



FCC Test Report
for
47CFR15, Subpart B for Unintentional Radiators, per Section 101
Equipment authorization of unintentional radiators,
and
47CFR15, Subpart C for Intentional Radiators, per Section 247
Operation within the bands 902 to 928 MHz

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

part number
1620-05002

itc report number
20030327-01-F15

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

judgement
Complies

tests and report by
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Lab Code: 200172-0

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

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PART 1 General

Test Information

Product Name Model(s)	Gas Pulse Interface OWS-963	
Test Laboratory	ITC Engineering Services (ITC) 9959 Calaveras Road, PO Box 543 Sunol, CA 94586-0543 Tel: (925) 862-2944 Email: docs@itcemc.com Web Site: http://www.itcemc.com	Fax: (925) 862-9013
Test Number	20030327-01	
Test Date(s)	July 02 to August 18, 2003	
Issue Date	September 25, 2003	
Project Engineer(s) & EMC Mgr	Lan Vu & Bandele Adepoju	Bandele Adepoju

The electromagnetic interference tests, which this report describes, were performed by an independent electromagnetic compatibility consultant, ITC Engineering Services, Inc. (ITC), in accordance with the emissions requirements specified in the FCC rules, 47CFR Part 15, Subparts B and C. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications specified in this report for compliance must be implemented in all production units for compliance to be maintained.

Tests Performed:

Emissions Requirements:

- OPEN FIELD RADIATED EMISSIONS in accordance with the FCC 47 CFR 15.109

RF Requirements:

- MAXIMUM PEAK OUTPUT OF FUNDAMENTAL in accordance with the FCC 47 CFR 15.247(b) (1)
- OPERATING BAND in accordance with FCC 47 CFR 15.247(a)
- BAND-EDGE in accordance with the FCC 47 CFR 15.247(c)
- 6dB BANDWIDTH in accordance with FCC 47 CFR 15.247(a)(2)
- SPECTRAL DENSITY in accordance with FCC 47 CFR 15.247(d)
- HARMONIC/SPURIOUS EMISSIONS in accordance with the FCC 47 CFR 15.247(c)
- RESTRICTED BAND EMISSIONS in accordance with the FCC 47 CFR 15.205(c)

PART 1 General (Cont)

Declaration/Disclaimer

ITC Engineering Services, Inc. (ITC) reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. ITC Engineering Services, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from ITC Engineering Services, Inc. issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full with our written approval. The applicant/manufacturer shall not use this report to claim product endorsement by NVLAP or any US Government agency.

ITC Engineering Services, Inc. (ITC) is:

Accepted by the Federal Communications Commission (FCC) for FCC Methods, CISPR Methods and AUSTEL Technical Standards (Ref: NVLAP Lab Code 200172-0)

Approved by the Industry Canada for Telecom Testing

Certified by Rockford Engineering Services GmbH for EMC Testing according to the European EMC Directive 89/336/EEC per EN45001

Certified by Reg. TP for EMC Testing according to the European EMC Directive 89/336/EEC per EN45001 for RES GmbH (DAR-Registration number: TTI-P-G 159/98-00)

Certified by the Voluntary Control Council for Interference by Information Technology Equipment (VCCI) for EMC testing, in accordance with the Regulations for Voluntary Control Measures, Article 8, Registration Numbers - Site 1: C-1582 and R-1497.

PART 1 General (Cont)

Test Methodology

The electromagnetic interference tests, which this report describes, were performed by an independent electromagnetic compatibility consultant, ITC Engineering Services, Inc., in accordance with the FCC test procedure ANSI C63.4-1992.

Test Facility

The open area test site, the conducted measurement facility, and the test equipment used to collect the emissions data is located in Sunol, California, and is fully described in a site attenuation report. The approved site attenuation description is on file at the Federal Communications Commission.

Table 1 Radio Device Measurement Information

Product Type	Gas Pulse Interface	
Model	OWS-963	
Applicant / Manufacturer Address	Silver Spring Networks, Inc. 13000 West Silver Spring Drive Butler, WI 53007	
Contact	Mr Juan Luglio Tel: (262) 364-5317	juan.luglio@silverspringnetworks.com Fax: (262) 783-0200
Test Results	☒ Complies	☐ Not Compliant
Total Number of Pages including Appendices	40 Pages	
Test Report File No.	20030327-01-F15	

Table 2 Measurement Uncertainty

RF frequency	$\pm 1 \times 10^{-7}$ HP8565E
RF power, conducted	± 1.5 dB
Adjacent channel power	± 3 dB
Conducted emission of transmitter, valid up to 1 GHz	± 1.5 dB
Conducted emission of transmitter, valid up to 18 GHz	± 1.5 dB
Conducted emission of receivers	± 1.5 dB
Radiated emission of transmitter, valid up to 1 GHz	± 1.5 dB
Radiated emission of transmitter, valid up to 18 GHz	± 1.5 dB
Radiated emission of transmitter, valid up to 26 GHz	± 3 dB
Radiated emission of transmitter, valid up to 40 GHz	± 3 dB
Radiated emission of transmitter, valid up to 75 GHz	± 3 dB

Accuracy of Test Data

The test results contained in this report accurately represent the emissions generated by the sample equipment under test. ITC Engineering Services, Inc. (ITC) as an independent testing laboratory declares that the equipment as tested complies with the requirements of:

1. FCC standard 47CFR15.247.

for Intentional Radiators Operation within the bands 2400 to 2483.5 MHz.


Bandele Adepoju
EMC MANAGER

Prepared By: ITC Engineering Services, Inc. 9959 Calaveras Road, PO Box 543 Sunol, California 94586-0543 Tel: [925] 862-2944 Fax: [925] 862-9013 Email: docs@itcemc.com Web: www.itcemc.com	Gas Pulse Interface P/N: 1620-05002 Report No.: 20030327-01-F15
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PART 2 RECEIVER MEASUREMENTS

OPEN FIELD RADIATED EMISSIONS

Test Specification: 47 CFR PART 15, Sub-Part B

The Gas Pulse Meter (or the EUT) was set up at 3 or 10 meters in accordance with the suggested configuration given in FCC Measurement Procedure ANSI C63.4-1992. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The Gas Pulse Meter was set up on a wooden non-conductive tabletop, 80 cm above the ground reference plane, in an open field. The transmit function was de-activated for the tests. For measurements below 1GHz, the Gas Pulse Meter (or the EUT) was set up at a 10 meters distance from the search antenna with the EUT running in a continuous mode. The EUT was rotated 360 degrees azimuth and the search antenna height varied 1 to 4m in order to maximize the emissions. Significant peaks from the EUT were then recorded to determine margin to the limits. For measurements above 1GHz, the EUT running in continuous mode was set up at a 3 meter distance from the search antenna and was rotated 360 degrees azimuth and also rotated in its x-y-z axis positions to determine the precise amplitude of the emissions

Table 3 Test Equipment – Radiated Emissions Tests

Equipment Description	Manufacturer	Model Name	Serial Number
Spectrum Analyzer	Hewlett-Packard	8566B	2618A02909
Spectrum Analyzer Display	Hewlett-Packard	85662A	2848A17028
Quasi Peak Adapter	Hewlett-Packard	85650	2521A00871
Preselector	Hewlett-Packard	85685A	2620A00265
Spectrum Analyzer	Hewlett-Packard	8565E	2618A02909
Pre-amplifier	Hewlett-Packard 8449B		3008A00101
Pre-amplifier	Hewlett-Packard 83051A		3332A002B3
Antenna Cable	Hewlett-Packard (OPTK45)	RG8/u	-
Antenna Cable (high freq)	Specialty Cable Corp.	M17/60-RG142	-

Equipment calibration data is listed in Appendix A at the end of this report.

Table 4 Support Equipment – Radiated Emissions Tests

Description	Manufacturer	Model No.	Serial No.

OPEN FIELD RADIATED EMISSIONS (cont)

Test Range – Radiated Emissions Tests

The frequency search range investigated was from 30 MHz to 5 GHz.

Spectrum Analyzer Configuration (during swept frequency scans) – Radiated Emissions

IF Bandwidth.....	120 kHz
Measurements below 1000 MHz (unless stated otherwise)	
Analyzer Mode (for Peak Measurements)	Peak/Log
Resolution Bandwidth	100 kHz
Video Bandwidth.....	100 kHz
Analyzer Mode (for Quasi-Peak Measurements)	
Quasi-Peak/Linear Resolution Bandwidth.....	1000 kHz
Video Bandwidth.....	1000 kHz
Measurements above 1000 MHz (unless stated otherwise)	
Quasi-Peak Adapter Mode	Disabled
Analyzer Mode (for Peak Measurements)	Peak
Resolution Bandwidth	1000 kHz
Video Bandwidth.....	1000 kHz
Analyzer Mode (for Average Measurements)	Video Filter
Resolution Bandwidth	1000 kHz
Video Bandwidth.....	10 Hz

Table 5 Data Table Legend and Field Strength Calculation – Radiated Emissions Tests

Detector mode: Peak (P) or Quasi-Peak (QP) or Average (A)

	Polarization	Antenna	Freq Range (MHz)
VB	Vertical	EMCO 3104/sn 3549 Biconical	30 – 200
HB	Horizontal	EMCO 3104/sn 3549 Biconical	30 – 200
VL	Vertical	EMCO 3146/sn. 2075 Log Periodic	200 – 1000
HL	Horizontal	EMCO 3146/sn. 2075 Log Periodic	200 – 1000
VH1	Vertical	EMC 3115/sn. 2362 Horn	Below 18000
HH1	Horizontal	EMC 3115/sn. 2362 Horn	Below 18000
VH2	Vertical	EMC 3116/sn. 2655 Horn	Below 26500
HH2	Horizontal	EMC 3116/sn. 2655 Horn	Below 26500
VH4	Vertical	S&D DBD-520 Horn	Below 75000
HH4	Horizontal	S&D DBD-520 Horn	Below 75000

The margin in the Table 6 is calculated as follows:

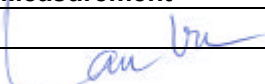
Margin = Corrected Amplitude – Limit, where Corrected Amplitude = Spectrum Analyzer Amplitude + Cable Loss + Antenna Factor – Pre-Amp Gain.

OPEN FIELD RADIATED EMISSIONS Results

Site Used – Radiated Emissions Measurement

- ☐ 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 – Radiated Emissions Measurement

Test Date:	July 02, 2003
Test Engineer:	Lan Vu 

Environmental Conditions – Radiated Emissions Measurement

Temperature	22.8°C
Humidity	35%

Table 6 Test Data for Radiated Emissions Measurement up to 1 GHz @ 10 meters

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarization, and EUT orientations.

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B		
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	DET
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB	MODE
44.32	11.3	11.4	0.7	23.3	90	1.0	VB	-	-	30.0	-6.7	P
52.63	9.5	8.0	1.2	18.7	90	1.0	HB	-	-	30.0	-11.3	P
83.31	13.9	6.9	2.0	22.8	0	1.0	VB	-	-	30.0	-7.2	P
109.41	5.7	12.9	3.3	21.9	0	1.0	VB	-	-	33.0	-11.1	P
124.24	6.7	11.7	3.6	22.0	180	1.0	VB	-	-	33.0	-11.0	P
137.27	8.6	11.1	4.0	23.7	180	1.0	VB	-	-	33.0	-9.3	P
137.76	12.7	9.6	4.0	26.3	180	2.0	HB	-	-	33.0	-6.7	P
205.28	7.9	11.6	3.6	23.1	0	1.0	VL	-	-	33.0	-9.9	P
224.03	8.0	10.9	3.8	22.7	90	1.0	VL	-	-	36.0	-13.3	P
340.52	2.1	14.4	5.8	22.3	90	1.0	HL	-	-	36.0	-13.7	P
350.41	5.2	14.8	6.1	26.2	90	1.0	VL	-	-	36.0	-9.8	P
425.91	2.8	16.3	4.9	24.0	90	1.0	VL	-	-	36.0	-12.0	P
425.91	2.8	16.1	4.9	23.7	90	1.0	HL	-	-	36.0	-12.3	P

No emission of significant level (within 6dB) was observed from 30 MHz to 1GHz.

OPEN FIELD RADIATED EMISSIONS Results (cont)

Table 7 Test Data for Radiated Emissions Measurement above 1 GHz @ 3 meters

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarization, and EUT orientations.

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B		
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	DET
GHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB	MODE
1.06	40.0	24.7	-36.0	28.7	90	1.0	VH	-	-	54.0	-25.3	P
1.05	39.0	24.7	-36.0	27.7	90	1.0	HH	-	-	54.0	-26.3	P
1.18	46.0	24.7	-36.0	34.7	180	1.0	VH	-	-	54.0	-19.3	P
1.32	48.0	25.2	-36.0	37.2	0	1.0	VH	-	-	54.0	-16.8	P
2.02	39.0	29.3	-24.0	44.3	90	1.0	VH	-	-	54.0	-9.7	P
3.00	27.0	31.5	-13.0	45.5	90	1.0	VH	-	-	54.0	-8.5	P
3.00	27.0	31.5	-13.0	45.5	90	1.0	HH	-	-	54.0	-8.5	P
4.00	27.0	34.5	-19.0	42.5	90	1.0	VH	-	-	54.0	-11.5	P
5.00	27.0	35.1	-18.0	44.1	90	1.0	VH	-	-	54.0	-9.9	P

No emission of significant level (within 6dB) was observed from 1000 MHz to 5000 MHz.

P = Peak

QP = Quasi Peak

Test Data Summary

The margin is calculated as follows:

Margin = Corrected Amplitude - Limit; where Corrected Amplitude = Amplitude + Cable Loss + Antenna Factor.

Conclusion

The Gas Pulse Meter meets the requirements of FCC Part 15, Class B.

PART 3 RF MEASUREMENTS

Test Setup Configurations

Voltage Tested	Battery	3.6VDC
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List of equipment used during RF Tests

Table 8: Support Equipment – RF Measurements

Description	Manufacturer	Model No.	Serial No.

Table 9: Test Equipment – RF Measurements

Test Equipment	Manufacturer	Model Number	Serial Number
Preamplifier	Hewlett-Packard	8449B	3008A00101
Preamplifier	Hewlett-Packard	83051A	3332A002B3
RF Power Amplifier	Amplifier Research	5S1G4	18220
Signal Generator	Hewlett Packard	8673C	2918A00649
Quasi Peak Adapter	Hewlett-Packard	85650A	2521A00737
Spectrum Analyzer	Hewlett-Packard	8566B	2618A02909
Spectrum Analyzer Display	Hewlett-Packard		
Signal Generator	Hewlett-Packard	8656B	2623A04271
Spectrum Analyzer	Hewlett-Packard	8591A	3149A2541
Signal Generator	Anritsu	Mg3690A	

Equipment calibration data is listed in Appendix A at the end of this report.

Table 10: Data Table Legend and Field Strength Calculation

Detector mode: Peak (P) or Quasi-Peak (QP) or Average (A)

	Polarization	Antenna	Freq Range (MHz)
VB	Vertical	EMCO 3104/sn 3549 Biconical	30 – 200
HB	Horizontal	EMCO 3104/sn 3549 Biconical	30 – 200
VL	Vertical	EMCO 3146/sn. 2075 Log Periodic	200 – 1000
HL	Horizontal	EMCO 3146/sn. 2075 Log Periodic	200 – 1000
VH1	Vertical	EMC 3115/sn. 2362 Horn	Below 18000
HH1	Horizontal	EMC 3115/sn. 2362 Horn	Below 18000
VH2	Vertical	EMC 3116/sn. 2655 Horn	Below 26500
HH2	Horizontal	EMC 3116/sn. 2655 Horn	Below 26500
VH4	Vertical	S&D DBD-520 Horn	Below 75000
HH4	Horizontal	S&D DBD-520 Horn	Below 75000

MAXIMUM IN-BAND PEAK / NUMBER OF CHANNELS

Maximum Peak Measurement

The EUT was set up on a wooden non-conductive tabletop, attached at the antenna connector to the measuring device. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The EUT was configured to run in continuous mode during the tests. The measurement data below represents the maximum worst-case result from the measurement performed in accordance to the requirements of this section.

Site Used – Maximum In-Band Peak Measurement

- ☐ 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 – Maximum In-Band Peak Measurement

Test Date(s):	August 18, 2003
Test Engineer(s):	Bande Adepouju

Environmental Conditions – Maximum In-Band Peak Measurement

Temperature	24.0°C
Humidity	51.6%

Test Data – Maximum In-Band Peak Measurement

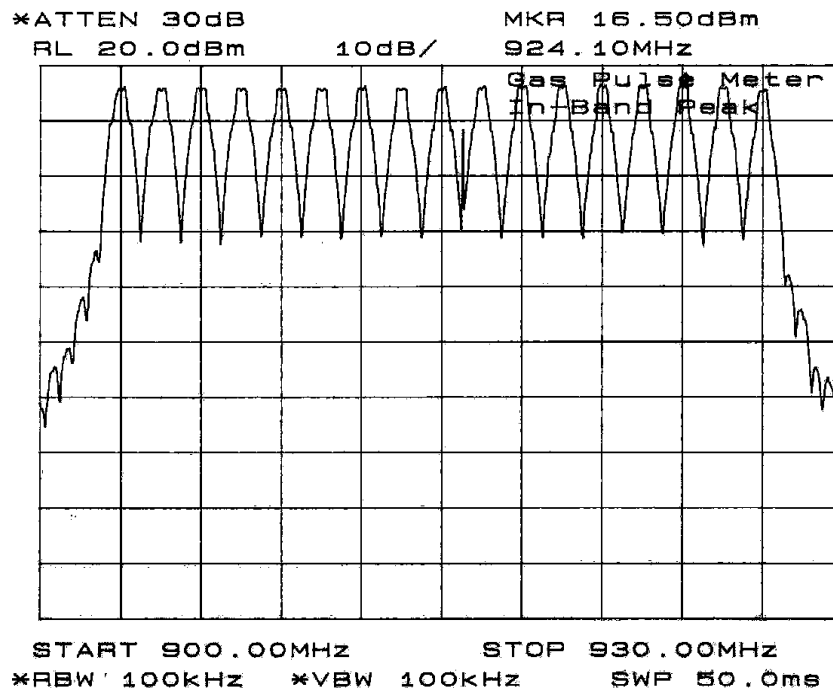


Figure 1: Plot of In-Band Peak Measurement

Test-Data Summary – Peak Measurement:

Peak Frequency = 924 MHz
Peak Level: = 16.50dBm
Number of Channels = 17

CHANNEL SEPARATION MEASUREMENT

Maximum Peak Measurement

The EUT was set up on a wooden non-conductive tabletop, attached at the antenna connector to the measuring device. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The EUT was configured to run in continuous mode during the tests. The measurement data below represents the maximum worst-case result from the measurement performed in accordance to the requirements of this section.

Site Used – Maximum In-Band Peak Measurement

- ☐ 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 – Maximum In-Band Peak Measurement

Test Date(s):	August 18, 2003
Test Engineer(s):	Bande Adepouju

Environmental Conditions – Maximum In-Band Peak Measurement

Temperature	24.1°C
Humidity	51.6%

Test Data – Maximum In-Band Peak Measurement

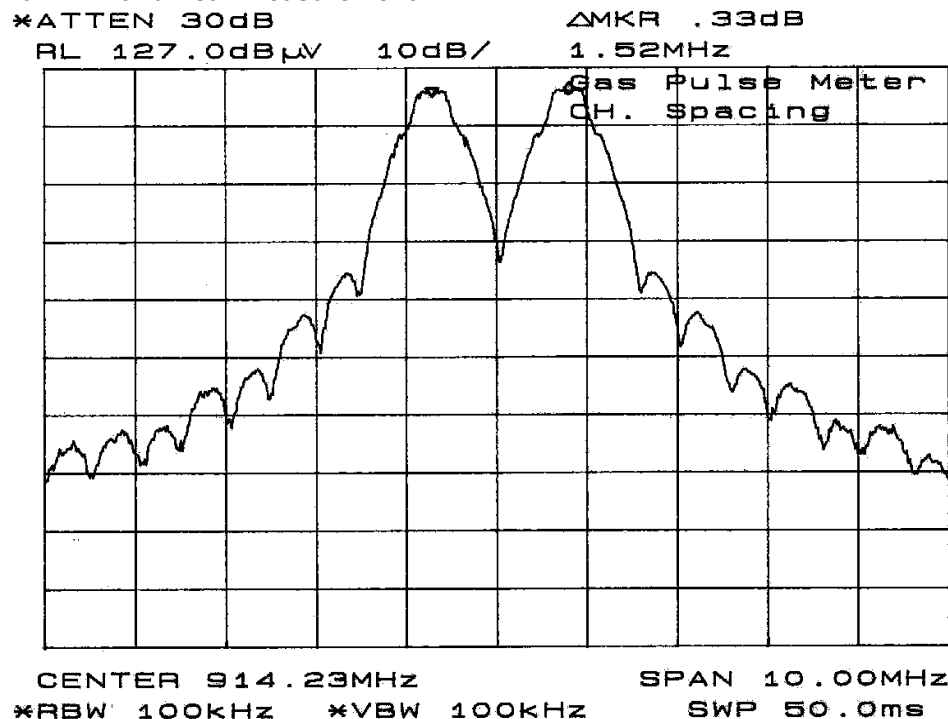


Figure 2: Plot of Maximum Power Measurement at 906MHz

Test-Data Summary – Peak Measurement:

Peak Frequencies = 913.5 MHz (CH 7) & 915 MHz (CH 8)
 Channel Separation (measured) = 1.52 MHz

MAXIMUM POWER OUTPUT per 47 CFR 15.247(B) (1)

Maximum Power Measurement

The EUT was set up on a wooden non-conductive tabletop, attached at the antenna connector to the measuring device. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The EUT was configured to run in continuous mode during the tests. The measurement data below represents the maximum worst-case result from the measurement performed in accordance to the requirements of this section.

Site Used – Maximum Power Measurement

- ☐ 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 – Maximum Power Measurement

Test Date(s):	August 18, 2003
Test Engineer(s):	Bande Adepouju

Environmental Conditions – Maximum Power Measurement

Temperature	24.1°C
Humidity	51.6%

Test Data – Maximum Power Measurement (CH 2 - 906MHz)

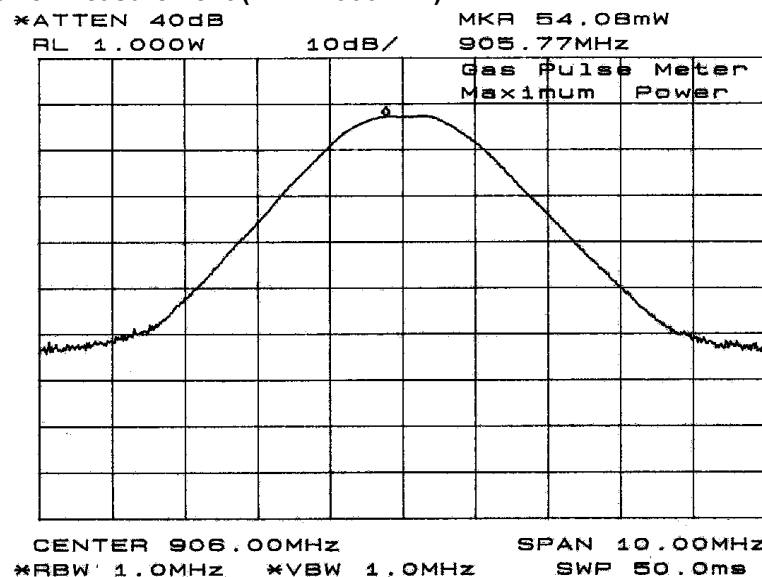


Figure 3: Plot of Maximum Power Measurement at 906MHz

Test-Data Summary – Peak Measurement (CH 2 – 906MHz):

Center Frequency = 906 MHz
 Peak Level: = 55.06mW
 Limit per 15.247(b)(1) = 1 W

MAXIMUM POWER OUTPUT (cont)

Test Data – Maximum Power Measurement (CH 8 - 915MHz)

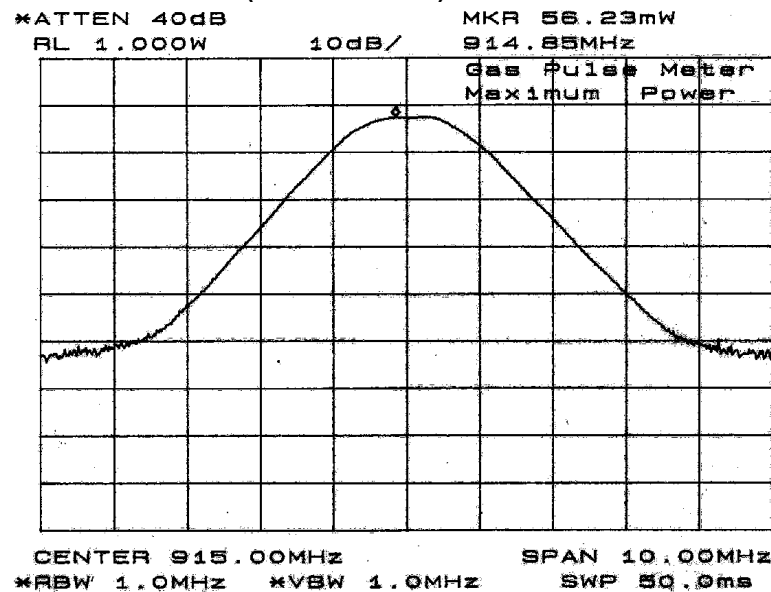


Figure 4: Plot of Maximum Power Measurement at 915MHz

Test-Data Summary – Maximum Power Measurement (CH 8 – 915MHz):

Center Frequency = 915 MHz
Peak Level: = 57.23mW
Limit per 15.247(b)(1) = 1 W

Test Data – Maximum Power Measurement (CH 14 - 924MHz)

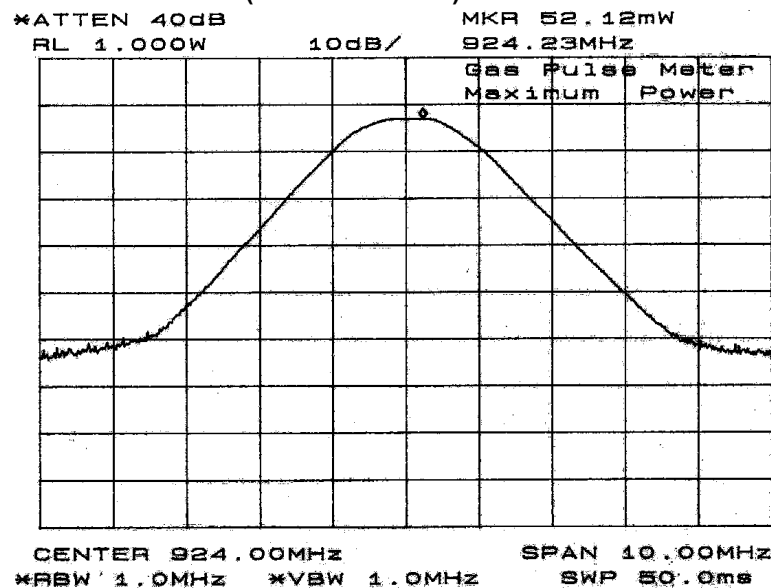


Figure 5: Plot of Maximum Power Measurement at 924MHz

Test-Data Summary – Maximum Power Measurement (CH 14 – 924MHz):

Center Frequency = 924 MHz
Peak Level: = 53.12mW
Limit per 15.247(b)(1) = 1 W

SPECTRAL DENSITY per 47 CFR 15.247(c)**Spectral Density Measurement**

The EUT was set up on a wooden non-conductive tabletop, attached at the antenna connector to the measuring device. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The EUT was configured to run in continuous mode during the tests. The measurement data below represents the maximum worst-case result from the measurement performed in accordance to the requirements of this section.

Site Used – Spectral Density Measurement

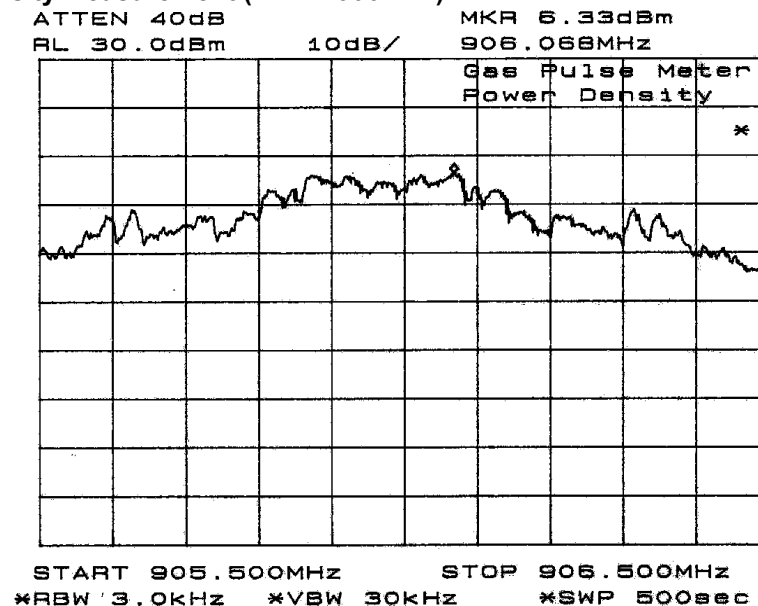
- ☐ Test Site 1 - Shielded Room: 16' x 12' x 9'
☐ Test Site 1 - 3m Open Field Radiated Site
☐ Test Site 1 - 10m Open Field Radiated Site
☐ Test Site 2 - Environmental Lab
☒ EMC Lab 1 - Test Laboratory
☐ Semi-Anechoic Absorber Lined Shielded Room
☐ Other: _____

Administrative Details – Spectral Density Measurement

Test Date(s):	August 18, 2003
Test Engineer(s):	Bande Adepouju <i>Bande</i>

Environmental Conditions – Spectral Density Measurement

Temperature	24.1°C
Humidity	51.4%

Test Data – Spectral Density Measurement (CH 2 - 906MHz)**Figure 6: Plot of Spectral Density Measurement at 906MHz****Test-Data Summary – Spectral Density Measurement (CH 2 – 906MHz):**

Center Frequency = 906 MHz
 Peak Level: = 7.33dBm
 Limit per 15.247(c) = 8dBm

SPECTRAL DENSITY (cont)

Test Data – Spectral Density Measurement (CH 8 - 915MHz)

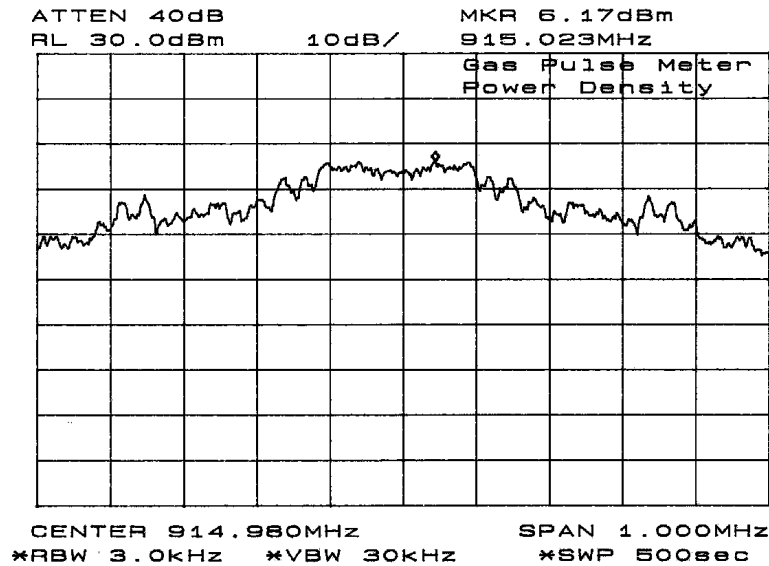


Figure 7: Plot of Spectral Density Measurement at 915MHz

Test-Data Summary – Spectral Density Measurement (CH 8 – 915MHz):

Center Frequency = 915 MHz
Peak Level: = 7.17dBm
Limit per 15.247(c) = 8dBm

Test Data – Spectral Density Measurement (CH 14 - 924MHz)

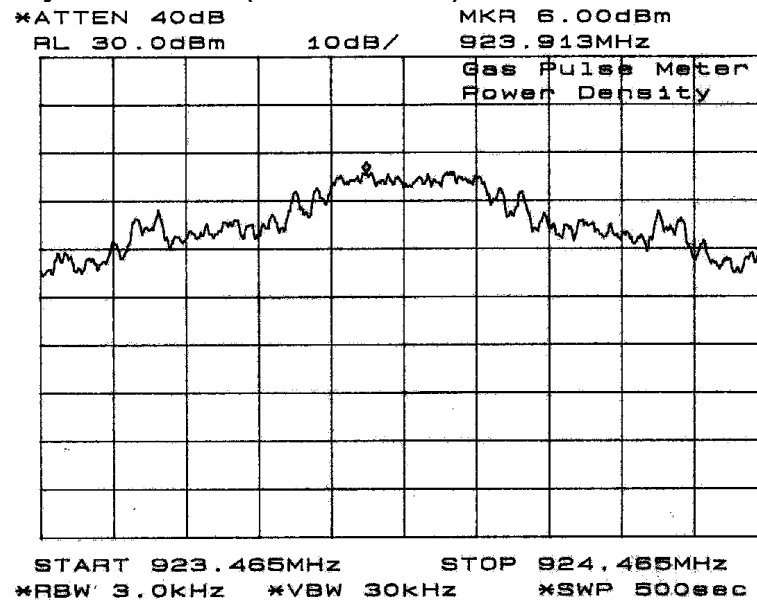


Figure 8: Plot of Spectral Density Measurement at 924MHz

Test-Data Summary – Spectral Density Measurement (CH 14 – 924MHz):

Center Frequency = 924 MHz
Peak Level: = 7dBm
Limit per 15.247(c) = 8dBm

6dB BANDWIDTH per 47 CFR 15.247(a) (2)

6dB Bandwidth Measurement

The EUT was set up on a wooden non-conductive tabletop, attached at the antenna connector to the measuring device. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The EUT was configured to run in continuous mode during the tests. The measurement data below represents the maximum worst-case result from the measurement performed in accordance to the requirements of this section.

Site Used – 6dB Bandwidth Measurement

- ☐ 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 – 6dB Bandwidth Measurement

Test Date(s):	August 18, 2003
Test Engineer(s):	Bande Adepouju

Environmental Conditions – 6dB Bandwidth Measurement

Temperature	24.1°C
Humidity	51.4%

Test Data – 6dB Bandwidth Measurement (CH 2 - 906MHz)

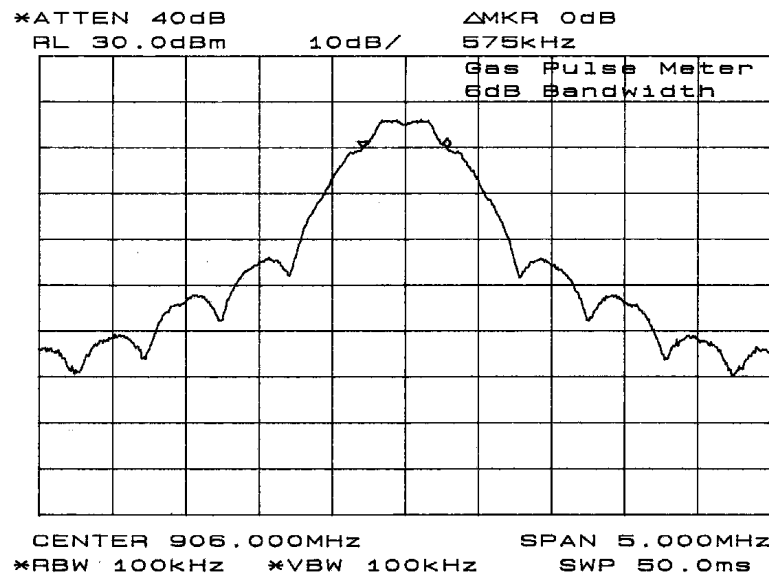


Figure 9: Plot of 6dB Bandwidth Measurement at 906MHz

Test-Data Summary – 6dB Bandwidth Measurement (CH 2 – 906MHz):

Center Frequency = 906 MHz
6dB Bandwidth = 575KHz
Limit per 15.247(a)(2) = 500KHz minimum

6dB BANDWIDTH (cont)

Test Data – 6dB Bandwidth Measurement (CH 8 - 915MHz)

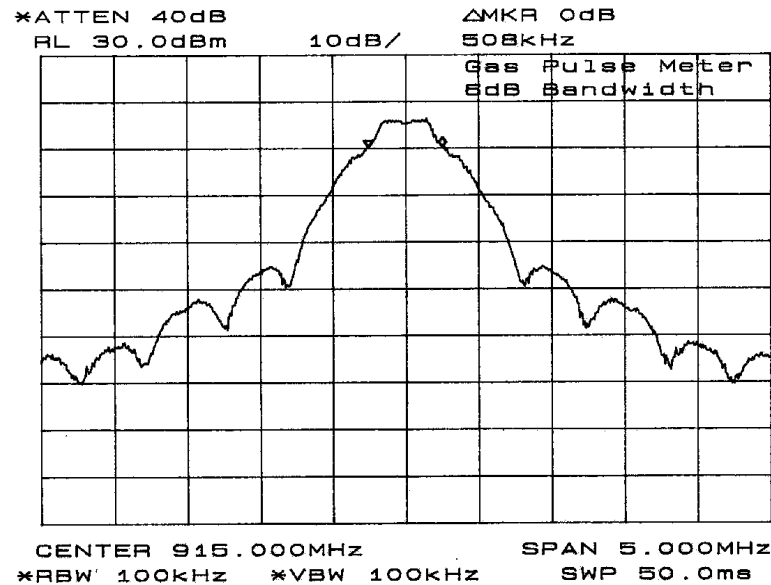


Figure 10: Plot of 6db Bandwidth Measurement at 915MHz

Test-Data Summary – 6dB Bandwidth Measurement (CH 8 – 915MHz):

Center Frequency = 915 MHz
6dB Bandwidth = 508KHz
Limit per 15.247(a)(2) = 500KHz minimum

Test Data – 6dB Bandwidth Measurement (CH 14 - 924MHz)

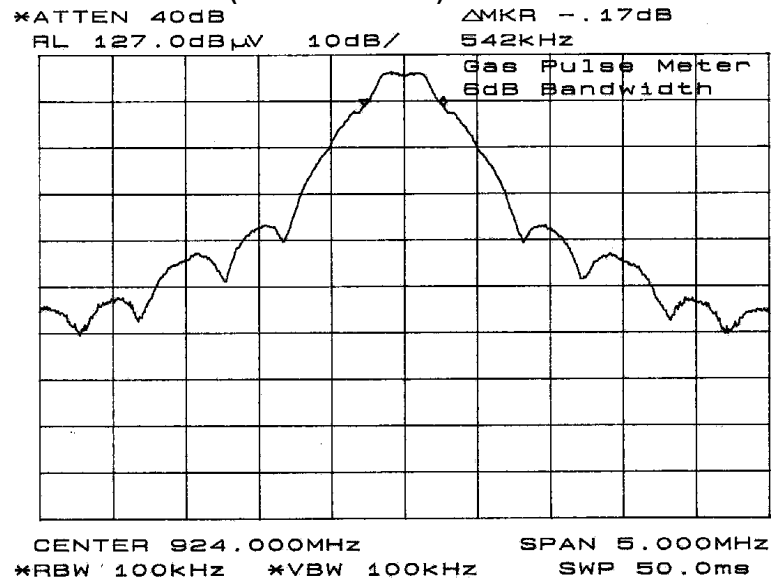


Figure 11: Plot of 6dB Bandwidth Measurement at 924MHz

Test-Data Summary – 6dB Bandwidth Measurement (CH 14 – 924MHz):

Center Frequency = 924 MHz
6dB Bandwidth = 542KHz
Limit per 15.247(a)(2) = 500KHz minimum

6dB BAND-EDGE per 47 CFR 15.247(c)

6dB Band-Edge Measurement

The EUT was set up on a wooden non-conductive tabletop, attached at the antenna connector to the measuring device. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The EUT was configured to run in continuous mode during the tests. The measurement data below represents the maximum worst-case result from the measurement performed in accordance to the requirements of this section.

Site Used –Band-Edge Measurement

- ☐ 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 –Band-Edge Measurement

Test Date(s):	August 18, 2003
Test Engineer(s):	Bande Adepouju

Environmental Conditions –BandEdge Measurement

Temperature	24.1°C
Humidity	51.4%

Test Data –Band-Edge Measurement (CH 0 - 902MHz)

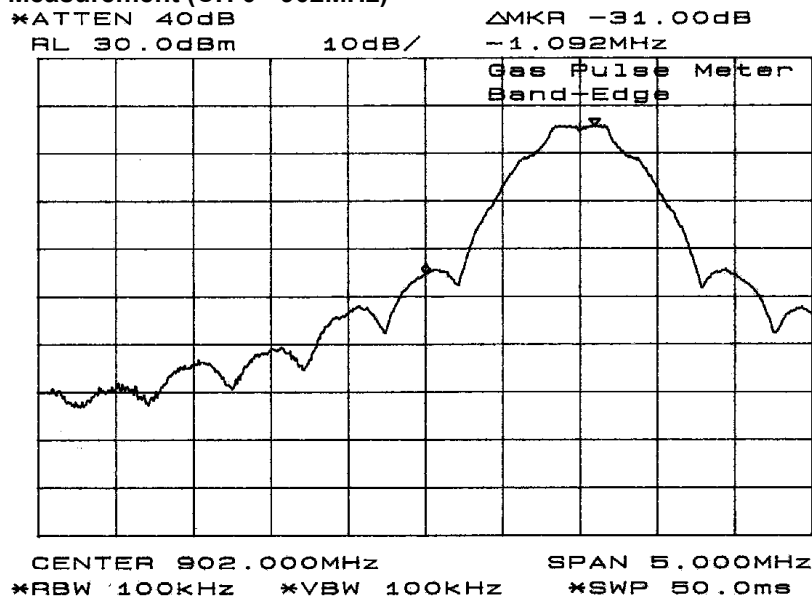


Figure 12: Plot of Band-Edge Measurement at 902MHz

Test-Data Summary –Band-Edge Measurement (CH 0 – 902MHz):

Center Frequency = 902 MHz
Band-Edge Level = -31dB
Limit per 15.247(c) = 20dB below in-band peak (or -20dB)

BAND-EDGE MEASUREMENT (cont)

Test Data –Band-Edge Measurement (CH 16 - 928MHz)

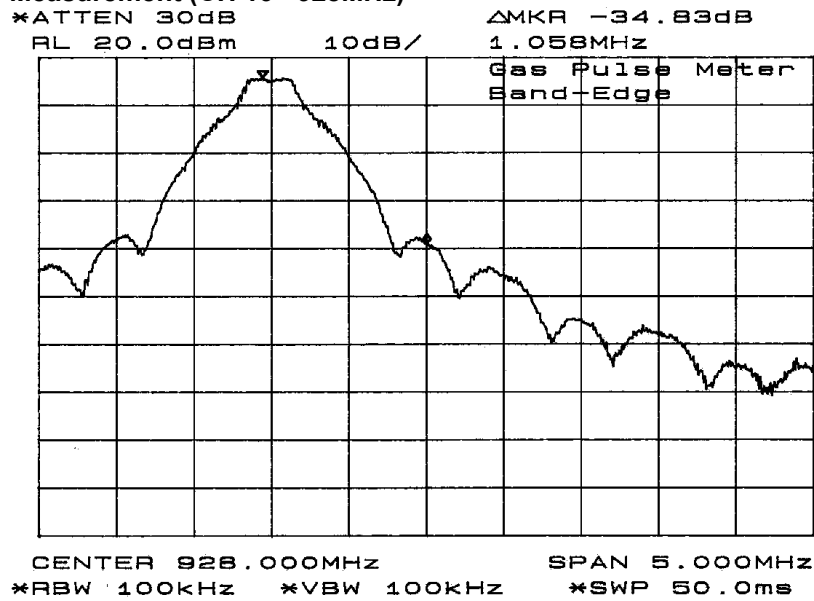


Figure 13: Plot of Band-Edge Measurement at 928MHz

Test-Data Summary –Band-Edge Measurement (CH 16 – 928MHz):

Center Frequency = 928MHz
Band-Edge Level = -34.83dB
Limit per 15.247(c) = 20dB below in-band peak (or -20dB)

100kHz Bandwidth Out-of-Band Emissions per 47 CFR 15.247(a) (2)

100kHz Bandwidth Out-of-Band Emissions Measurement

The EUT was set up on a wooden non-conductive tabletop, attached at the antenna connector to the measuring device. The measurement instrumentation used was a receiver with bandwidth parameters as stipulated in ANSI C63.4-1992. The EUT was configured to run in continuous mode during the tests. The measurement data below represents the maximum worst-case result from the measurement performed in accordance to the requirements of this section.

Site Used – 6dB Bandwidth Measurement

- ☐ 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 – 100 kHz Bandwidth Out-of-Band Measurement

Test Date(s):	August 18, 2003
Test Engineer(s):	Bande Adepouju

Environmental Conditions – 100 kHz Bandwidth Out-of-Band Measurement

Temperature	23.9°C
Humidity	51.6%

Test Data – 100kHz Bandwidth Out-of-Band Measurement (In-Band Peak)

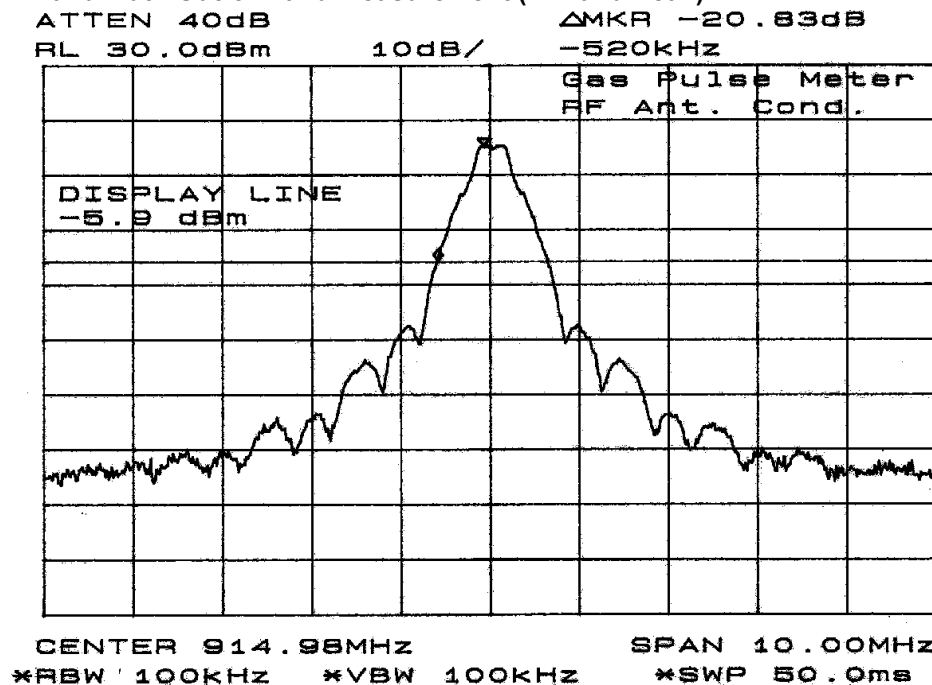


Figure 14: Plot of 100 kHz Bandwidth Out-of-Band Measurement (In-Band Peak)

Test-Data Summary – 100 kHz Bandwidth Out-of-Band Measurement (In-Band Peak):

Center Frequency = 906 MHz
Center Frequency Peak = 15.07dB
20dB Limit (measured) per 15.247(c) = -5.07dBm

OUT-of-BAND EMISSIONS (cont)

Test Data – 100 kHz Bandwidth Out-of-Band Measurement (CH 2 – 906MHz) 30MHz to 906MHz

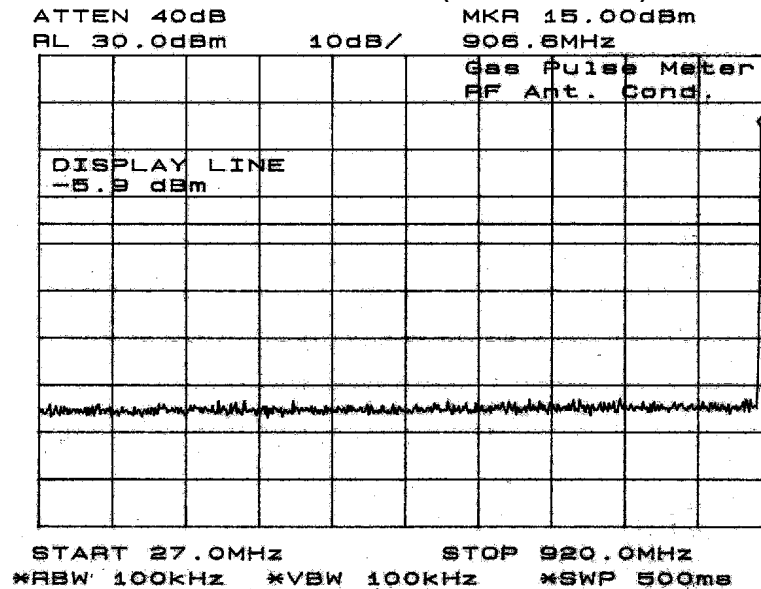


Figure 15: Plot of 100 kHz Bandwidth Out-of-Band Measurement at 906MHz (30 to 905.8MHz)

Test-Data Summary – 6dB Bandwidth Measurement (CH 2 – 906MHz) 30 to 905.8 MHz:

Peak Frequency (Fundamental) = 906 MHz
Maximum Peak (30 to 905.8 MHz) = Noise Floor
20dB Limit (measured) per 15.247(c) = -5.07dBm

Test Data – 100 kHz Bandwidth Out-of-Band Measurement (CH 2 - 906MHz) 906.2 MHz to 5000 MHz

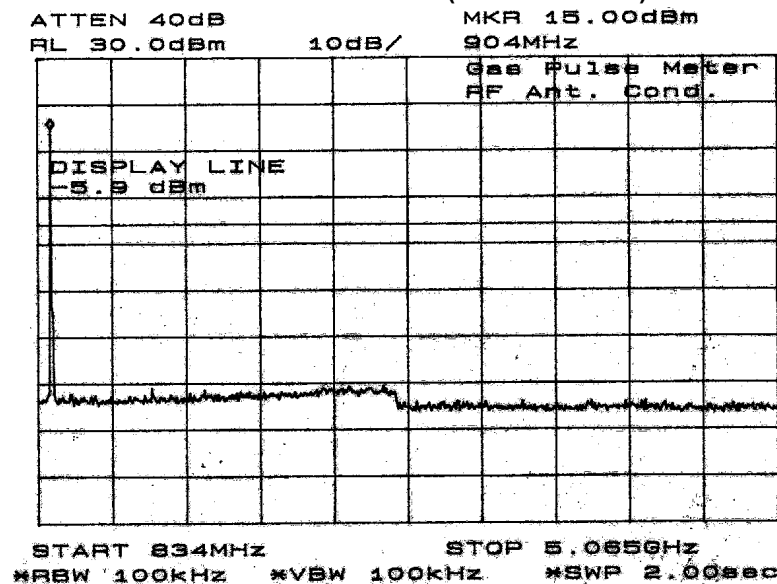


Figure 16: Plot of 100 kHz Bandwidth Out-of-Band Measurement at 906MHz (906.2 to 5000 MHz)

Test-Data Summary – 100 kHz Bandwidth Out-of-Band Measurement (CH 2 – 906MHz) 906.2 to 5000 MHz:

Peak Frequency (Fundamental) = 906 MHz
Maximum Peak (906.2 to 5000 MHz) = Noise Floor
20dB Limit (measured) per 15.247(c) = -5.07dBm

OUT-of-BAND EMISSIONS (cont)

Test Data – 100 kHz Bandwidth Out-of-Band Measurement (CH 2 – 906MHz) 5000MHz to 10000MHz

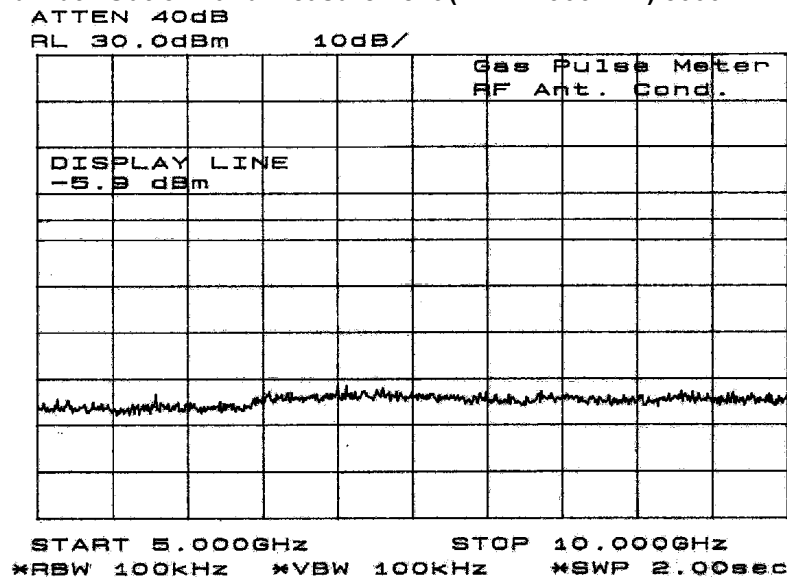


Figure 17: Plot of 100 kHz Bandwidth Out-of-Band Measurement at 906MHz (5000 to 10000 MHz)

Test-Data Summary – 100 kHz Bandwidth Out-of-Band Measurement (CH 2 – 906MHz) 5000 to 10000 MHz:

Peak Frequency (Fundamental) = 906 MHz
Maximum Peak (5000 to 10000 MHz) = Noise Floor
20dB Limit (measured) per 15.247(c) = -5.07dBm

Test Data – 100 kHz Bandwidth Out-of-Band Measurement (CH 8 - 915MHz) 30 MHz to 914.8 MHz

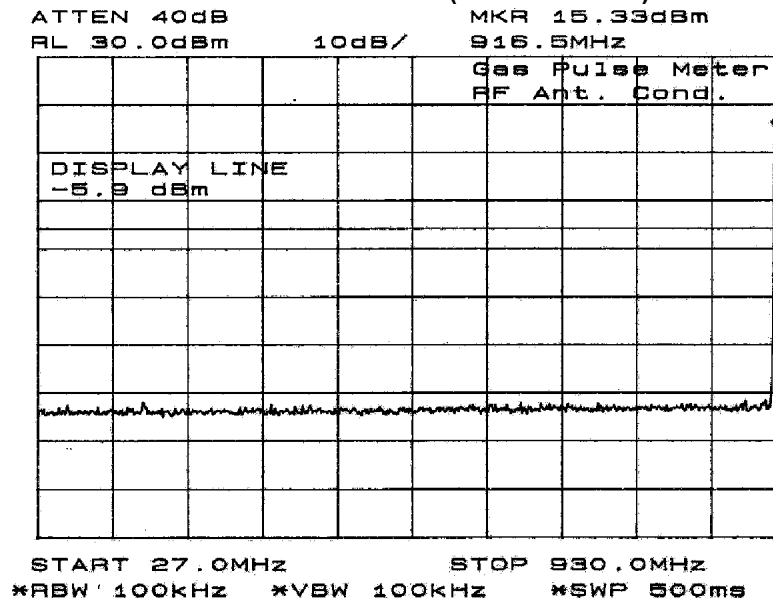


Figure 18: Plot of 100 kHz Bandwidth Out-of-Band Measurement at 915MHz (30 to 914.8 MHz)

Test-Data Summary – 100 kHz Bandwidth Out-of-Band Measurement (CH 14 – 915MHz) 30 MHz to 914.8 MHz:

Peak Frequency (Fundamental) = 915 MHz
Maximum Peak (30 to 914.8 MHz) = Noise Floor
20dB Limit (measured) per 15.247(c) = -5.07dBm

OUT-of-BAND EMISSIONS (cont)

Test Data – 100 kHz Bandwidth Out-of-Band Measurement (CH 8 – 915MHz) 915.2 MHz to 5000 MHz

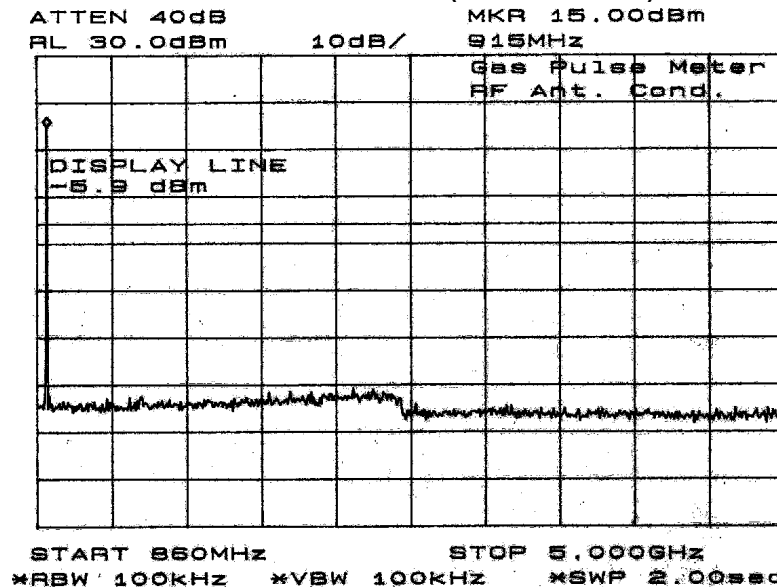


Figure 19: Plot of 100 kHz Bandwidth Out-of-Band Measurement at 915MHz (915.2 to 5000 MHz)

Test-Data Summary – 100 kHz Bandwidth Out-of-Band Measurement (CH 2 – 915MHz) 915.2 to 5000 MHz:

Peak Frequency (Fundamental) = 915 MHz
Maximum Peak (915.2 to 5000 MHz) = Noise Floor
20dB Limit (measured) per 15.247(c) = -5.07dBm

Test Data – 100 kHz Bandwidth Out-of-Band Measurement (CH 8 – 915MHz) 5000 MHz to 10000 MHz

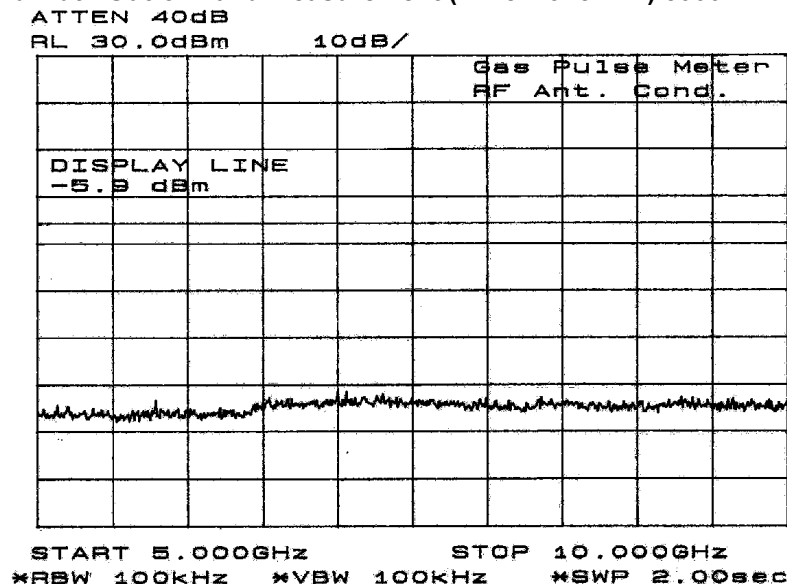


Figure 20: Plot of 100 kHz Bandwidth Out-of-Band Measurement at 915MHz (5000 to 10000 MHz)

Test-Data Summary – 100 kHz Bandwidth Out-of-Band Measurement (CH 14 – 915MHz) 5000 to 10000 MHz:

Peak Frequency (Fundamental) = 915 MHz
Maximum Peak (5000 to 10000 MHz) = Noise Floor
20dB Limit (measured) per 15.247(c) = -5.07dBm

OUT-of-BAND EMISSIONS (cont)

Test Data – 100 kHz Bandwidth Out-of-Band Measurement (CH 14 – 924MHz) 30 MHz to 923.8 MHz

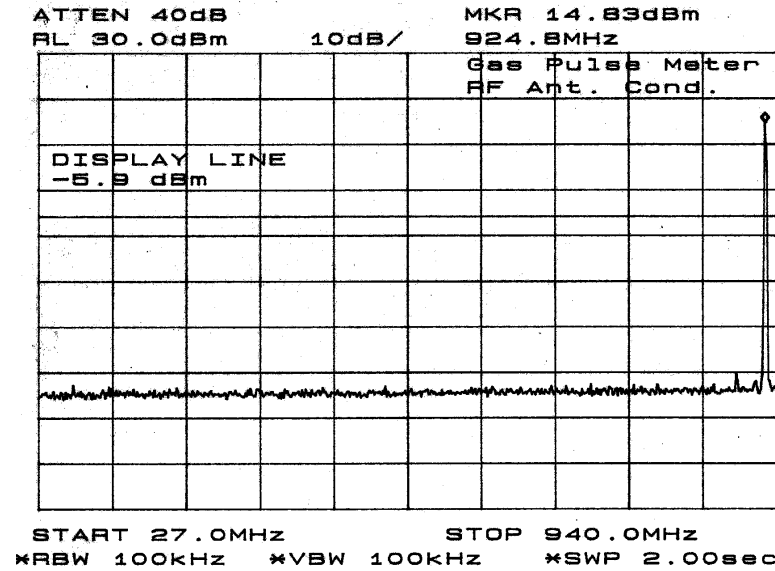


Figure 21: Plot of 100 kHz Bandwidth Out-of-Band Measurement at 924MHz (30 MHz to 923.8 MHz)

Test-Data Summary – 100 kHz Bandwidth Out-of-Band Measurement (CH 14 – 924MHz) 30 to 923.8 MHz:

Peak Frequency (Fundamental) = 924 MHz
Maximum Peak 30 to 923.8 MHz) = Noise Floor
20dB Limit (measured) per 15.247(c) = -5.07dBm

Test Data – 100 kHz Bandwidth Out-of-Band Measurement (CH 14 – 924MHz) 924.2 MHz to 5000 MHz

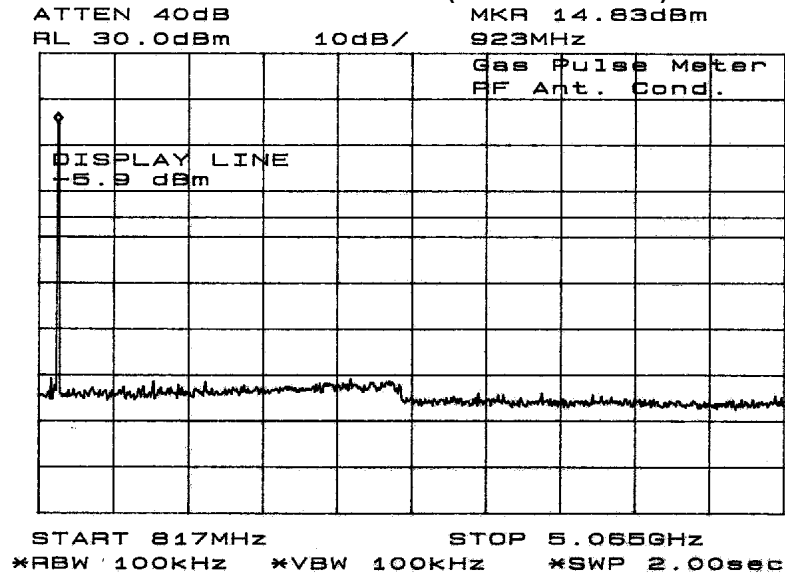


Figure 22: Plot of 100 kHz Bandwidth Out-of-Band Measurement at 924MHz (924.2 to 5000 MHz)

Test-Data Summary – 100 kHz Bandwidth Out-of-Band Measurement (CH 14 – 924MHz) 924.2 to 5000 MHz:

Peak Frequency (Fundamental) = 924 MHz
Maximum Peak (924.2 to 5000 MHz) = Noise Floor
20dB Limit (measured) per 15.247(c) = -5.07dBm

OUT-of-BAND EMISSIONS (cont)

Test Data – 100 kHz Bandwidth Out-of-Band Measurement (CH 14 – 924MHz) 5000 MHz to 10000 MHz

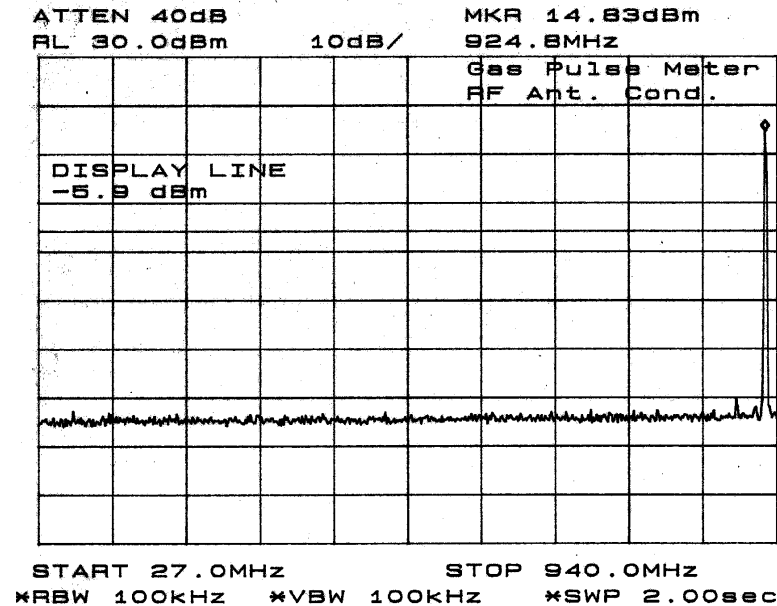


Figure 23: Plot of 100 kHz Bandwidth Out-of-Band Measurement at 924MHz (5000 to 10000 MHz)

Test-Data Summary – 100 kHz Bandwidth Out-of-Band Measurement (CH 14 – 924MHz) 5000 to 10000 MHz:

Peak Frequency (Fundamental) = 924 MHz
 Maximum Peak (5000 to 10000 MHz) = Noise Floor
 20dB Limit (measured) per 15.247(c) = -5.07dBm

RF MEASUREMENTS (cont)

RF Radiated Measurements

Test Specification: 47 CFR PART 15, Section 247 (c)

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 receiver 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

Table 11 Test Equipment – Radiated Emissions Tests

Equipment Description	Manufacturer	Model Name	Serial Number
Spectrum Analyzer	Hewlett-Packard	8566B	2618A02909
Spectrum Analyzer Display	Hewlett-Packard	85662A	2848A17028
Quasi Peak Adapter	Hewlett-Packard	85650	2521A00871
Preselector	Hewlett-Packard	85685A	2620A00265
Spectrum Analyzer	Hewlett-Packard	8565E	2618A02909
Pre-amplifier	Hewlett-Packard 8449B		3008A00101
Pre-amplifier	Hewlett-Packard 83051A		3332A002B3
Antenna Cable	Hewlett-Packard (OPTK45)	RG8/u	-
Antenna Cable (high freq)	Specialty Cable Corp.	M17/60-RG142	-

Equipment calibration data is listed in Appendix A at the end of this report.

Table 12 Support Equipment – Radiated Emissions Tests

Description	Manufacturer	Model No.	Serial No.

Spectrum Analyzer Configuration (during swept frequency scans) – Spurious and Restricted Emissions

IF Bandwidth..... 120 kHz

Measurements below 1000 MHz (unless stated otherwise)

Analyzer Mode (for Peak Measurements) Peak/Log

Resolution Bandwidth..... 100 kHz

Video Bandwidth..... 100 kHz

Analyzer Mode (for Quasi-Peak Measurements)

Quasi-Peak/Linear Resolution Bandwidth..... 1000 kHz

Video Bandwidth..... 1000 kHz

Measurements above 1000 MHz (unless stated otherwise)

Quasi-Peak Adapter Mode Disabled

Analyzer Mode (for Peak Measurements) Peak

Resolution Bandwidth..... 1000 kHz

Video Bandwidth..... 1000 kHz

Analyzer Mode (for Average Measurements) Video Filter

Resolution Bandwidth..... 1000 kHz

Video Bandwidth..... 10 Hz

The margin in the Tables below is calculated as follows:

Margin = Corrected Amplitude – Limit, where Corrected Amplitude = Spectrum Analyzer Amplitude + Cable Loss + Antenna Factor – Pre-Amp Gain.

Applicant: Silver Spring Networks, Inc.

FCC ID: OWS-963

SPURIOUS/HARMONIC EMISSIONS and Emissions in the RESTRICTED BANDS

Test Specification: FCC PART 15 SECTION 47 CFR 15.205
FCC PART 15 SECTION 47 CFR 15.247(c)

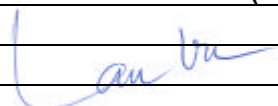
Test Range – Spurious/Harmonics Emissions:

The measurement range investigated was from 30 MHz to 10GHz.

Site Used – Spurious/Harmonics Emissions Measurements

- ☐ 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 – Spurious and Harmonics Emissions (CH 2 – 906 MHz)

Test Date:	July 03, 2003
Test Engineer:	Lan Vu 

Environmental Conditions – Spurious and Harmonics Emissions (CH 2 – 906 MHz)

Temperature	31.1°C
Humidity	28%

Table 13 Test Data – Spurious Emissions @ 906 MHz (Measurements @ 10 meters)

The table below shows the summary of the highest amplitudes of the spurious RF radiated emissions from the equipment under test.

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B		DET	
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	MODE	NOTES
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB		
44.32	11.0	11.4	0.7	23.0	90	1.0	VB	-	-	30.0	-7.0	P	
124.24	6.2	11.7	3.6	21.5	180	1.0	VB	-	-	33.0	-11.5	P	
137.27	8.1	11.1	4.0	23.2	180	1.0	VB	-	-	33.0	-9.8	P	
137.76	12.3	9.6	4.0	25.9	180	2.0	HB	-	-	33.0	-7.1	P	
205.28	7.0	11.6	3.6	22.2	0	1.0	VL	-	-	33.0	-10.8	P	
224.03	8.2	10.9	3.8	22.9	90	1.0	VL	-	-	36.0	-13.1	P	
350.41	5.2	14.8	6.1	26.1	90	1.0	VL	-	-	36.0	-9.9	P	
425.91	2.2	16.3	4.9	23.4	90	1.0	VL	-	-	36.0	-12.6	P	
425.91	2.2	16.1	4.9	23.1	90	1.0	HL	-	-	36.0	-12.9	P	

Prepared By: ITC Engineering Services, Inc.
9959 Calaveras Road, PO Box 543
Sunol, California 94586-0543
Tel: [925] 862-2944 Fax: [925] 862-9013
Email: docs@itcemc.com Web: www.itcemc.com

Gas Pulse Interface
P/N: 1620-05002

Report No.: 20030327-01-F15

SPURIOUS and HARMONICS Emissions (cont)

Table 14 Test Data – Spurious and Harmonics Emissions @ 906 MHz (Measurement @ 3 meter)

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarization, and EUT orientations

INDICATED		CORRECTION		CORR	TURNABLE ANT			CLASS A		CLASS B		DET	
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	MODE	NOTES
GHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB		
906.20	93.0	23.4	-36.0	80.4	90	1.0	VL	-	-	143.0	-62.6	P	1
906.20	92.0	22.9	-36.0	78.9	90	1.0	HL	-	-	143.0	-32.9	P	1
917.00	49.0	23.3	-36.0	36.3	90	1.0	VL	-	-	46.0	-9.7	P	
936.00	46.0	23.6	-36.0	33.6	90	1.0	VL	-	-	46.0	-12.4	P	
948.00	40.0	23.1	-36.0	27.1	180	1.0	VL	-	-	46.0	-18.9	P	
948.00	45.0	23.3	-36.0	32.3	180	1.0	HL	-	-	46.0	-13.7	P	
1.130	32.0	23.7	-36.0	19.7	0	1.0	VH	-	-	54.0	-34.3	P	
1.130	35.0	25.4	-36.0	24.4	0	1.0	HH	-	-	54.0	-29.6	P	
1.200	42.0	25.2	-36.0	31.2	0	1.0	VH	-	-	54.0	-22.8	P	
1.200	43.0	25.5	-36.0	32.5	0	1.0	HH	-	-	54.0	-21.5	P	
1.500	40.0	25.7	-36.0	29.7	0	1.0	VH	-	-	54.0	-24.3	P	
1.500	40.0	26.9	-36.0	30.9	0	1.0	HH	-	-	54.0	-23.1	P	
1.570	39.0	26.6	-36.0	29.6	0	1.0	VH	-	-	54.0	-24.4	P	
1.570	42.0	27.0	-36.0	33.0	90	1.0	HH	-	-	54.0	-21.0	P	
1.765	31.0	28.0	-27.0	32.0	90	1.0	VH	-	-	54.0	-22.0	P	
1.765	35.0	28.0	-27.0	36.0	90	1.0	HH	-	-	54.0	-18.0	P	
1.812	41.0	28.5	-27.0	42.5	0	1.0	VH	-	-	54.0	-11.5	P	
1.812	43.0	28.5	-27.0	44.5	0	1.0	HH	-	-	54.0	-9.5	P	
2.718	40.0	31.0	-20.0	51.0	90	1.0	VH	-	-	54.0	-3.0	P	
2.718	39.0	31.0	-20.0	55.0	90	1.0	HH	-	-	54.0	-4.0	P	
3.624	26.0	33.0	-12.0	47.0	90	1.0	VH	-	-	54.0	-7.0	P	
3.624	27.0	33.0	-12.0	48.0	90	1.0	HH	-	-	54.0	-6.0	P	
4.531	25.0	33.9	-18.0	40.9	90	1.0	VH	-	-	54.0	-13.1	P	
4.531	25.0	33.9	-18.0	40.9	90	1.0	HH	-	-	54.0	-13.1	P	
5.437	25.0	35.9	-20.0	40.9	90	1.0	VH	-	-	54.0	-13.1	P	
5.437	25.0	35.9	-20.0	40.9	90	1.0	HH	-	-	54.0	-13.1	P	
6.343	25.0	36.0	-19.0	42.0	90	1.0	VH	-	-	54.0	-12.0	P	
6.343	25.0	36.0	-19.0	42.0	90	1.0	HH	-	-	54.0	-12.0	P	
7.249	25.0	37.5	-18.0	44.5	90	1.0	VH	-	-	54.0	-9.5	P	
7.249	25.0	37.5	-18.0	44.5	90	1.0	HH	-	-	54.0	-9.5	P	
8.156	25.0	37.8	-20.0	42.8	90	1.0	VH	-	-	54.0	-11.2	P	
8.156	25.0	37.8	-20.0	42.8	90	1.0	HH	-	-	54.0	-11.2	P	
9.062	25.0	39.9	-25.0	39.9	90	1.0	VH	-	-	54.0	-14.1	P	
9.062	25.0	39.9	-25.0	39.9	90	1.0	HH	-	-	54.0	-14.1	P	
9.968	25.0	38.7	-22.0	41.7	90	1.0	VH	-	-	54.0	-12.3	P	
9.968	25.0	38.7	-22.0	41.7	90	1.0	HH	-	-	54.0	-12.3	P	

1. Fundamental Frequency

SPURIOUS and HARMONICS Emissions (cont)

Administrative Details – Spurious and Harmonics Emissions (CH 8 – 915 MHz)

Test Date:	July 08, 2003
Test Engineer:	Lan Vu

Environmental Conditions – Spurious and Harmonics Emissions (CH 8 – 915 MHz)

Temperature	31.7°C
Humidity	30%

Table 15 Test Data – Spurious Emissions @ 915 MHz (Measurements @ 10 meters)

The table below shows the summary of the highest amplitudes of the spurious RF radiated emissions from the equipment under test.

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B		DET	
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	MODE	NOTES
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB		
36.04	12.5	10.6	0.5	23.6	0	1.0	VB	-	-	30.0	-6.4	P	
48.06	7.3	11.3	0.7	19.3	90	1.0	VB	-	-	30.0	-10.7	P	
65.78	8.9	9.0	1.8	19.7	90	1.0	VB	-	-	30.0	-10.3	P	
70.89	11.3	7.4	1.8	20.5	180	1.0	VB	-	-	30.0	-9.5	P	
132.75	5.0	11.4	3.6	20.0	0	1.0	VB	-	-	33.0	-13.0	P	
137.78	5.7	9.6	4.0	19.3	0	1.0	HB	-	-	33.0	-13.7	P	
165.93	5.8	15.3	5.7	26.8	0	1.0	VB	-	-	33.0	-6.2	P	
215.85	8.1	10.7	3.8	22.7	90	1.0	HL	-	-	33.0	-10.3	P	
217.57	9.3	10.8	3.9	24.0	0	1.0	VL	-	-	36.0	-12.0	P	
240.02	6.7	11.5	3.8	22.0	180	1.0	HL	-	-	36.0	-14.0	P	
252.04	10.2	12.2	2.0	24.3	180	1.0	HL	-	-	36.0	-11.7	P	
264.04	9.1	12.8	4.6	26.5	180	1.0	HL	-	-	36.0	-9.5	P	
288.04	6.0	13.7	5.1	24.9	180	1.0	HL	-	-	36.0	-11.1	P	
288.04	10.1	13.9	5.1	29.2	90	1.0	VL	-	-	36.0	-6.8	P	
312.04	10.8	14.4	4.8	30.0	180	1.0	HL	-	-	36.0	-6.0	P	
312.04	9.3	14.6	4.8	28.7	90	1.0	VL	-	-	36.0	-7.3	P	
336.04	8.8	14.4	5.7	28.9	180	1.0	HL	-	-	36.0	-7.1	P	
360.04	12.1	14.1	6.4	32.6	180	1.0	HL	-	-	36.0	-3.4	P	
360.04	8.7	14.7	6.4	29.8	90	1.0	VL	-	-	36.0	-6.2	P	
372.04	4.5	15.0	6.7	26.2	180	1.0	VL	-	-	36.0	-9.8	P	
420.04	4.8	16.3	5.2	26.3	180	1.0	VL	-	-	36.0	-9.7	P	
441.81	6.4	16.4	4.4	27.2	90	1.0	VL	-	-	36.0	-8.8	P	
468.02	6.7	17.1	3.2	27.1	180	1.0	HL	-	-	36.0	-8.9	P	

1. Fundamental Frequency

SPURIOUS and HARMONICS Emissions (cont)

Table 16 Test Data – Spurious and Harmonics Emissions @ 915 MHz (Measurement @ 3 meter)

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarization, and EUT orientations

INDICATED		CORRECTION		CORR	TURNABLE ANT			CLASS A		CLASS B		DET	
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	MODE	NOTES
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB		
915.0	100.0	22.6	-36.0	87.4	90	1.0	VL	-	-	143.0	55.6	P	1
915.0	95.0	23.3	-36.0	81.9	90	1.0	HL	-	-	143.0	61.1	P	1
927.0	48.0	23.3	-36.0	35.3	0	1.0	VL	-	-	46.0	-10.7	P	
927.0	45.0	23.6	-36.0	32.6	0	1.0	VL	-	-	46.0	-13.4	P	
965.0	40.0	23.1	-36.0	27.1	90	1.0	VL	-	-	54.0	-26.9	P	
965.0	45.0	23.3	-36.0	32.3	90	1.0	HL	-	-	54.0	-21.7	P	
1.033	57.2	23.5	-36.0	44.7	90	1.0	VH	-	-	54.0	-9.3	P	
1.047	51.4	24.5	-36.0	39.9	0	1.0	HH	-	-	54.0	-14.1	P	
1.073	60.0	24.2	-36.0	48.2	0	1.0	VH	-	-	54.0	-5.8	P	
1.150	59.8	24.7	-36.0	48.5	0	1.0	HH	-	-	54.0	-5.5	P	
1.154	55.2	23.7	-36.0	42.9	180	1.0	VH	-	-	54.0	-11.1	P	
1.226	53.8	25.0	-36.0	42.8	180	1.0	VH	-	-	54.0	-11.2	P	
1.226	51.7	25.4	-36.0	41.1	0	1.0	HH	-	-	54.0	-12.9	P	
1.516	60.2	25.7	-36.0	49.9	90	1.0	HH	-	-	54.0	-4.1	P	
1.521	60.6	26.2	-36.0	50.8	90	1.0	VH	-	-	54.0	-3.2	P	
1.606	50.2	25.8	-27.0	49.0	90	1.0	HH	-	-	54.0	-5.0	P	
1.606	51.4	25.4	-27.0	49.8	0	1.0	VH	-	-	54.0	-4.2	P	
1.777	50.0	27.5	-27.0	50.5	0	1.0	HH	-	-	54.0	-3.5	P	
1.830	49.0	28.7	-27.0	50.7	0	1.0	VH	-	-	54.0	-3.3	P	
1.830	48.6	29.0	-27.0	50.6	0	1.0	HH	-	-	54.0	-3.4	P	
2.745	38.2	31.0	-20.0	49.2	0	1.0	VH	-	-	54.0	-4.8	P	
2.745	39.3	31.0	-20.0	50.3	0	1.0	HH	-	-	54.0	-3.7	P	
3.660	27.5	33.0	-12.0	48.5	0	1.0	VH	-	-	54.0	-5.5	P	
3.660	29.3	33.0	-12.0	50.3	0	1.0	HH	-	-	54.0	-3.7	P	
4.575	25.0	33.9	-18.0	40.9	0	1.0	VH	-	-	54.0	-13.1	P	
4.575	25.0	33.9	-18.0	40.9	0	1.0	HH	-	-	54.0	-13.1	P	
5.490	25.0	35.9	-20.0	40.9	0	1.0	VH	-	-	54.0	-13.1	P	
5.490	25.0	35.9	-20.0	40.9	0	1.0	HH	-	-	54.0	-13.1	P	
6.405	25.0	36.0	-19.0	42.0	0	1.0	VH	-	-	54.0	-12.0	P	
6.405	25.0	36.0	-19.0	42.0	0	1.0	HH	-	-	54.0	-12.0	P	
7.320	25.0	37.5	-18.0	44.5	0	1.0	VH	-	-	54.0	-9.5	P	
7.320	25.0	37.5	-18.0	44.5	0	1.0	HH	-	-	54.0	-9.5	P	
8.235	25.0	37.8	-20.0	42.8	0	1.0	VH	-	-	54.0	-11.2	P	
8.325	25.0	37.8	-20.0	42.8	0	1.0	HH	-	-	54.0	-11.2	P	
9.150	25.0	39.9	-25.0	39.9	0	1.0	VH	-	-	54.0	-14.1	P	
9.150	25.0	39.9	-25.0	39.9	0	1.0	VH	-	-	54.0	-14.1	P	
10.165	25.0	38.7	-22.0	41.7	0	1.0	HH	-	-	54.0	-12.3	P	
10.165	25.0	38.7	-22.0	41.7	0	1.0	HH	-	-	54.0	-12.3	P	

1. Fundamental Frequency

SPURIOUS and HARMONICS Emissions (cont)

Administrative Details – Spurious and Harmonics Emissions (CH 14 – 924 MHz)

Test Date:	July 17, 2003
Test Engineer:	Lan Vu

Environmental Conditions – Spurious and Harmonics Emissions (CH 14 – 924 MHz)

Temperature	26.7°C
Humidity	32%

Table 17 Test Data – Spurious Emissions @ 924 MHz (Measurements @ 10 meters)

The table below shows the summary of the highest amplitudes of the spurious RF radiated emissions from the equipment under test.

INDICATED		CORRECTION		CORR	TURNTABLE ANT			CLASS A		CLASS B			
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	DET	
MHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB	MODE	NOTES
36.04	11.9	10.6	0.5	23.0	0	1.0	VB	-	-	30.0	-7.0	P	
70.89	10.8	7.4	1.8	20.0	180	1.0	VB	-	-	30.0	-10.0	P	
165.93	5.3	15.3	5.7	26.3	0	1.0	VB	-	-	33.0	-6.7	P	
264.04	9.0	12.8	4.6	26.4	180	1.0	HL	-	-	36.0	-9.6	P	
288.04	5.4	13.7	5.1	24.3	180	1.0	HL	-	-	36.0	-11.7	P	
288.04	9.5	13.9	5.1	28.7	90	1.0	VL	-	-	36.0	-7.3	P	
312.04	10.3	14.4	4.8	29.5	180	1.0	HL	-	-	36.0	-6.5	P	
312.04	8.3	14.6	4.8	27.7	90	1.0	VL	-	-	36.0	-8.3	P	
336.04	8.0	14.4	5.7	28.1	180	1.0	HL	-	-	36.0	-7.9	P	
360.04	11.2	14.1	6.4	31.7	180	1.0	HL	-	-	36.0	-4.3	P	
360.04	8.2	14.7	6.4	29.3	90	1.0	VL	-	-	36.0	-6.7	P	
372.04	4.6	15.0	6.7	26.3	180	1.0	VL	-	-	36.0	-9.7	P	
420.04	4.1	16.3	5.2	25.6	180	1.0	VL	-	-	36.0	-10.4	P	
441.81	6.1	16.4	4.4	26.9	90	1.0	VL	-	-	36.0	-9.1	P	
468.02	6.8	17.1	3.2	27.2	180	1.0	HL	-	-	36.0	-8.8	P	

SPURIOUS and HARMONICS Emissions (cont)

Table 18 Test Data – Spurious and Harmonics Emissions @ 924 MHz (Measurement @ 3 meter)

The table below shows a summary of the highest amplitudes of the radiated emissions from the equipment under test at various antenna heights, antenna polarization, and EUT orientations

INDICATED		CORRECTION		CORR	TURNABLE ANT			CLASS A		CLASS B		DET	
FREQ	AMPL	ANT	CAB	AMPL	ANG	HT	POL	AMPL	MARG	AMPL	MARG	MODE	NOTES
GHz	dBuV/m	dB	dB	dBuV/m	DEG	m	-	dBuV/m	dB	dBuV/m	dB		
924.00	95.0	22.6	-36.0	81.6	90	1.0	VL	-	-	143.0	61.4	P	1
924.00	93.0	23.3	-36.0	80.3	90	1.0	HL	-	-	143.0	62.7	P	1
936.00	42.0	23.3	-36.0	29.3	0	1.0	VL	-	-	46.0	-16.7	P	
936.00	44.0	23.6	-36.0	31.6	0	1.0	VL	-	-	46.0	-14.4	P	
952.00	40.0	23.1	-36.0	27.1	90	1.0	VL	-	-	46.0	-18.9	P	
952.00	46.0	23.3	-36.0	33.3	90	1.0	HL	-	-	46.0	-12.7	P	
1.043	55.2	25.0	-36.0	44.2	90	1.0	VH	-	-	54.0	-9.8	P	
1.043	51.8	25.0	-36.0	40.8	0	1.0	HH	-	-	54.0	-13.2	P	
1.086	47.6	25.3	-36.0	36.9	0	1.0	VH	-	-	54.0	-17.1	P	
1.086	53.8	25.2	-36.0	43.0	0	1.0	HH	-	-	54.0	-11.0	P	
1.285	50.9	25.5	-36.0	40.4	180	1.0	VH	-	-	54.0	-13.6	P	
1.286	53.4	25.5	-36.0	42.9	180	1.0	HH	-	-	54.0	-11.1	P	
1.350	47.0	26.0	-36.0	37.0	0	1.0	HH	-	-	54.0	-17.0	P	
1.459	48.1	26.3	-36.0	38.4	90	1.0	HH	-	-	54.0	-15.6	P	
1.461	51.4	26.4	-36.0	41.8	90	1.0	VH	-	-	54.0	-12.2	P	
1.532	47.3	26.7	-35.0	39.0	90	1.0	HH	-	-	54.0	-15.0	P	
1.532	49.5	27.3	-35.0	41.8	0	1.0	VH	-	-	54.0	-12.2	P	
1.606	47.6	27.5	-35.0	40.1	0	1.0	HH	-	-	54.0	-13.9	P	
1.606	49.8	27.3	-35.0	42.1	0	1.0	VH	-	-	54.0	-11.9	P	
1.717	49.9	27.1	-27.0	50.0	0	1.0	VH	-	-	54.0	-4.0	P	
1.781	41.6	27.5	-27.0	42.1	0	1.0	VH	-	-	54.0	-11.9	P	
1.848	49.3	28.0	-27.0	50.3	0	1.0	HH	-	-	54.0	-3.7	P	
1.848	48.9	28.0	-27.0	50.9	0	1.0	VH	-	-	54.0	-3.1	P	
2.045	41.7	29.3	-24.0	47.0	90	1.0	VH	-	-	54.0	-7.0	P	
2.166	44.5	29.5	-24.0	50.0	90	1.0	VH	-	-	54.0	-4.0	P	
2.189	42.1	30.0	-24.0	48.1	90	1.0	HH	-	-	54.0	-5.9	P	
2.772	40.0	30.3	-20.0	50.3	0	1.0	VH	-	-	54.0	-3.7	P	
2.772	39.1	30.3	-20.0	49.4	0	1.0	HH	-	-	54.0	-4.6	P	
3.696	25.0	33.2	-12.0	46.2	0	1.0	VH	-	-	54.0	-7.8	P	
3.696	25.0	33.2	-12.0	46.2	0	1.0	HH	-	-	54.0	-7.8	P	
4.620	25.0	34.6	-18.0	41.6	0	1.0	VH	-	-	54.0	-12.4	P	
4.620	25.0	34.6	-18.0	41.6	0	1.0	HH	-	-	54.0	-12.4	P	
5.544	25.0	35.9	-20.0	40.9	0	1.0	VH	-	-	54.0	-13.1	P	
5.544	25.0	35.9	-20.0	40.9	0	1.0	HH	-	-	54.0	-13.1	P	
6.468	25.0	36.3	-20.0	41.3	0	1.0	VH	-	-	54.0	-12.7	P	
6.468	25.0	36.3	-20.0	41.3	0	1.0	VH	-	-	54.0	-12.7	P	
7.392	25.0	37.8	-22.0	40.8	0	1.0	HH	-	-	54.0	-13.2	P	
7.392	25.0	37.8	-22.0	40.8	0	1.0	HH	-	-	54.0	-13.2	P	
8.316	25.0	38.0	-25.0	38.0	0	1.0	VH	-	-	54.0	-16.0	P	
8.316	25.0	38.0	-25.0	38.0	0	1.0	VH	-	-	54.0	-16.0	P	
9.240	25.0	39.0	-22.0	42.0	0	1.0	HH	-	-	54.0	-12.0	P	
9.240	25.0	39.0	-22.0	42.0	0	1.0	HH	-	-	54.0	-12.0	P	
10.164	25.0	38.7	-22.0	41.7	0	1.0	HH	-	-	54.0	-12.3	P	
10.164	25.0	38.7	-22.0	41.7	0	1.0	HH	-	-	54.0	-12.3	P	

1. Fundamental Frequency

Conclusion

The Gas Pulse Meter meets the requirements of the test reference for Spurious and Restricted Bands emissions levels specified in the 47CFR15.209

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Gas Pulse Interface
P/N: 1620-05002

Report No.: 20030327-01-F15

PART 4 APPENDICES

A. TEST EQUIPMENT

Some or all of the following test equipment was used to measure the equipment under test:

Test Equipment	Manufacturer & Model Number	Serial Number	Calibration Due Date
Spectrum Analyzer	Hewlett Packard 8590A	2752 A02715	12/06/2003
Spectrum Analyzer	Hewlett-Packard 8590A	2542A11954	12/06/2003
Spectrum Monitor	Rhode & Schwarz EZM	881 334/025	03/01/2004
Test Receiver (9 kHz - 30 MHz)	Rhode & Schwarz ESH3	RES 0753	03/01/2004
Test Receiver (20-1300 MHz)	Rhode & Schwarz ESVP	RES 0749	03/01/2004
Spectrum Analyzer	Hewlett-Packard 8566B	2618A02909	12/06/2003
Spectrum Analyzer	Hewlett-Packard 8567A	2602A00239	12/06/2003
Spectrum Analyzer Display (Site 1)	Hewlett-Packard 85662A	2848A17028	12/06/2003
Quasi Peak Adapter (Site 1)	Hewlett-Packard 85650	2521A00871	12/06/2003
Preselector (Site 1)	Hewlett-Packard 85685A	2620A00265	03/01/2004
Preamp	Hewlett-Packard 8447D	2648A04855	03/01/2004
Preamp	Hewlett-Packard 8449B	3008A00101	03/01/2004
Absorbing Clamp	MDS21	891 092/025	05/13/2004
Antenna Cable (OPTK45)	RG8/u	-	N/A
Antenna System	EMCO 3230	-	N/A
Biconical Antenna (Site 1)	EMCO 3104	3549	01/25/2004
L. P. Ant. (Site 1) (200-1000 MHz)	EMCO 3146	2075	01/25/2004
Adj. Elem. Dip. Ant. (28 MHz-1 GHz)	EMCO 3120	2632	03/01/2004
Horn Antenna	Eaton 96001	2632	01/12/2004
LISN (25 Amp)	EMCO 38825/2	9210-2008	03/01/2004
LISN (100 Amp)	Solar 8610-50-TS-100N		03/01/2004
LISN	EMCO 3825/2R	1188/1001	03/01/2004
Computer	HP 000/300	RES 449	N/A
Remote Controlled 8 ft Rotating Table	RES RT1	Not Provided	N/A
Remote Controlled 25 ft Rotating Table	RES RT2	Not Provided	N/A
Remote Controlled 4 ft Rotating Table	RES RT3, RT4, RT5	Not Provided	N/A
Remote Controlled 4 m Antenna Mast	RES AM1	Not Provided	N/A
Remote Controlled 6 m Antenna Mast	RES AM2 & AM3	Not Provided	N/A
3 Phase 230 V~50 Hz Generator	Not Provided	DB7130B40	05/13/2004
Oscilloscope (300 MHz)	Tektronix 2465B	602053	05/13/2004
Lindgren RF Shielded Enclosure	46-3/5-0	8220	N/A
Haefely ESD Simulator	PSD25B	081 486-02	05/13/2004
Hewlett Packard Signal Generator	HP8662A	2330A01371	05/13/2004
Amplifier Research Power Amplifier	100A100	10922	05/13/2004
Amplifier Research Power Amplifier	25W1000M7	10830	05/13/2004
Amplifier Research Field Strength Monitor	FM1000	60670	05/13/2004
Amplifier Research Isotropic Field Probe	FP1000	16270	05/13/2004
Amplifier Research L. P. Antenna (100-1000 MHz)	AT 1100	10537	05/13/2004
Amplifier Research F. Generator (10kHz - 100MHz)	AT500	11294	05/13/2004
Lindgren RFI Shielded Enclosure	46-2/5-0	8220	N/A
IFI Field Strength Meter	EFS-1	-	05/13/2004
IFI LDI	Not Provided	-	05/13/2004
Hewlett Packard Signal Generator	8673C	2918A00649	05/13/2004
Leader Functional Generator	LFG-1300S	7050152	05/13/2004
Haefely Burst-Tester Mainframe	PEFT.1	081 979-03	05/13/2004
Haefely Coupling Filter Module	PHV 4/1	081 979-03	05/13/2004
Haefely Control Unit Module	P90.1	0810979-03	05/13/2004
Haefely Power Supply Module	PP53.1	081 979-03	05/13/2004
Haefely Capacitive Coup. Clamp	IPA	083839-11	05/13/2004
Haefely Coupling Filter	FP 16/3-1	082529-12	05/13/2004
Haefely Surge Generator	PC6-288-1	Not Provided	05/13/2004

A. TEST EQUIPMENT (Cont.)

Haefely Coupling Filter	FP 20/3-3	Not Provided	05/13/2004
Haefely Comm. Wave 1.2/50us, 8/20us.	PHV1	Not Provided	05/13/2004
Haefely H.V. Retractable Probe	-	Not Provided	05/13/2004
Topaz Electronics Isolation Transformer	16630	Not Provided	05/13/2004
HP Signal Generator	8673C	2918A00649	03/21/2004
HP Signal Generator	8656B	2623A04271	01/11/2004
Amplifier Research Power Amplifier	100A100	10922	05/13/2004
Amplifier Research Power Amplifier	25W1000M7	10830	05/13/2004
Amplifier Research Leveling Amplifier	999	Not Provided	N/A
Lindgren RFI Shielded Enclosure	46-2/5-0	8220	N/A
Hewlett Packard Spectrum Analyzer	8566B	2618A02909	12/08/2004
Westelle Power Supply	-	AF1AA	05/08/2004
Fischer Custom Comm. P.L. Coup/Decoup.	FCC-801-M3-25A	02003	01/08/2004
Fischer Custom Comm. Passive Impedance Adapt.	FCC-801-150-50-CDN	02013-02014	01/08/2004
Schaffner Main Frame	NSG200E	2514	05/08/2004
Schaffner Line Voltage Simulator	NSG203A	2514	05/13/2004
Tektronix Oscilloscope	2465B	B013718	05/09/2004
Powerstat Variac	GP58004	801-5218	05/13/2004
Schaffner Main Frame	NSG200E	2514	05/13/2004
HP HP6843A Harmonic & Flicker Test Sys.	3531A-00130		N/A
Acer Pentium 90	2600427019	N/A	N/A
Acer 6311-K Keyboard	K6311459320	N/A	N/A
Logitech M-SR14 Mouse	LT293C00116	N/A	N/A
Acer 2133S111 Monitor	M5A00000462C1A8A	N/A	N/A
HFTS Software Version HFTS A.00.05	-	N/A	N/A

Note for Test Equipment: The spectrum analyzers are self-calibrated every morning before test and are calibrated annually. All calibrations are traceable to the NIST.

B. EUT TECHNICAL SPECIFICATION

Applicant	Silver Spring Network, Inc.		
Product Specifications			
Description	900MHz LP Gas Interface Device		
	Model Number(s)	OWS-963	
	Part Number	1620-05002	
	Serial Number(s)	1000000677	
	Central Processor	PIC 16LF876-041/SO	
	Dimensions	190mm(l) x 135mm(w) x 55mm(h)	
	Main Board	Manufacturer	Innovatec
		Part Number	960-00001 rev 5.1
		Dimension	Approx. 100mm(l) x 60mm(w) x 12mm(h)
		Layers	4
		Crystal(s)	X1 32.768 kHz
		Oscillator(s)	X2 12 MHz
	Reed Switch Board	Manufacturer	Innovatec
		Part Number	960-00002 Rev. 5.1
		Dimension	Approx. 28mm x 15mm
		Layers	2-sided
		Crystal/Osc	None
	Connectors	One (1) N-Connector for Antenna	
		One (1) 3-Contact Circular Connector for Diagnostics	
	Antenna Type	Sleeve Dipole	
	Antenna Gain	2.14 dBi	
	Cable(s)	Coaxial	
		Length	3.5m
	Power Supply(s)	DC Battery	3.6VDC
	Transmitter Type	Direct Sequence Spread Spectrum (DSSS)	
	Frequency	903-927 MHz	
	Bandwidth	1.50 MHz	
	Modulation Type	Direct Sequence Spread Spectrum Minimum Shift Key (DSSS-MSK)	
	Emission Designation	1M50F7D	
	Maximum rated output	20 dBm	
	Receiver Range	903-927 MHz	
Channel List	Ch0 903.0 MHz	Ch9 916.5 MHz	
	Ch1 904.5 MHz	Ch10 918.0 MHz	
	Ch2 906.0 MHz	Ch11 919.5 MHz	
	Ch3 907.5 MHz	Ch12 921.0 MHz	
	Ch4 909.0 MHz	Ch13 922.5 MHz	
	Ch5 910.5 MHz	Ch14 924.0 MHz	
	Ch6 912.0 MHz	Ch15 925.5 MHz	
	Ch7 913.5 MHz	Ch16 927.0 MHz	
	Ch8 915.0 MHz		

D. MODIFICATION LETTER

To Whom It May Concern:

This is to certify that no modifications were necessary for Gas Pulse Interface, model OWS-963, to comply with the required Requirements of:

FCC Rules and Regulations per 47 CFR 15.247

It is the manufacturer's responsibility to ensure that additional production units of the Gas Pulse Interface are manufactured with identical electrical and mechanical characteristics.

For further information, please contact the manufacturer at:

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13000 West Silver Spring Drive
Butler, WI 53007

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