FCC Part 15.247(b)(4) RF Exposure Calculation
for
ITC Engineering Services, Inc. Report Number 20030327-01-F15

on

Gas Pulse Interface
[Model Number/FCC ID: OWS-963]

part number

1620-05002

manufacturer

Silver Spring Networks, Inc.
13000 West Silver Spring Drive
Butler, WI 53007

tests and report by

ITC Engineering Services, Inc. (ITC)
9959 Calaveras Road, P.O. Box 543
Sunol, California 94586
Tel.: (925) 862-2944
Fax: (925) 862-9013
E-Mail: docs@itcemc.com
Web Site: www.itcemc.com

Lab Code: 200172-0

EN45001 Accredited Compliance Laboratory (RES-GmbH)
Registration number: TTI-P-G 159/98-00 (RES-GmbH)

Tested and Prepared By:
ITC Engineering Services, Inc. Tel: 925-862-2944
9959Calaveras Road, Box 543 Fax: 925-862-9013
Sunol, CA 94586-0543 Email: docs@itcemc.com

RF Safety Exposure Calculation per FCC Requirement

Test Requirement: FCC 47 CFR PART 1.1307(b)1
FCC 47 CFR PART 15.247(b)4

Measurement Guide: EIA/IS-19-B-1988
TIA/EIA/IS-137-A-1996

Site Used

- ☐ Test Site 1 - Shielded Room: 16' x 12' x 9'
- ☒ Test Site 1 - 3m Open Field Radiated Site
- ☐ Test Site 1 - 10m Open Field Radiated Site
- ☐ Test Site 2 - Environmental Lab
- ☐ EMC Lab 1 - Test Laboratory
- ☐ Semi-Anechoic Absorber Lined Shielded Room
- ☐ Other: _____

Administrative Details

Test Date:	March 04, 2004
Test Engineer:	Bandele Adepoju

Environmental Conditions

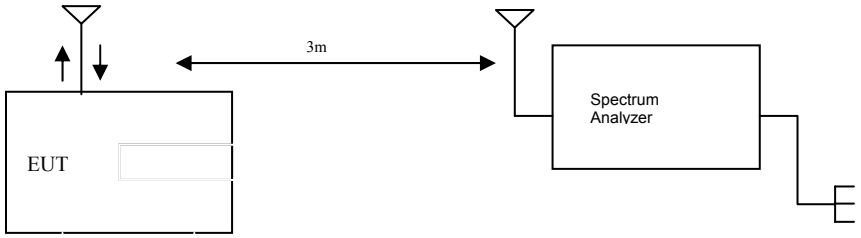
Temperature	63°C
Humidity	58%

Test Equipment

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due
L.p. Ant (200 -1000MHz)	EMCO	3146	1596/1001	01-28-2005
Spectrum Analyzer	Hewlett-Packard	8591A	3149A02541	Cal before Test
Signal Generator	Hewlett-Packard	8656B	2623A04271	12-09-2004

Test Procedure

The Gas Pulse Meter (or the EUT) was set up at 3 meters from the search antenna in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was a



Spectrum Analyzer with bandwidth parameters as stipulated in ANSI C63.4-1992. The EUT was rotated 360 degrees azimuth and also rotated in its x-y-z axis positions to determine the precise amplitude of the emissions. The equipment under test was placed on a wooden turntable 3 meters away from the calibrated receiving antenna, which was in turn connected to the spectrum analyzer. For each transmitter frequency, the received signal was maximized by rotating the turntable and adjusting the height of the receiving antenna. The Maximum Peak Output Power was calculated from the formula below.

$$P = (Exd)^2 / (30xG)$$

Note: **"E"** is the measured maximum field strength in V/m.
"G" is the numeric gain of the transmitting antenna over an isotropic radiator.
"d" is the distance from which the field strength was measured in meters.
"P" is the power in watts

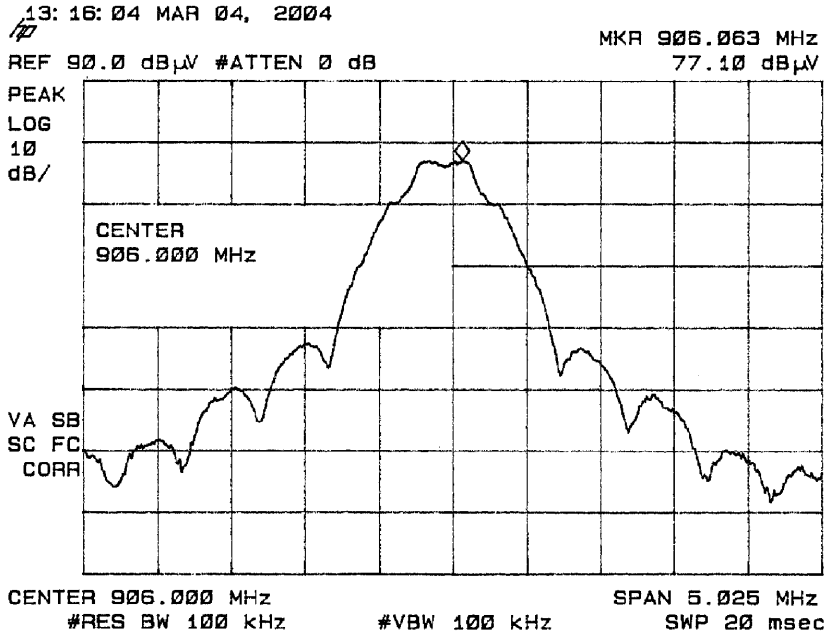
The process was repeated with the EUT antenna in horizontal polarity and receive antenna also in horizontal polarity.

The EUT was tested for Maximum Peak Output Power at high, middle, and low frequencies with the Maximum Peak Output Power obtained at channels (Numbers. 2, 8 and 14) with frequencies being 906MHz, 915MHz and 924MHz respectively. The test data is presented in this report under the section.

Maximum Peak Output Power ERP Calculation

Test Name: Maximum Peak Output Power calculation

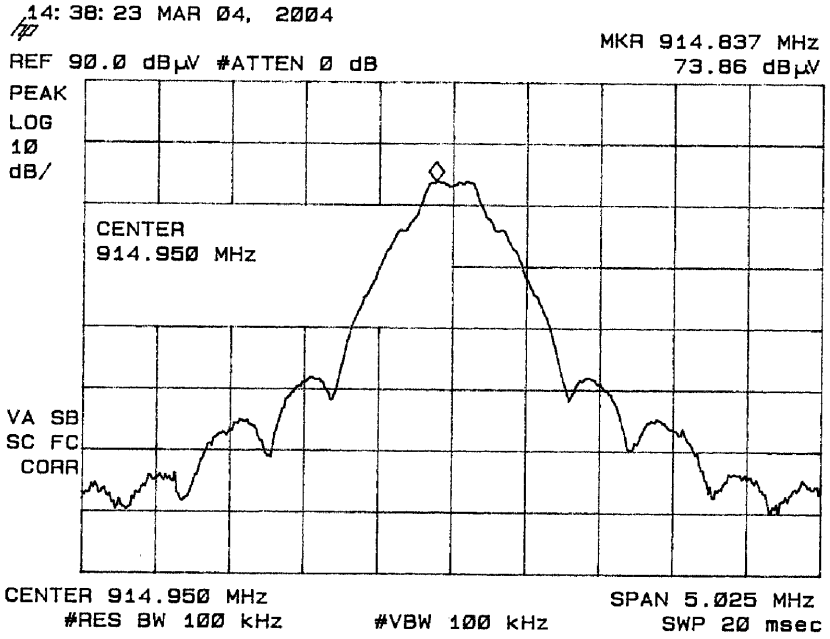
a. 906.00 MHz (Low End)



INDICATED		CORRECTION		CORR	TURNTABLE	ANT		
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	DET
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	MODE
906.06	77.10	23.0	10.97	111.07	45	1.4	HL	P

E = 111.07dBuV = 0.357V/m
P = $(0.357 \times 3)^2$ / 30 x 4.27 = 1.15/128 = 8.98mW

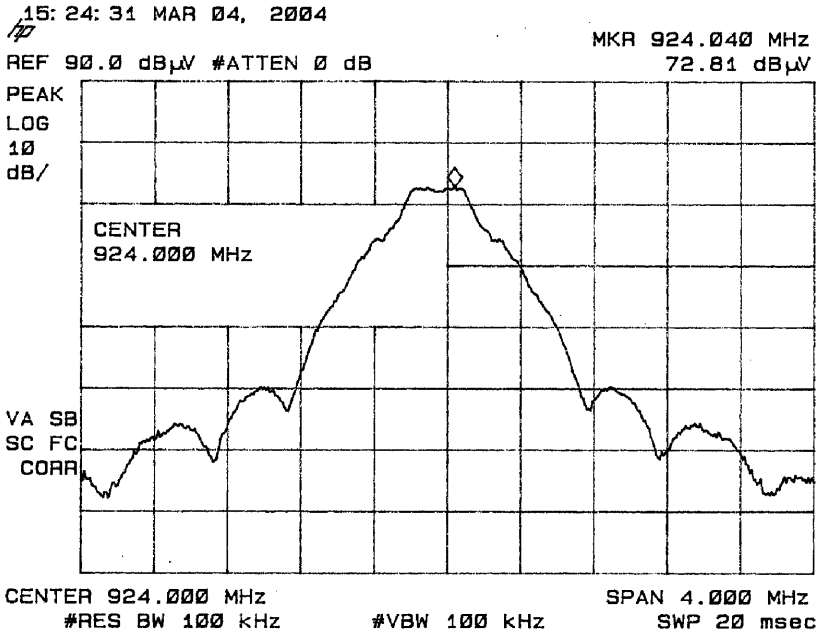
b. 915.06 MHz (Mid-Range)



INDICATED		CORRECTION		CORR	TURNTABLE	ANT		
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	DET
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	MODE
914.83	73.86	23.1	11.17	108.13	180	1.0	HL	P

E = 108.13dBuV = 0.257V/m
P = $(0.257 \times 3)^2 / 30 \times 4.31 = 0.594/129.3 = 4.60$mW

c. 927.803 MHz (High-End)



INDICATED		CORRECTION		CORR	TURNTABLE	ANT		
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	DET
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	MODE
924.04	72.81	22.8	9.29	105.00	45	1.0	HL	P

c. 927.803 MHz (High-End)

E = 105.00dBuV = 0.178V/m
P = $(0.178 \times 3)^2 / 30 \times 4.71 = 0.285/141.3 = 2.00$mW

Maximum RF Safety Exposure Calculation

The Maximum Permissible Exposure (MPE) power density per ANSI C95.1 table 2 for uncontrolled cellular phone environment is f/1500 [mW/cm^2]. The numeric value of the gain for the antenna is 4.0. Therefore, by using the formula of the power density

$S = ERP \times G / 4\pi R^2$, MPE=

$8.98\text{mW} \times 4.27/(4\pi r^2) = 906.06\text{ MHz}/1500[\text{mW/cm}^2]$

$$\frac{8.98\text{mW}*(4.27)}{4\pi r^2} = \frac{906.06\text{ MHz}}{1500\text{ mW/cm}^2}$$

$$r^2 = \frac{8.89\text{mW}*(4.27)*(1500\text{ cm}^2/\text{mW})}{906.06*(4\pi)}$$

$r = (5)^{1/2} = 2.24$cm

Therefore, the calculated MPE distance (r) is 8.72cm (2.24 + 6.48 margin uncertainty). The installation instructions shall indicate that at least 20cm separation shall be provided between the antennas and the people.

Measurement Uncertainty

150kHz to 30MHz:		
Combined standard uncertainty uc(y)	± 1.68 dB	Normal
Expanded uncertainty U	± 3.36 dB	Normal (k = 2)
30MHz to 1GHz:		
Combined standard uncertainty uc(y)	± 3.24 dB	Normal
Expanded uncertainty U	± 6.48 dB	Normal (k = 2)
1GHz to 18GHz:		
Combined standard uncertainty uc(y)	± 2.48 dB	Normal
Expanded uncertainty U	± 4.96 dB	Normal (k = 2)
Above 18GHz:		
Radiated emission up to 26 GHz	± 3 dB	
Radiated emission up to 40 GHz	± 3 dB	
Radiated emission up to 75 GHz	± 3 dB	