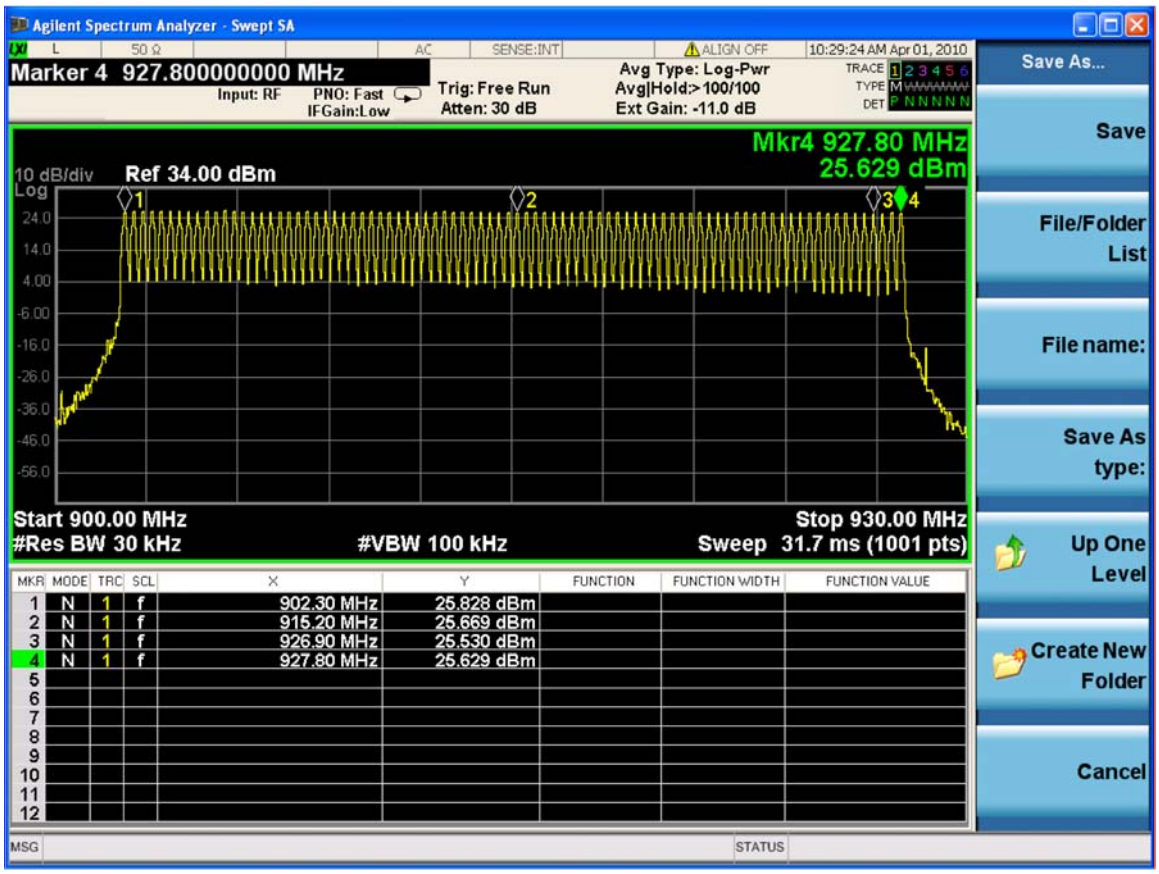
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 3 % of the span. The analyzer is set to Max Hold.

**RESULTS**

No non-compliance noted:

83 Channels observed, 902.3 – 926.9 MHz, the frequency range for FCC and IC compliance. The spectrum analyzer plot below shows 86 channels 902.3- 927.8 MHz, the full range of the product. The upper channels are used in Australia and other regulatory domains. The product software will limit operation to 902.3 – 926.9 MHz in the United States and Canada.

**NUMBER OF HOPPING CHANNELS**



# AVERAGE TIME OF OCCUPANCY

**LIMIT**

§15.247 (a) (1) (i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 20 second scan, to enable resolution of each occurrence.

**RESULTS**

No non-compliance noted:

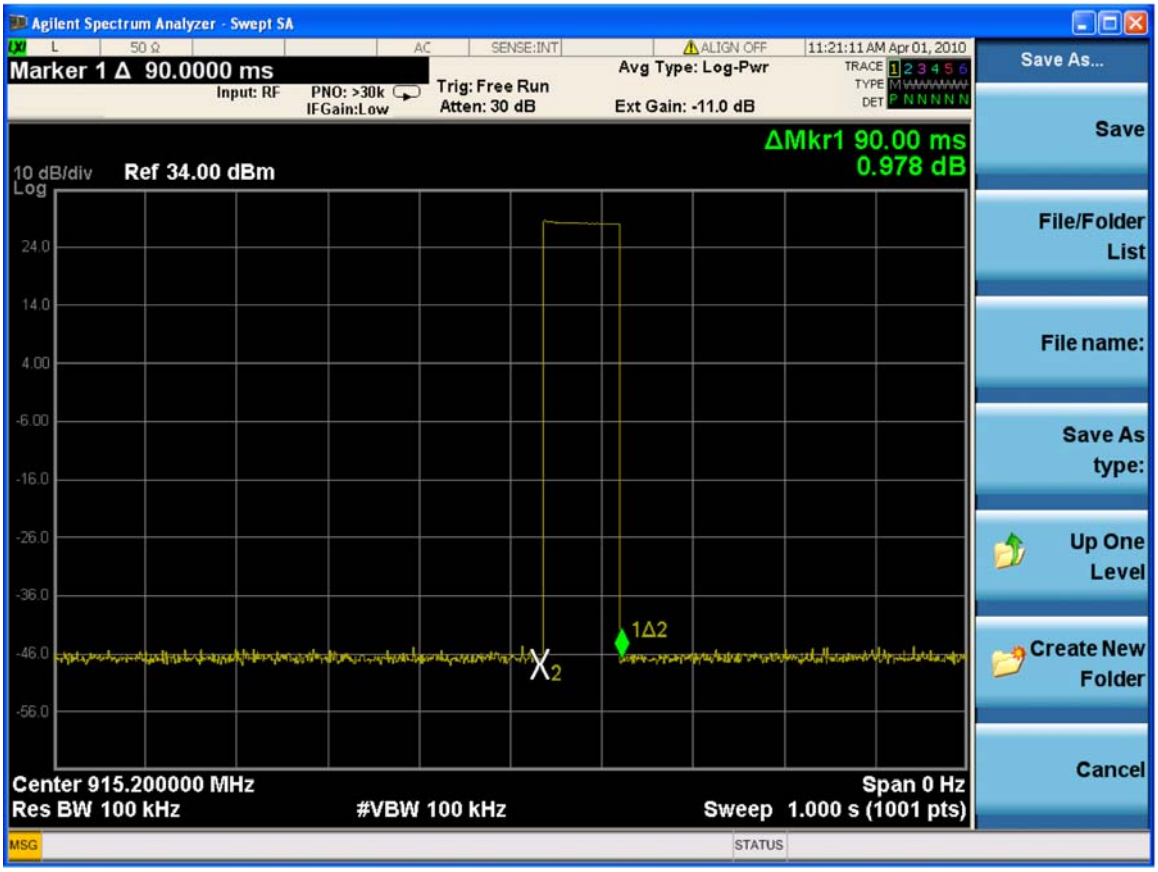
The on time for each pulse is 90 msec.

At a given frequency there is one pulse in 20 seconds.

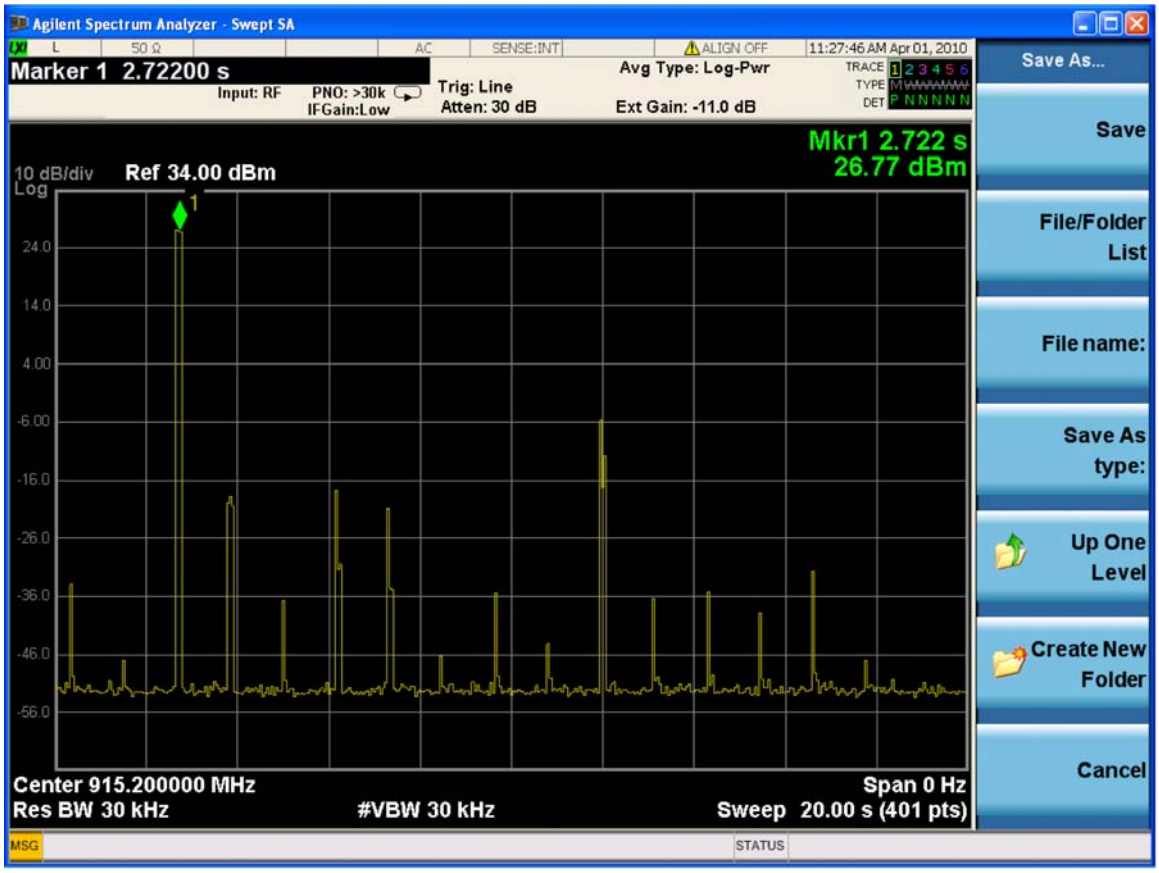
Therefore, the average time of occupancy in the specified 20-second period is 90 msec.

Limit: Not to exceed 400 msec.

**PULSE WIDTH**


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 90.0000 ms
Input: RF
PNO: >30k
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Ext Gain: -11.0 dB
11:21:11 AM Apr 01, 2010
ΔMkr1 90.00 ms
0.978 dB
10 dB/div
Log
Ref 34.00 dBm
24.0
14.0
4.00
-6.00
-16.0
-26.0
-36.0
-46.0
-56.0
1Δ2
Center 915.200000 MHz
Res BW 100 kHz
#VBW 100 kHz
Span 0 Hz
Sweep 1.000 s (1001 pts)
Save As...
Save
File/Folder List
File name:
Save As type:
Up One Level
Create New Folder
Cancel
MSG
STATUS

**NUMBER OF PULSES IN 20 SECOND OBSERVATION PERIOD**



**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**

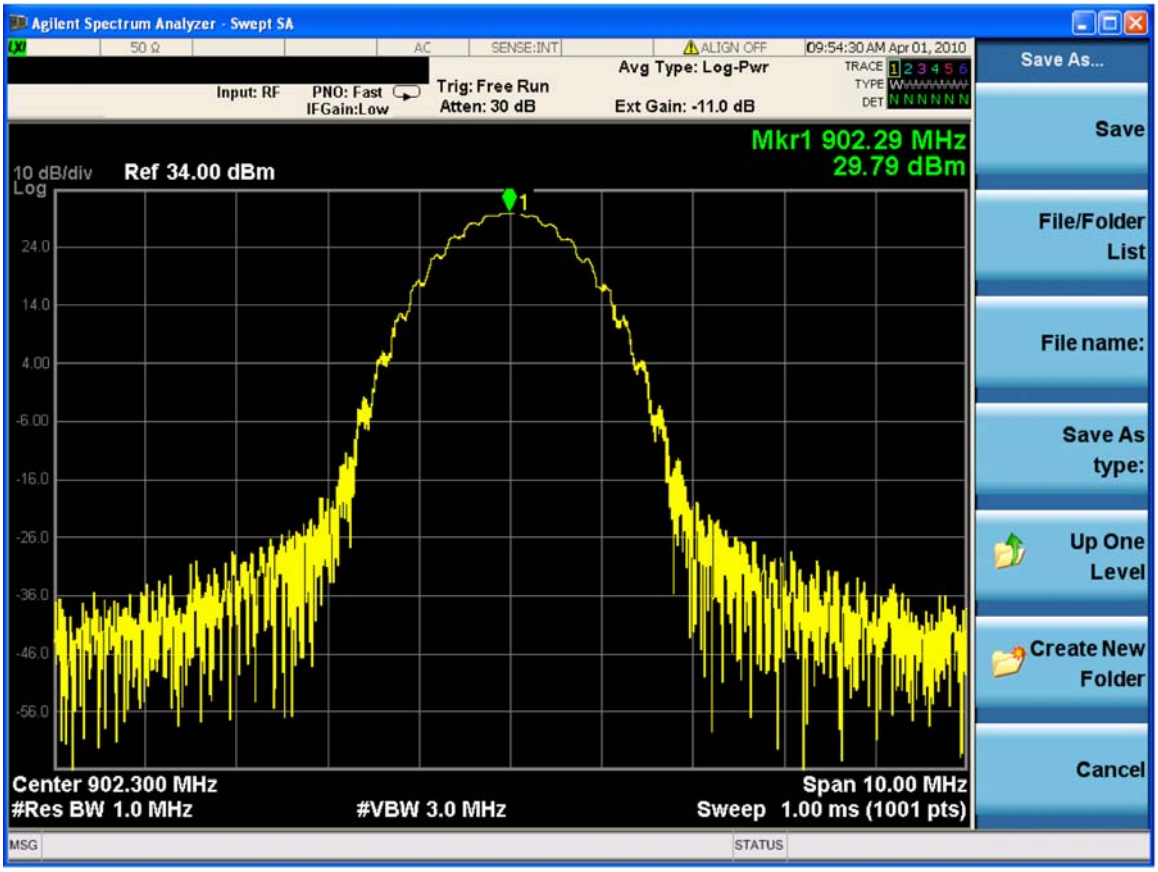
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

**RESULTS**

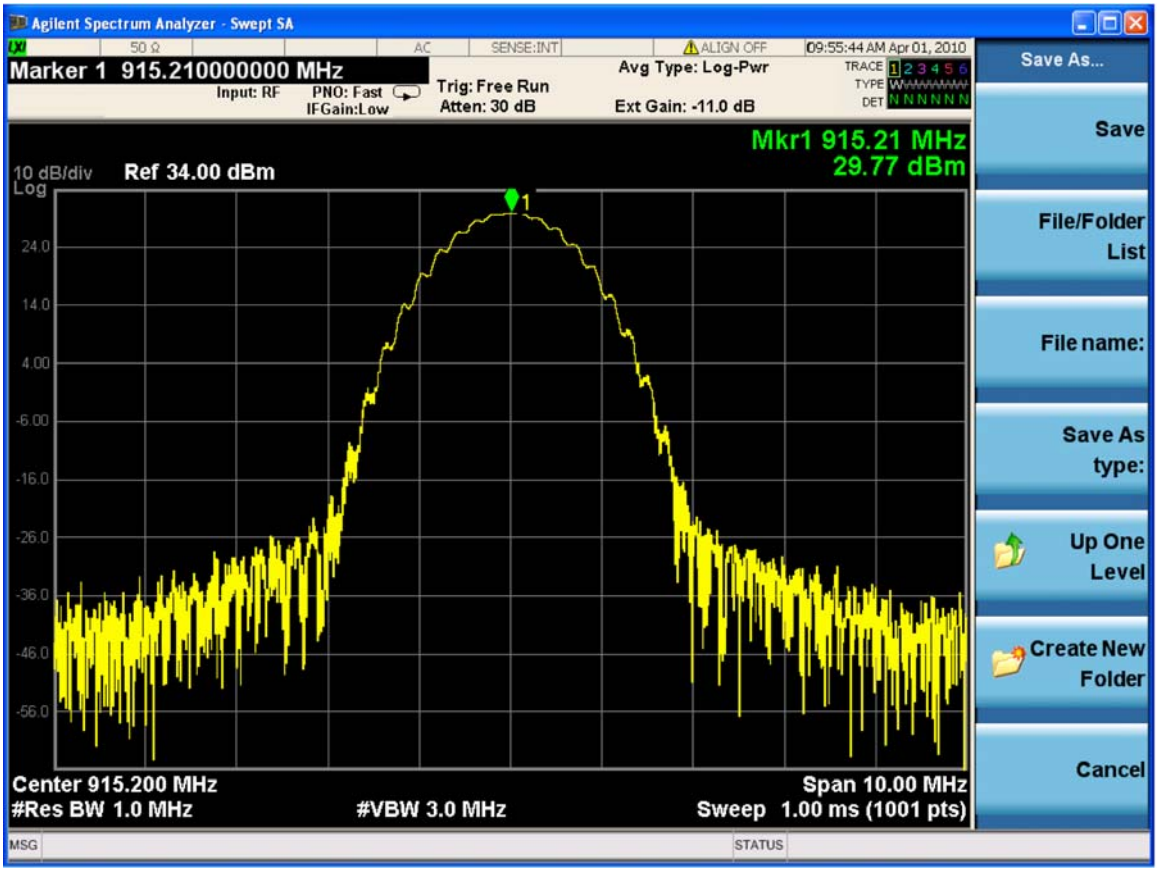
No non-compliance noted:

| Channel | Frequency | P out |
|---|---|---|
| Low | 902.3 | 29.79 |
| Mid | 915.2 | 29.77 |
| High | 926.9 | 28.54 |

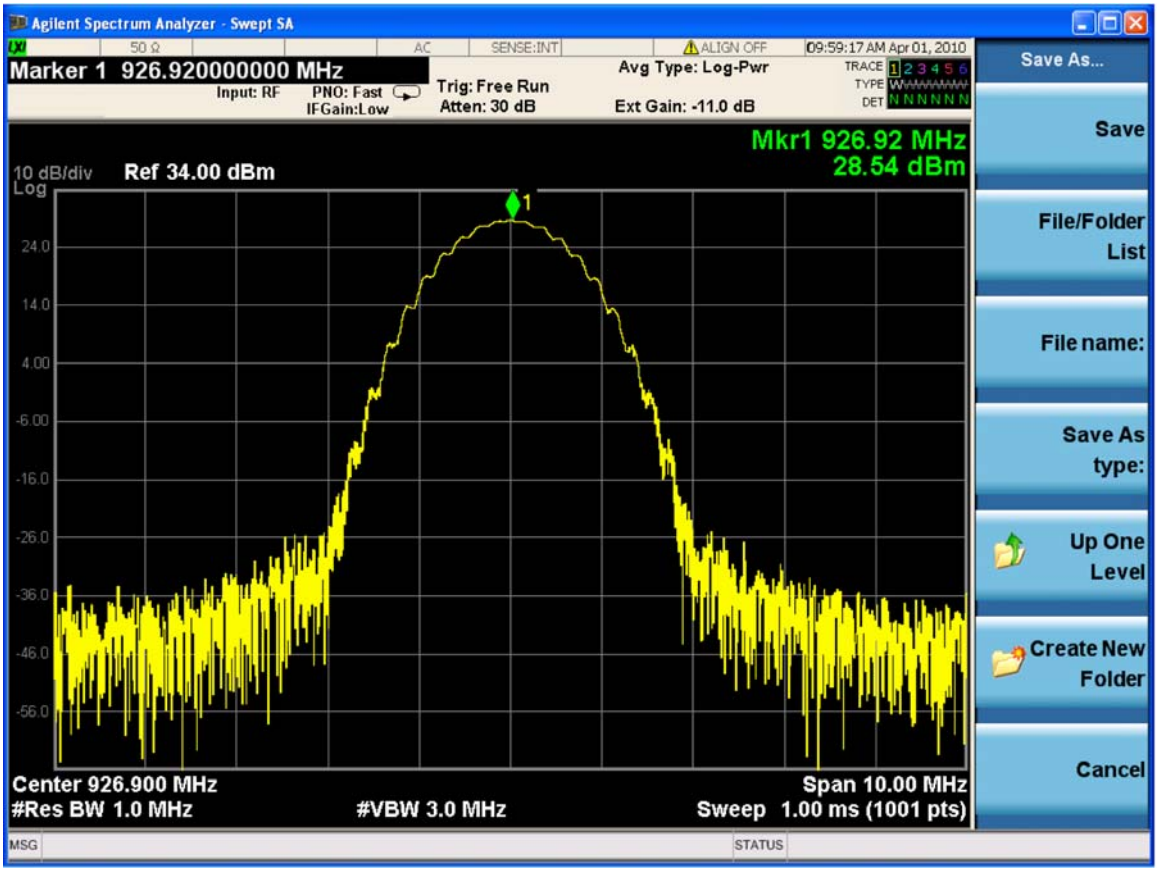
**OUTPUT POWER LOW CHANNEL**



**OUTPUT POWER MID CHANNEL**



**OUTPUT POWER HIGH CHANNEL**



# 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.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| (A) Limits for Occupational/Controlled Exposures | | | | |
| 0.3–3.0 | 614 | 1.63 | *(100) | 6 |
| 3.0–30 | 1842/f | 4.89/f | *($900/f^2$) | 6 |
| 30–300 | 61.4 | 0.163 | 1.0 | 6 |
| 300–1500 | ..... | ..... | f/300 | 6 |
| 1500–100,000 | ..... | ..... | 5 | 6 |
| (B) Limits for General Population/Uncontrolled Exposure | | | | |
| 0.3–1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34–30 | 824/f | 2.19/f | *($180/f^2$) | 30 |

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

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| 30–300 | 27.5 | 0.073 | 0.2 | 30 |
| 300–1500 | ..... | ..... | f/1500 | 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 occupational/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 exposed, 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)

yields

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ Equation (1)

where

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:

| Power Density Limit (mW/cm^2) | Output Power (dBm) | Antenna Gain (dBi) | S, mW/cm2 at 20cm |
|---|---|---|---|
| 0.6 | 29.79 | 3.00 | 0.31 |

MPE Distance: 15.87 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**

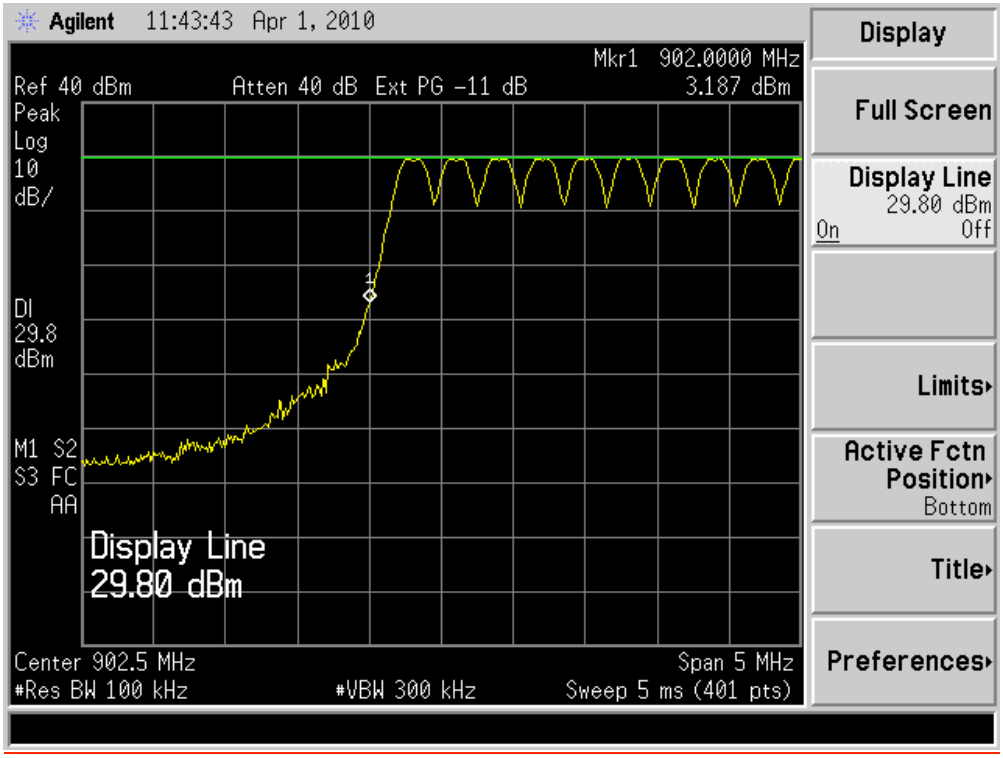
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

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

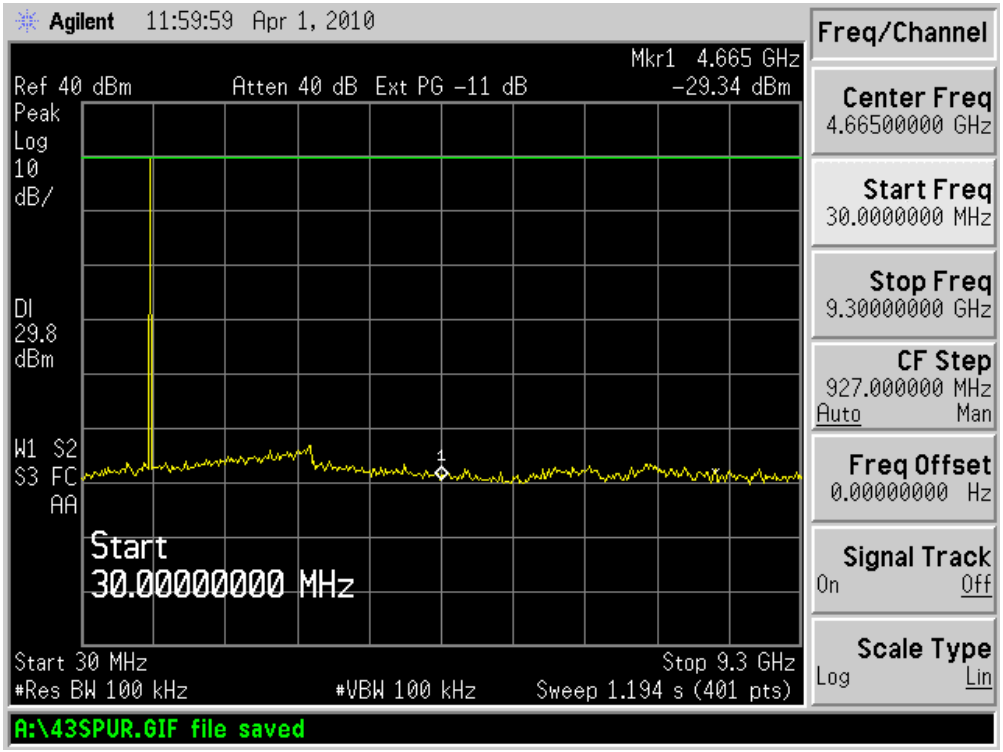
**RESULTS**

No non-compliance noted:

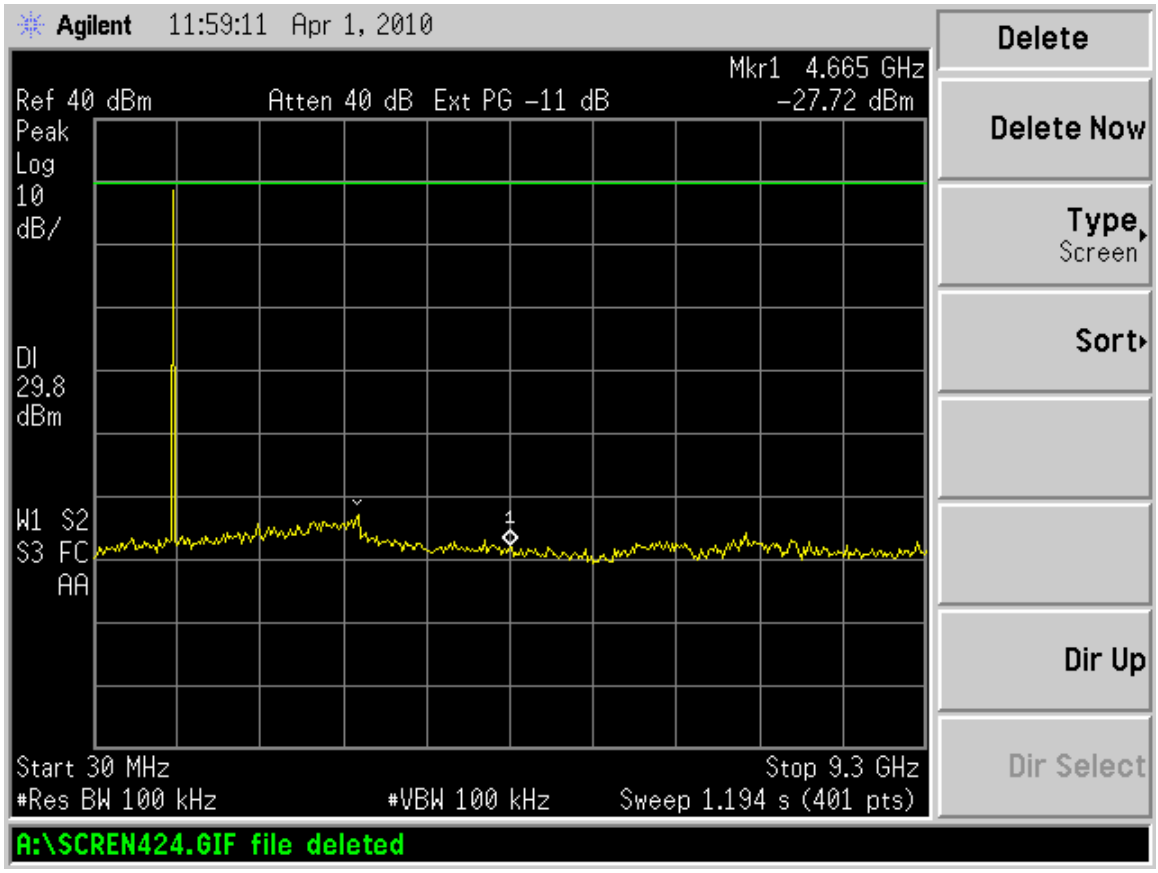
**SPURIOUS EMISSIONS, LOW CHANNEL, HOPPING**



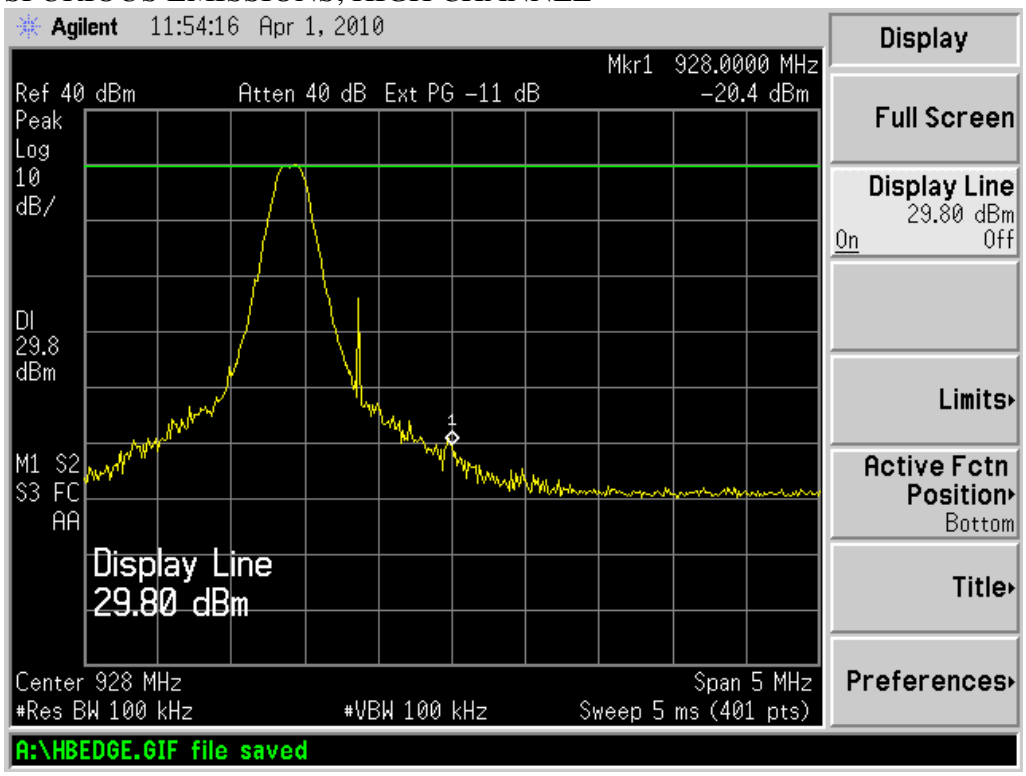

**SPURIOUS EMISSIONS, LOW CHANNEL**



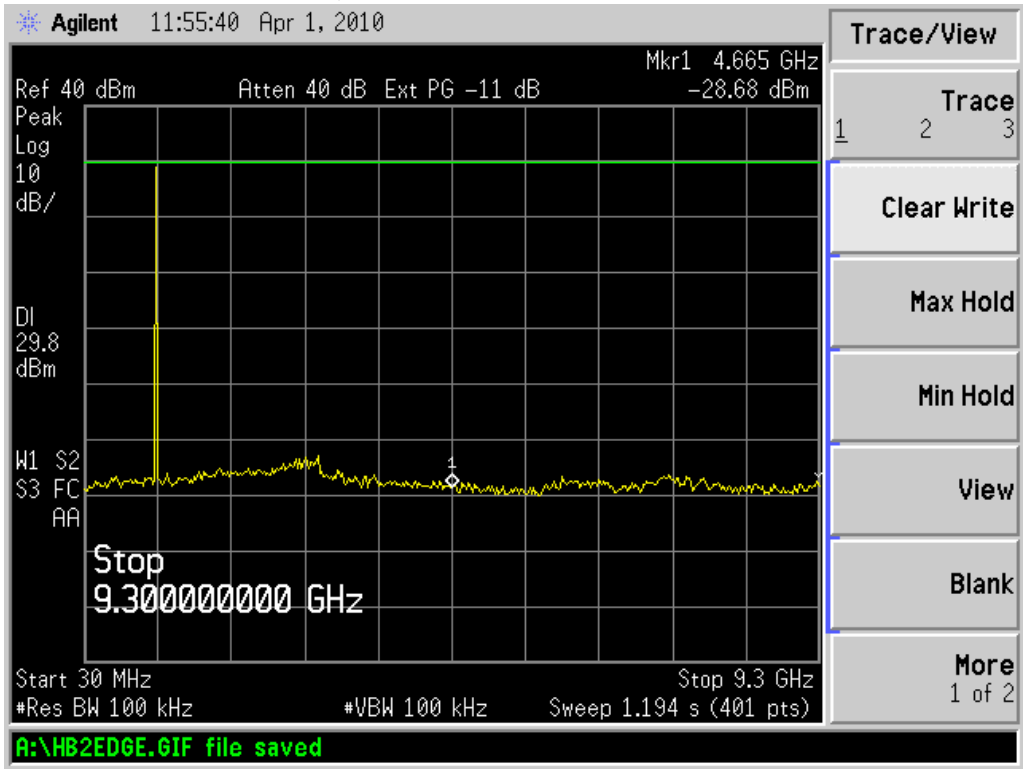
**SPURIOUS EMISSIONS, MID CHANNEL**



SPURIOUS EMISSIONS, HIGH CHANNEL




SPURIOUS EMISSIONS, HIGH CHANNEL



## 4.4 POWERLINE CONDUCTED EMISSIONS

**LIMIT**

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 $\mu$H/50 ohms line impedance stabilization network (LISN). 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.

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | 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.

**TEST PROCEDURE**

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

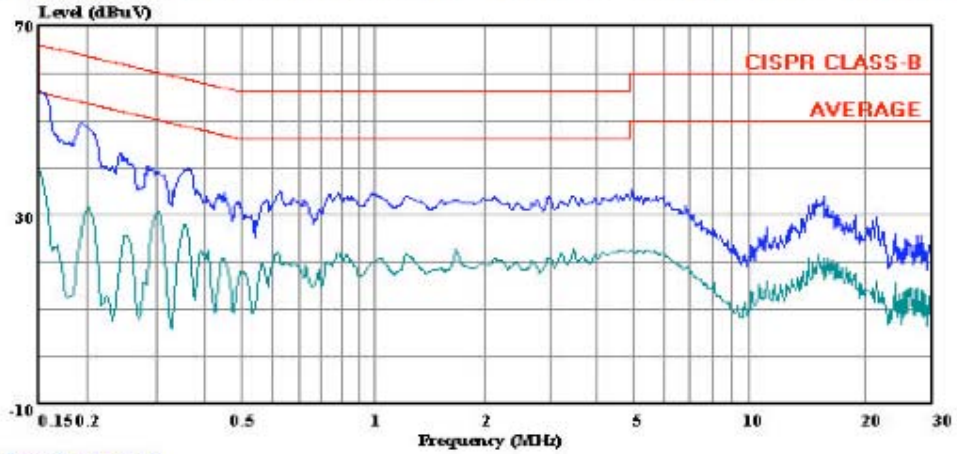
**RESULTS**

No non-compliance noted:

**900 MHz FHSS, LINE 1 RESULTS**

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 21 File#: 10U13145LC.EMI Date: 03-31-2010 Time: 15:26:29




(Line Conduction)

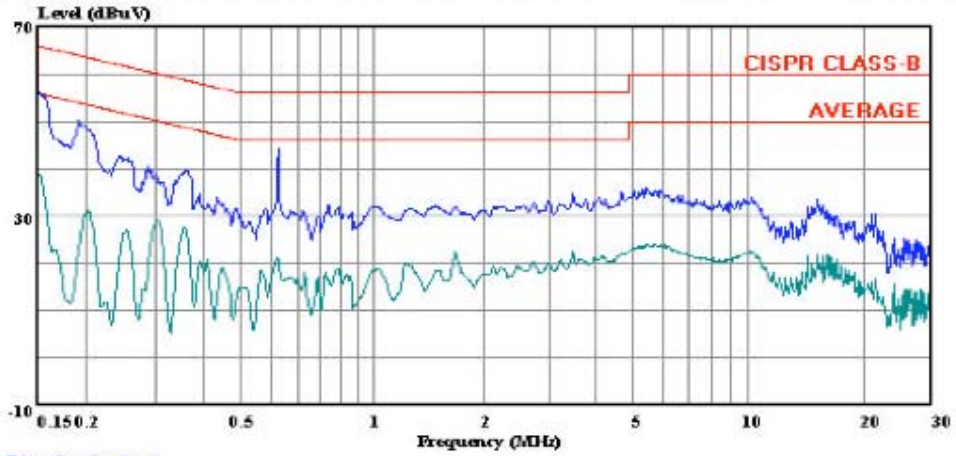
Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Doug Anderson
Project #: : 10U13145
Company: : Silver Springs Networks
EUT Description:: S-Bridge 902 to 928 FHSS
Configuration: : EUT, AC Adapter. and Support PC
Mode: : Continuous Transmit / Ch. 0
Target: : FCC Class B
Voltage: : 115VAC / 60Hz
: L1: Peak(Blue); Average (Green)

**900 MHz FHSS, LINE 2 RESULTS**

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 35 File#: 10U13145LC.EMI Date: 03-31-2010 Time: 15:46:25




(Line Conduction)

Trace: 33 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Doug Anderson
Project #: : 10U13145
Company: : Silver Springs Networks
EUT Description:: S-Bridge 902 to 928 FHSS
Configuration: : EUT, AC Adapter. and Support PC
Mode: : Continuous Transmit / Ch. 0
Target: : FCC Class B
Voltage: : 115VAC / 60Hz
: L2: Peak(Blue); Average (Green)

**Receiver Spurious Emissions**
FCC Requirement: 15.111
Industry Canada: RSS-Gen Sec. 6(b)

Test Procedure

The spectrum analyzer is connected directly to the antenna port. The radio was placed into receive only operation at the same Low, Mid, and High channels tested for transmitter emissions.

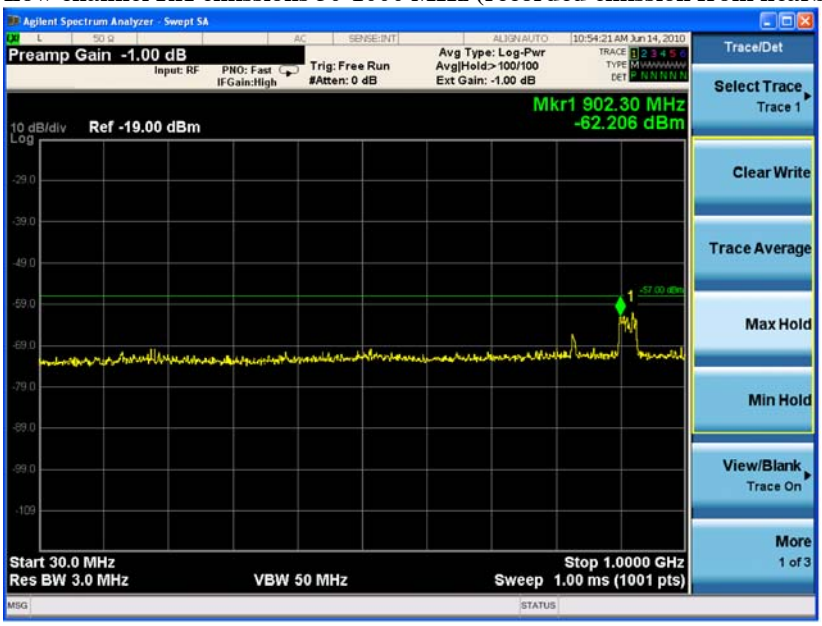
Limits

30 – 1000 MHz : -57 dBm
1000 – 7000 MHz: -54 dBm

Test Results

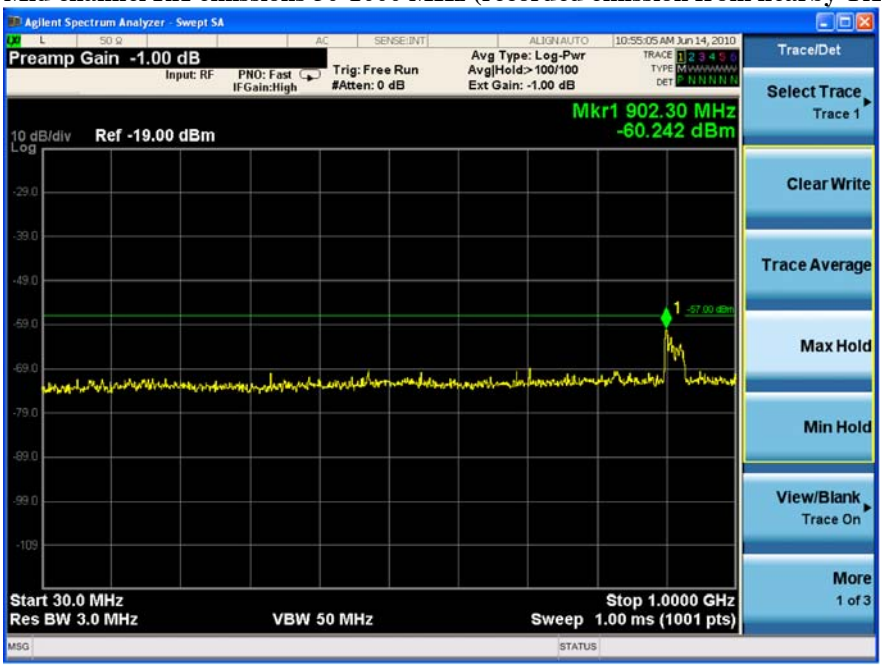
All emissions more than 20 dB below limits. Refer to the spectrum analyzer plots below.

**Low channel RX emissions 30-1000 MHz (recorded emission from nearby TX)**



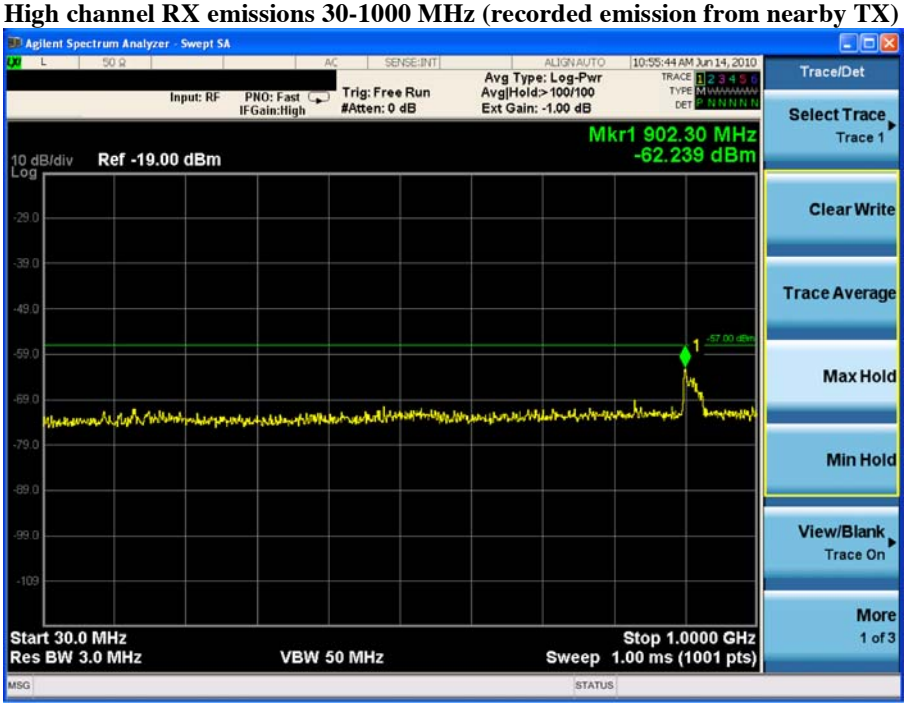

**Low channel RX emissions 1000-7000 MHz**

**Mid channel RX emissions 30-1000 MHz (recorded emission from nearby TX)**




**Mid channel RX emissions 1000-7000 MHz**

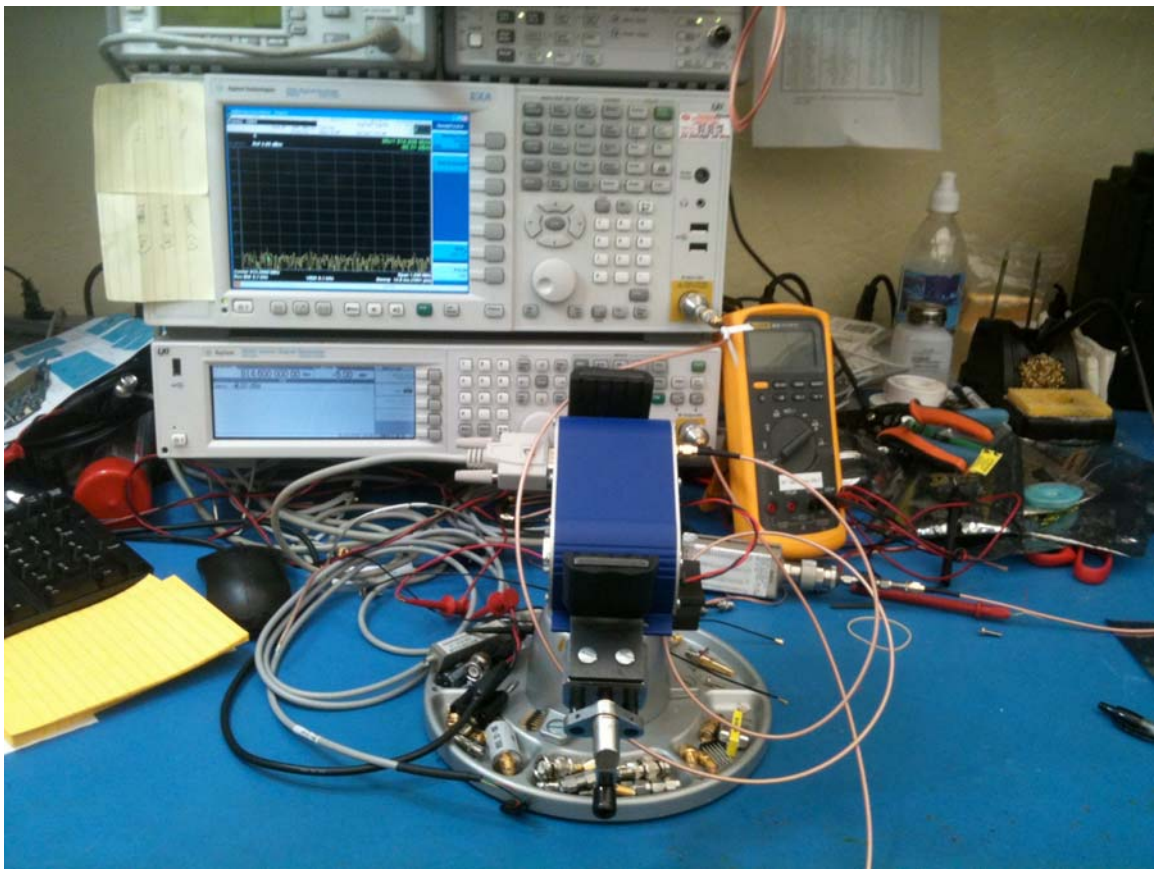
**High channel RX emissions 30-1000 MHz (recorded emission from nearby TX)**



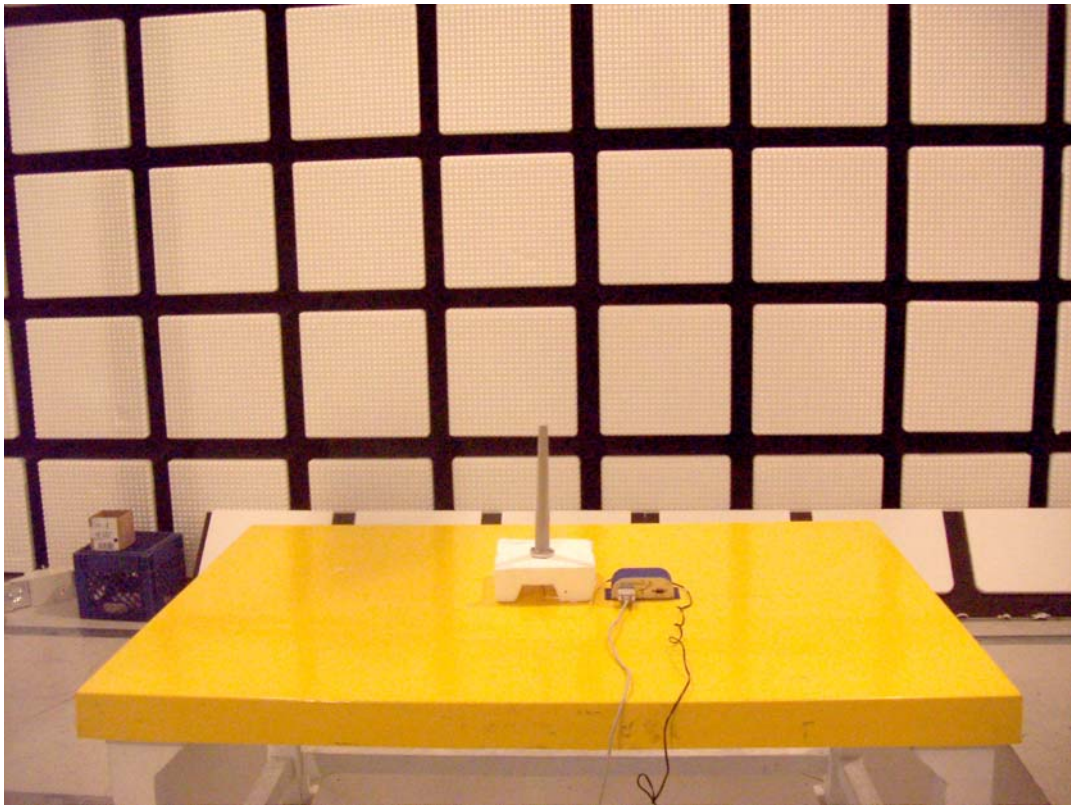

**High channel RX emissions 1000-7000 MHz**

# SETUP PHOTOS

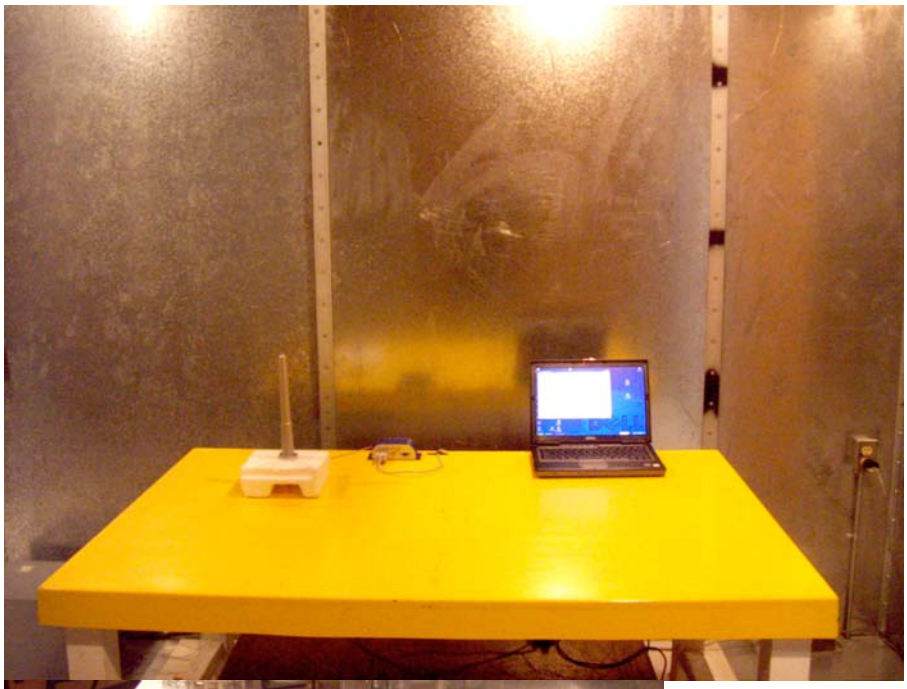
**ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP, SILVER SPRING NETWORKS**

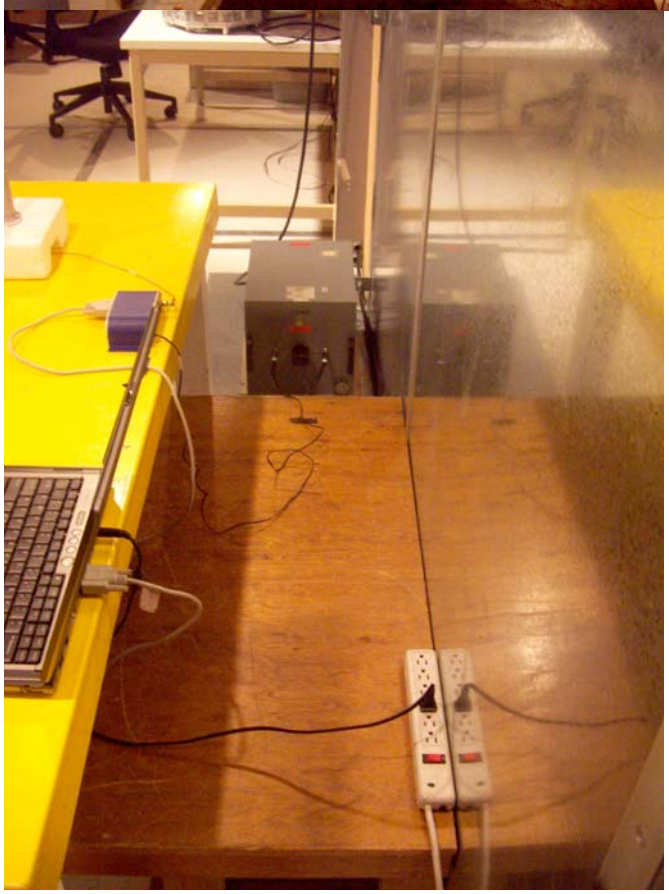


**RADIATED RF MEASUREMENT SETUP, CCS**



**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP, CCS**





# END OF REPORT

**Report Revision History**

| Revision No. | Revision Description | Pages Revised | Revised by | Date |
|---|---|---|---|---|
| - | Original Issue | | T. Cokenias | 05/03/2010 |
| A | Add RX Spurious Data<br>Update occupied bandwidth plots<br>Change model number to sBridge R1 | | T. Cokenias | 06/15/2010 |