28 October 2001

George Ronnenkamp
Omnex Control Systems Inc.
#74-1833 Coast Meridian Road
Port Coquitlam British Columbia
Canada V3C 6G5

Dear Mr. Ronnenkamp,

Enclosed is the FCC Certification Procedure Test Report for the 902-928 MHz Frequency Hopping Transmitter, Model OEM-900. Please check it thoroughly for discrepancies, and contact us immediately if you have any questions or if you identify any problems. In order to comply with FCC Regulations, you are required to retain a copy of this report, along with all other pertinent documentation until one year after the production of the Model OEM-900 has permanently ceased. This material may be necessary for future verification of compliance.

This is an official copy of your report, complete with the original Acme Testing Co. staff signatures. You should retain this report as the official record of testing, as proof of compliance in the future. Please be aware that our internal controls require us to retain a historical copy of your report on file for a three-year period, after which our copy of your report will be destroyed.

Additionally, Acme Testing Co. is accredited by the American Association for Laboratory Accreditation (A2LA), and there are current Mutual Recognition Agreements between the United States and Canada. This means that the *data* contained in your report is acceptable to Industry Canada, which is the EMC regulatory of Canada.

Thank you for your business and we look forward to being of service should you require testing services in the future.

Yours sincerely,

Harry H. Hodes
Principal EMC Engineer
President & CEO

:dd
Enclosure

2002 Valley Highway PO Box 3 Acme WA 98220-0003
phone:888 226-3837 fax: 360 595-2722

REPORT OF MEASUREMENTS
PART 15C (15.247) – INTENTIONAL RADIATOR

DEVICE:	902 - 928 MHZ FREQUENCY HOPPING TRANSMITTER
MODEL:	OEM-900
MANUFACTURER:	OMNEX CONTROL SYSTEMS INC.
ADDRESS:	#74 - 1833 COAST MERIDIAN ROAD PORT COQUITLAM BRITISH COLUMBIA CANADA V3C 6G5

WORK ORDER: 01DP-EMC-062001-02

1. General

1.1 Document History

REVISION	DATE	COMMENTS
	15 August 2001	Initial Release, Harry H. Hodes
A	25 October 2001	Correction of Technical Errors

Note: Acme Testing Co. hereby makes the following statements so as to conform with Chapter 10 (Test Reports) Requirement of ANSI C63.4: 1992 "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The units described in this report were received at Acme Testing Co.'s facilities on 28 June 2001. Testing was performed on the units described in this report on 28, 29 June & 02 August 2001 and October 12, 13, 17, 18, and 25 October 2001.
- The Test Results reported herein apply only to the Units actually tested, and to substantially identical Units.
- This test report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government, or any other foreign government.

1.2 Purpose

The purpose of this report is to present data that demonstrates compliance of the 902 - 928 MHz Frequency Hopping Transmitter, Model OEM-900 to the FCC regulations for Frequency Hopping Spread Spectrum unlicensed devices operating under Section 15.247 of the Code of Federal Regulations Title 47.

THE DATA CONTAINED IN THIS REPORT WAS COLLECTED AND COMPILED BY:

ANDREW K. PACE
EMC ENGINEER

DANIEL B. STATON
LABORATORY OPERATIONS MANAGER

STEPHEN ANDERSON
EMC TECHNICIAN

1.3 Manufacturer

Company Name:	Omnex Control Systems Inc.
Contact:	George Ronnenkamp
Street Address:	#74 - 1833 Coast Meridian Road
City/Province:	Port Coquitlam British Columbia
Country/Postal Code:	Canada V3C 6G5
Telephone:	604 944-9247
Fax:	604 944-9267

1.4 Test location

Laboratory:	Test Site #1 & #2
Street Address:	2002 Valley Highway
Mailing Address:	PO Box 3
City/State/Zip:	Acme WA 98220-0003
Telephone:	888 226-3837
Fax:	360 595-2722
E-mail:	acmetest@acmetesting.com
Web:	www.acmetesting.com

1.5 Accreditations and Listings

Acme Testing Co.'s test facilities are accredited by A2LA for a specific scope of accreditation which includes the tests detailed herein, under Certificate Numbers: 0829-01 (Acme, WA). Acme Testing Co.'s test facilities that are used to perform radiated and conducted emissions are currently registered with the Federal Communications Commission under registration numbers: 90420 (Acme, WA). In addition, Acme Testing Co.'s test facilities are also registered with the Industry Canada under registration numbers: IC3251 (Acme, WA).

2. Test Results Summary

Summary of Test Results
902 - 928 MHz Frequency Hopping Transmitter, Model OEM-900

Requirement	CFR Section	Test Result
Antenna Regulation	15.203	PASS
AC Emissions < 48 dBuV	15.207	Not Applicable*
Channel Separation >25 kHz	15.247 (al)	PASS
Number of Channels >50	15.247 (ali)	PASS
Max Output Power < 1 W	15.247(b2)	PASS
Antenna Gain <6dBi	15.247 (b3)	PASS
Conducted Spurious >-20 dBc	15.247(c)	PASS
Radiated Spurs < 15.209 Limits	15.205(b)	PASS
Band Edge Compliance	15.247(c)	PASS

* Not applicable, the EUT is DC Powered.

The signed original of this report, supplied to the client, represents the only "official" copy. Retention of any additional copies (electronic or non-electronic media) is at Acme Testing Co.'s discretion to meet internal requirements only. The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) is factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the referenced stand. Acme Testing Co. assumes responsibility only for the accuracy and completeness of this data as it pertains to the sample tested.

REVIEWED AND APPROVED BY:

Harry H. Hodes
President/CEO
Principal EMC Engineer

29 OCTOBER 2001
Date of Issuance

3. Description of Equipment and Peripherals

3.1 Equipment Under Test (EUT)

Device:	902 - 928 MHz Frequency Hopping Transmitter
Model Number:	OEM-900
Serial Number:	OEM210601
FCC ID:	None
Power:	12 VDC
Grounding:	None (DC Output of Power Supply was Floated)
Size of EUT:	5.5 cm x 7.5 cm x 1.5 cm

3.2 Support Equipment Used During Testing

Device	Manufacturer	Model Number	FCC ID	Serial Number
Test Switch Box	Omnex Controls	None	None	None
Whip Antenna	Omnex Controls	None	None	None
DC Power Supply	GW	GPR-6030D	None	8661470

3.3 Description of Interface Cables for Testing

EUT/Test Switch Board

Shielded	Unshielded	Flat	Round	Length	Ferrite
No	Yes	Yes	No	32 cm	No

EUT/Antenna

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	1.9 m	No

MCX/BNC

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	4 in	No

ARRANGEMENT OF INTERFACE CABLES: All interface cables were positioned for worst-case maximum emissions within the manner assumed to be a typical operation condition (please reference photographs).

3.4 Mode of Operation During Testing

The EUT was operated while connected to a test box. The function of the test box was to modify several parameters needed to fully evaluate its performance as a FHSS transceiver. The following switches were implemented into the test box:

Power (ON/OFF)
Power (tx/rx)
Modulation (ON/OFF)
Mode (Test/Run)
Channel

The Mode switch turned on and off the hopping function in order to make measurements on single channels. The Channel button (while the Mode switch was set to test) cycled through three channels in the EUT's band of operation. With the Modulation switch on, the test box sent data to the EUT to produce an FHSS signal.

3.5 Modifications Required for Compliance

1. None.

4. Antenna requirement

4.1 Regulation

15.204

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators, which in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

4.2 Test Results

The 902 - 928 MHz Frequency Hopping Transmitter, Model OEM-900 incorporated an MCX connector to comply with the requirements.

4.3 EUT Photograph

5. 20 dB Bandwidth and Channel Separation

Dates of Test: 25 October 2001

Laboratory: Test Site #2 (Acme, WA)

5.1 Regulation

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 hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system-hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

5.2 Test Equipment

⇒ Spectrum Analyzer (blue): Hewlett-Packard 8566B, Serial Number 2410A00168, Calibrated: 04 April 2001, Calibration due Date: 04 April 2002

⇒ RF Preselector (blue): Hewlett-Packard 85685A, Serial Number 2648A-00519, Calibrated: 04 April 2001, Calibration due Date: 04 April 2002

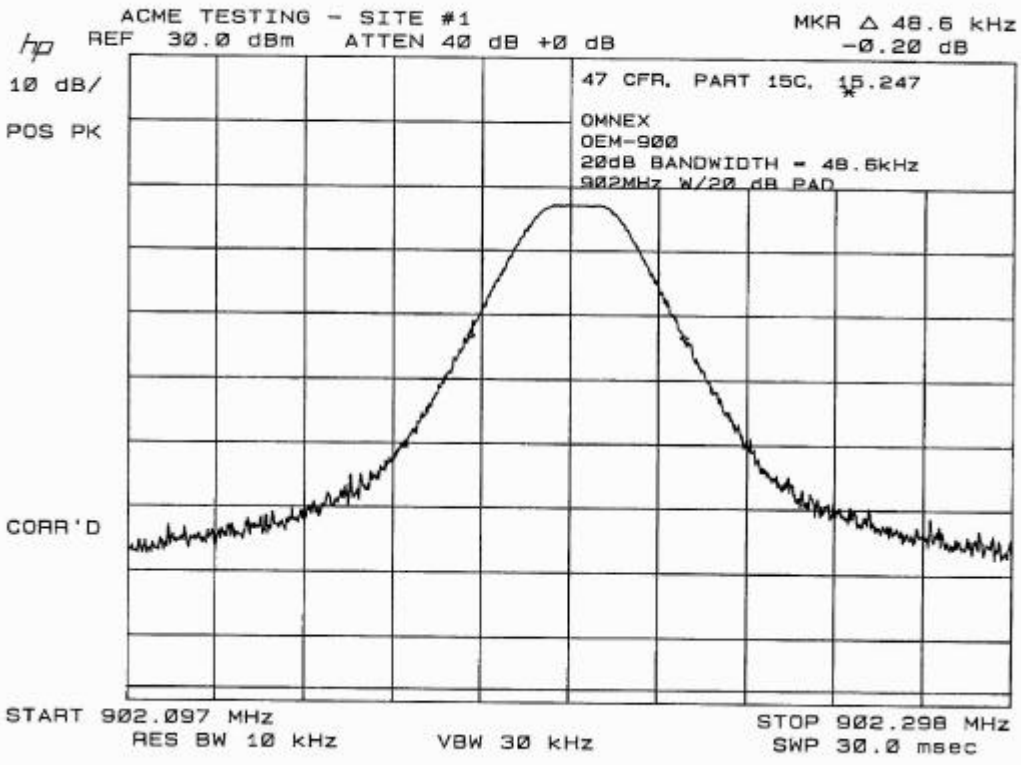
⇒ Precision Attenuator Set: Weinschel AS-18, Serial Number 665, Calibrated: 16 October 2001, Calibration Due Date: 16 October 2002

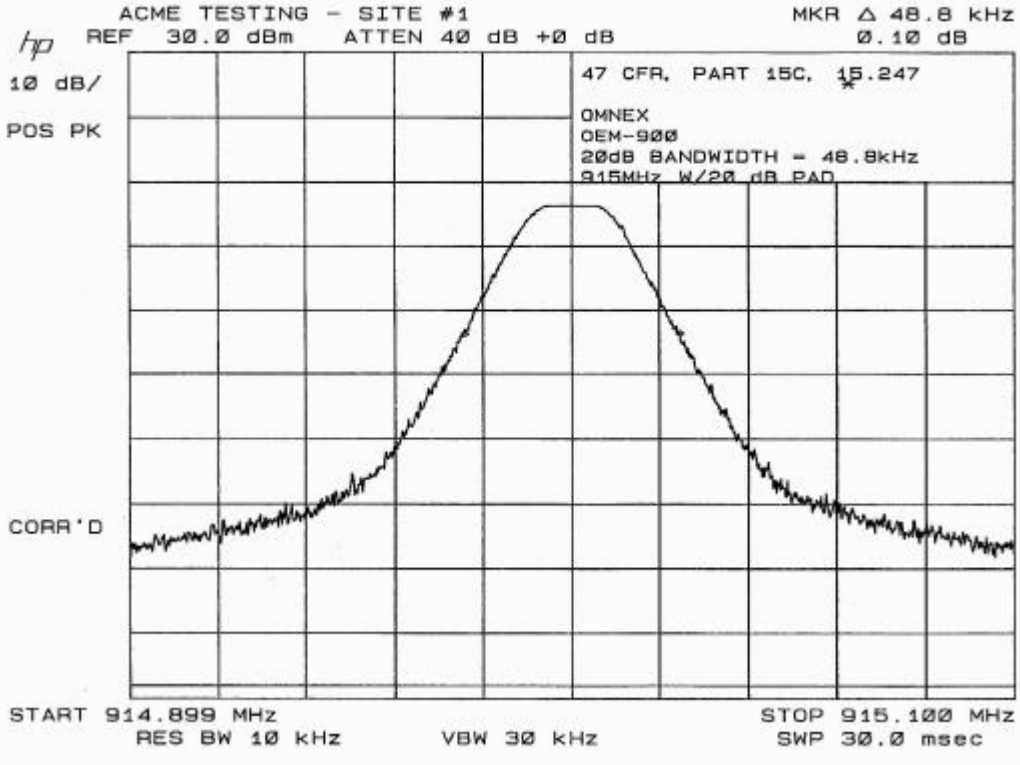
5.3 Test Procedures

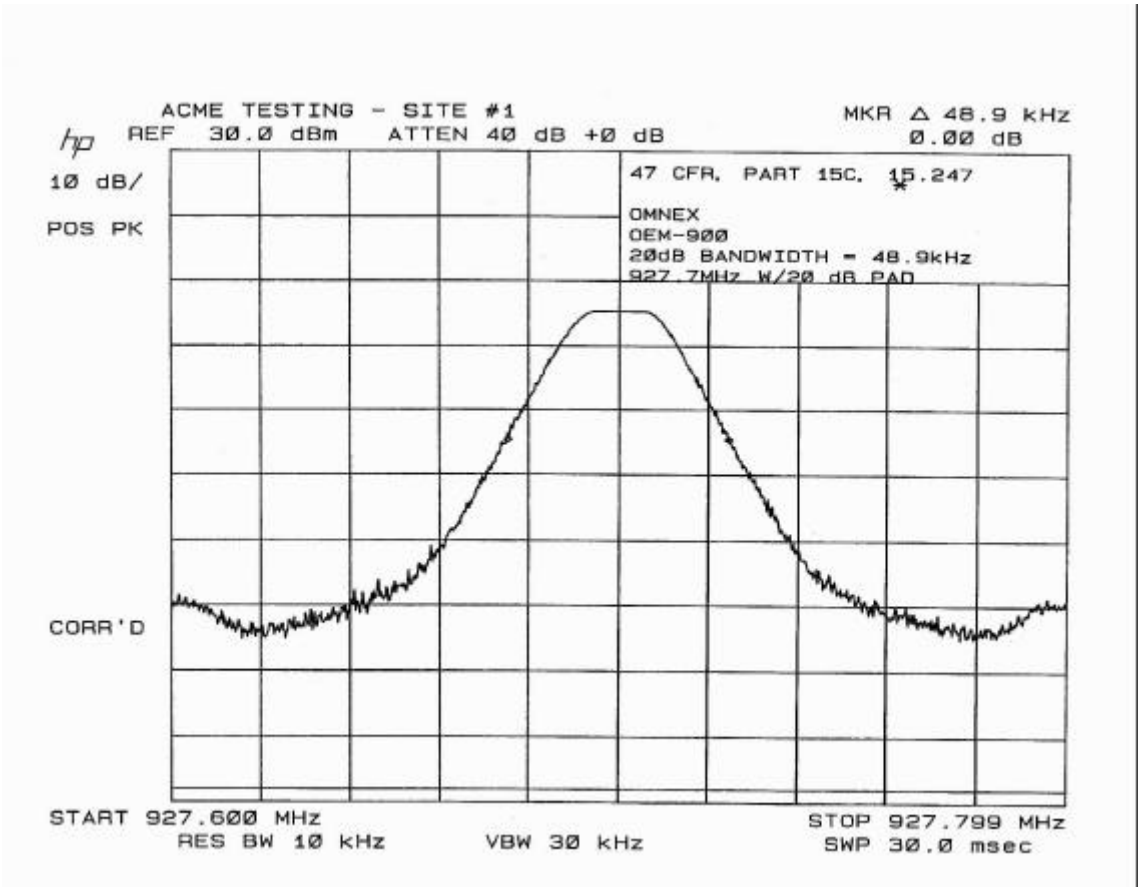
The RF output of the EUT was connected to the RF input port of the RF preselector through a 20-dB pad. The following measurements were made with a RBW = 10kHz and VBW = 30 kHz

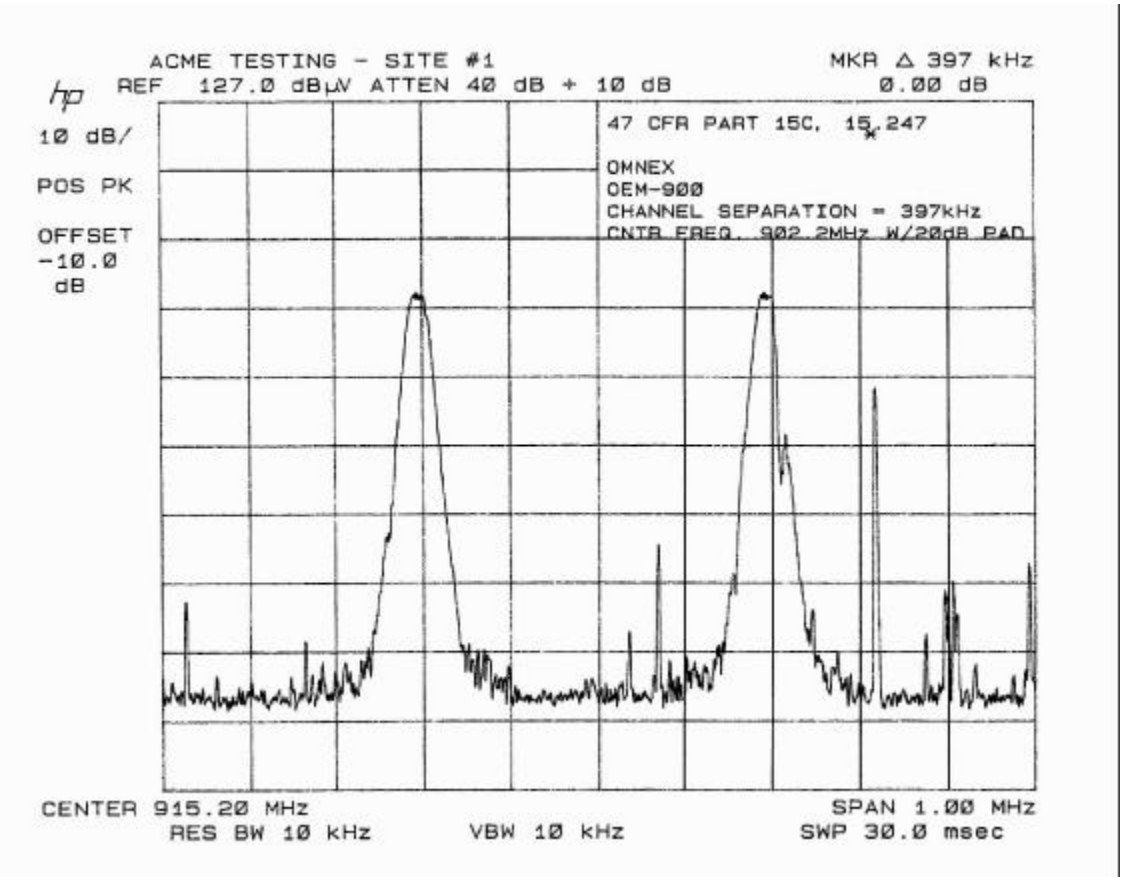
5.4 Test Results

The worst-case measured 20 dB bandwidth of the carrier frequency was 48.9 kHz (i.e. is less than 250 kHz). The transmitter had hopping channel carrier frequencies separated by 397 kHz. The EUT was compliant.


ACME TESTING - SITE #1
REF 30.0 dBm
ATTEN 40 dB +0 dB
MKR Δ 48.6 kHz
-0.20 dB
10 dB/
POS PK
47 CFR. PART 15C. 15.247
OMNEX
OEM-900
20dB BANDWIDTH = 48.6kHz
902MHz W/20 dB PAD
CORR'D
START 902.097 MHz
RES BW 10 kHz
VBW 30 kHz
STOP 902.298 MHz
SWP 30.0 msec


ACME TESTING - SITE #1
REF 30.0 dBm
ATTEN 40 dB +0 dB
MKR Δ 48.8 kHz
0.10 dB
10 dB/
POS PK
47 CFR. PART 15C. 15.247
OMNEX
OEM-900
20dB BANDWIDTH = 48.8kHz
915MHz W/20 dB PAD
CORR'D
START 914.899 MHz
RES BW 10 kHz
VBW 30 kHz
STOP 915.100 MHz
SWP 30.0 msec


ACME TESTING - SITE #1
MKR Δ 48.9 kHz
REF 30.0 dBm ATTEN 40 dB +0 dB
0.00 dB
10 dB/
POS PK
47 CFR, PART 15C, 15.247
OMNEX
OEM-900
20dB BANDWIDTH = 48.9kHz
927.7MHz W/20 dB PAD
CORR'D
START 927.600 MHz
RES BW 10 kHz
VBW 30 kHz
STOP 927.799 MHz
SWP 30.0 msec


ACME TESTING - SITE #1
MKR Δ 397 kHz
REF 127.0 dBμV ATTEN 40 dB + 10 dB
0.00 dB
10 dB/
POS PK
OFFSET
-10.0
dB
47 CFR PART 15C, 15.247
OMNEX
OEM-900
CHANNEL SEPARATION = 397kHz
CNTR FREQ, 902.2MHz W/20dB PAD
CENTER 915.20 MHz
RES BW 10 kHz
VBW 10 kHz
SPAN 1.00 MHz
SWP 30.0 msec

6. Number of Channels

Date of Test: 28 June 2001

Laboratory: Test Site #2 (Acme, WA)

6.1 Regulation

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.

6.2 Test Equipment

⇒ Spectrum Analyzer (blue): Hewlett-Packard 8566B, Serial Number 2410A00168, Calibrated: 04 April 2001, Calibration due Date: 04 April 2002

⇒ RF Preselector (blue): Hewlett-Packard 85685A, Serial Number 2648A-00519, Calibrated: 04 April 2001, Calibration due Date: 04 April 2002

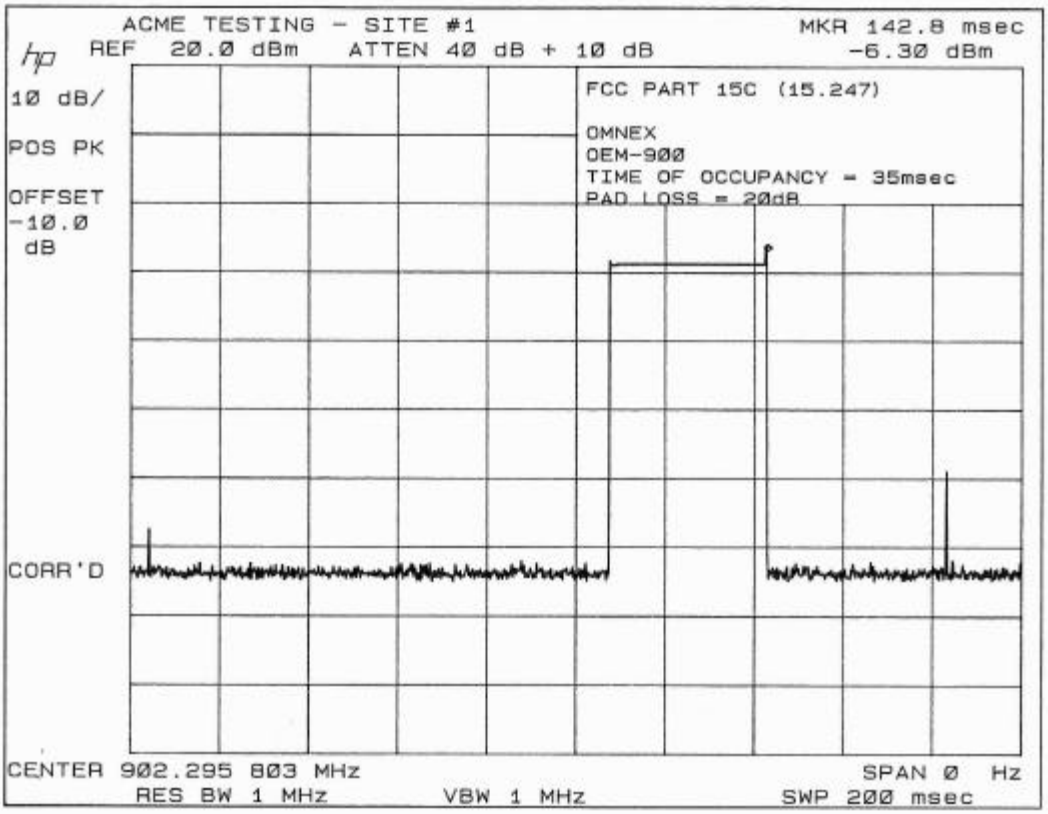
⇒ Precision Attenuator Set: Weinschel AS-18, Serial Number 665, Calibrated: 16 October 2001, Calibration Due Date: 16 October 2002

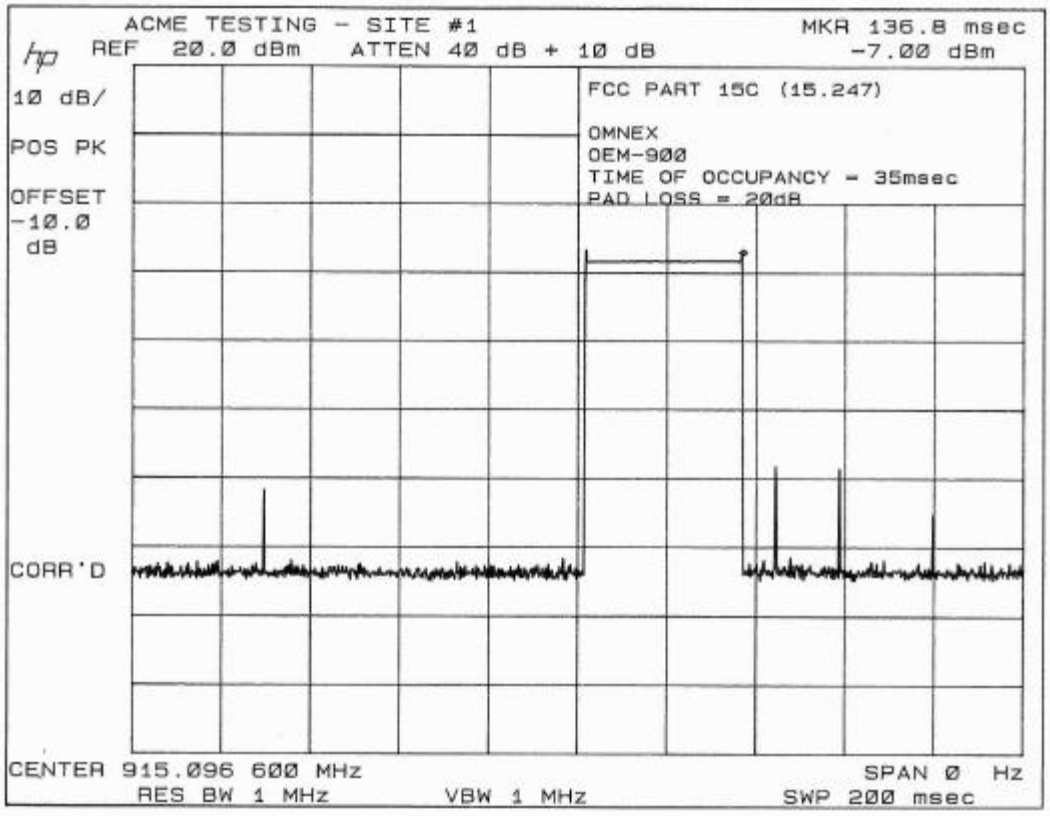
6.3 Test Procedures

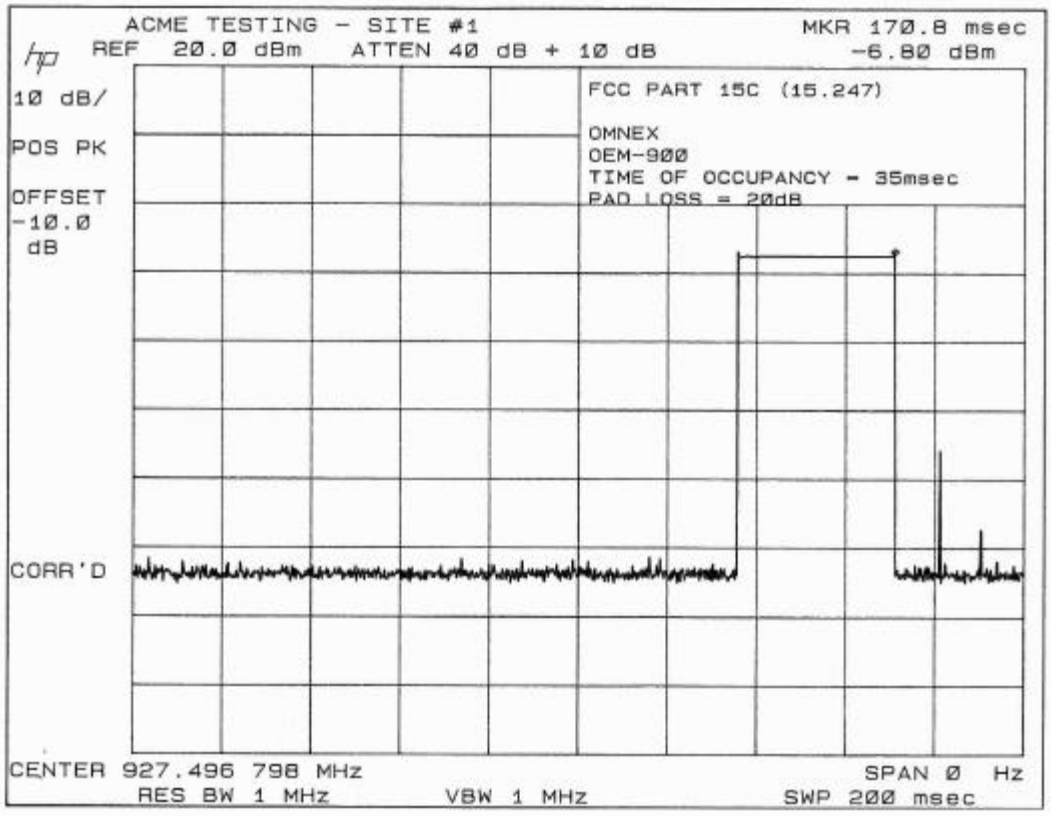
The RF output of the EUT was connected to the RF input port of the RF preselector through a 20-dB pad. The following measurements were made with a RBW = VBW = 1 MHz

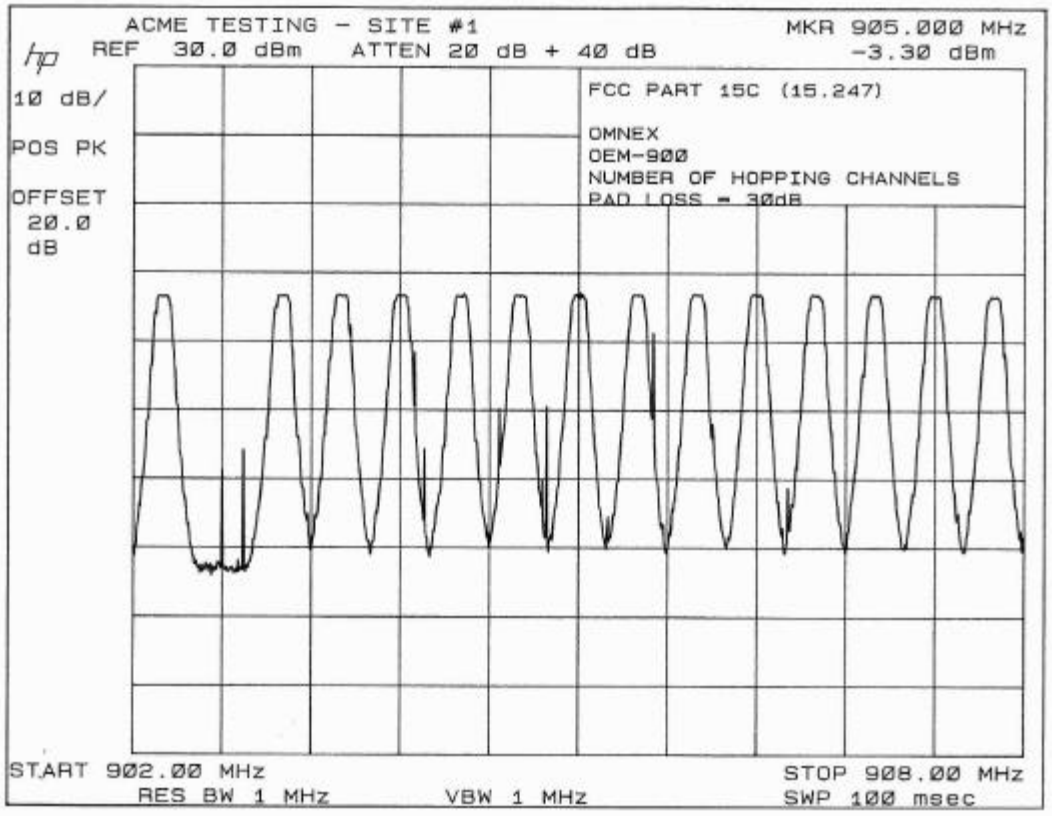
6.4 Test Results

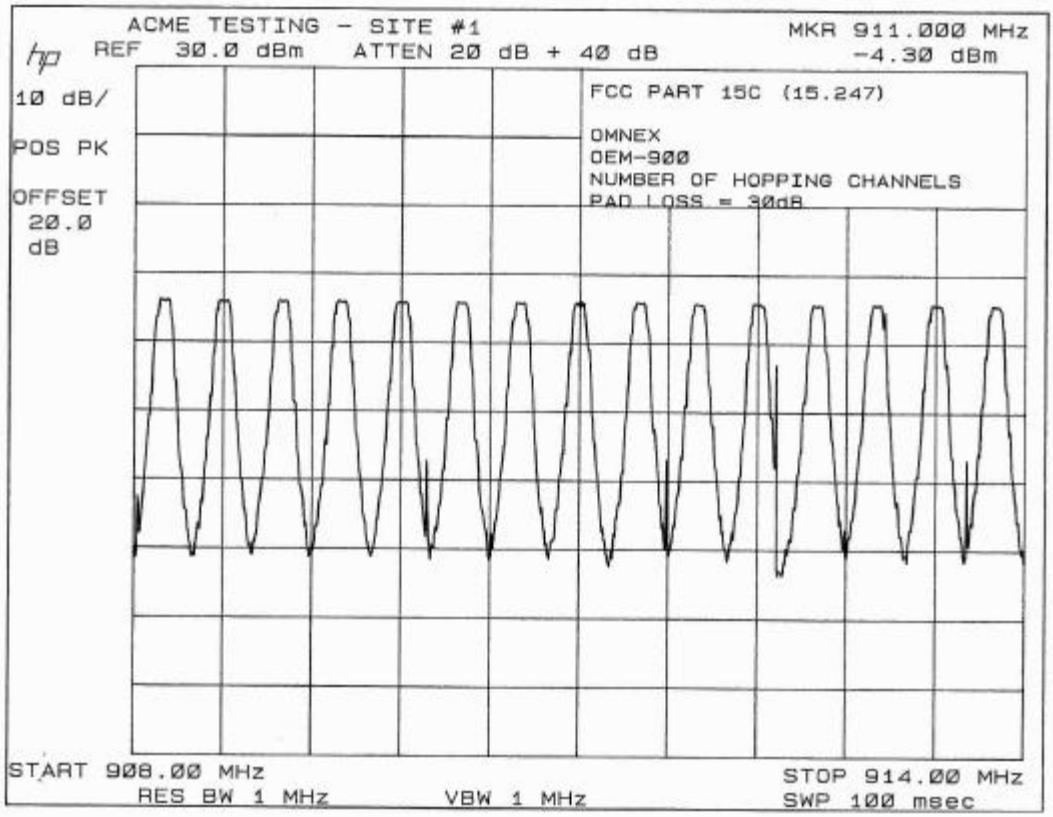
The transmitter used 63 hopping frequencies and had a 20 dB bandwidth of 210 kHz. The average dwell time of occupancy on any frequency was 0.35 milliseconds.

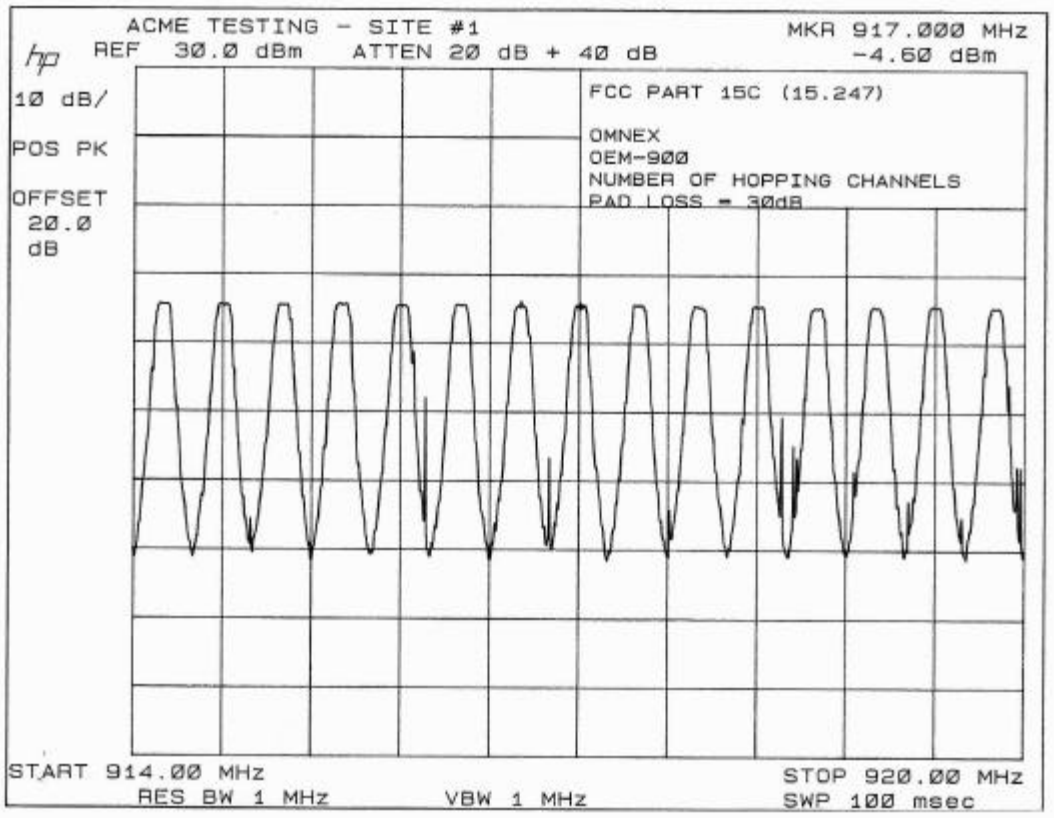

ACME TESTING - SITE #1
MKR 142.8 msec
REF 20.0 dBm
ATTEN 40 dB + 10 dB
-6.30 dBm
10 dB/
POS PK
OFFSET
-10.0
dB
FCC PART 15C (15.247)
OMNEX
OEM-900
TIME OF OCCUPANCY = 35msec
PAD LOSS = 20dB
CORR'D
CENTER 902.295 803 MHz
SPAN 0 Hz
RES BW 1 MHz
VBW 1 MHz
SWP 200 msec

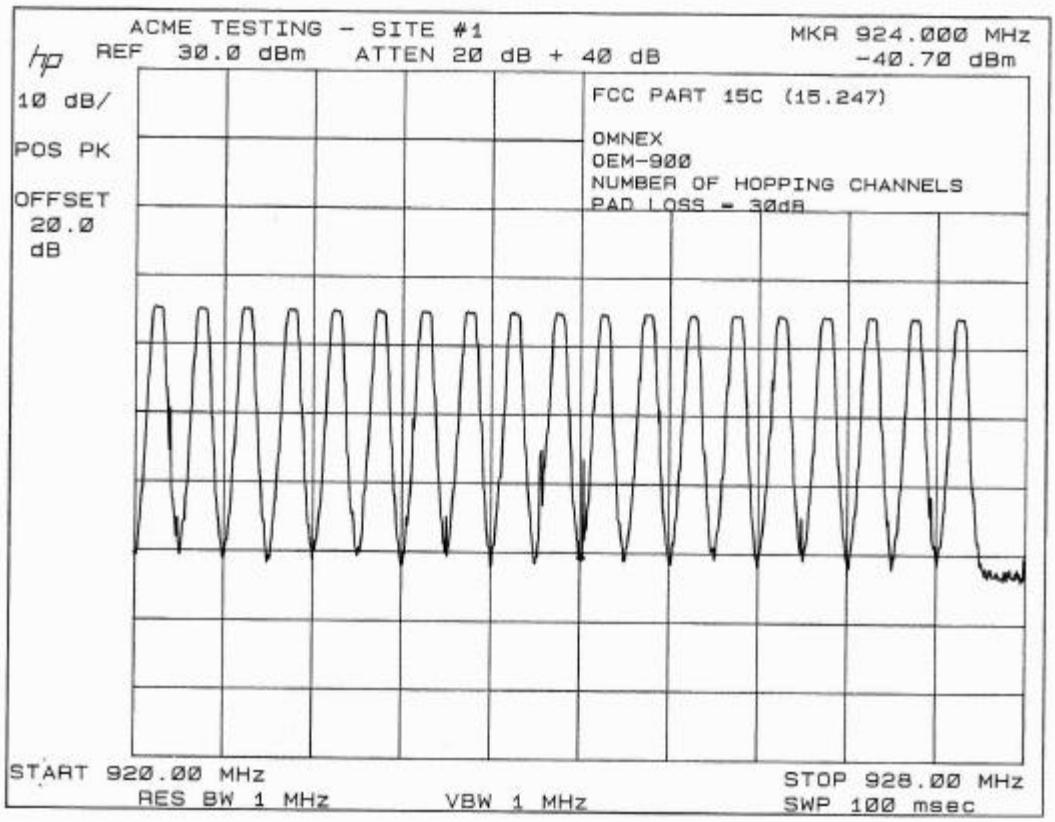

ACME TESTING - SITE #1
MKR 136.8 msec
REF 20.0 dBm
ATTEN 40 dB + 10 dB
-7.00 dBm
10 dB/
POS PK
OFFSET
-10.0
dB
FCC PART 15C (15.247)
OMNEX
OEM-900
TIME OF OCCUPANCY = 35msec
PAD LOSS = 20dB
CORR'D
CENTER 915.096 600 MHz
SPAN 0 Hz
RES BW 1 MHz
VBW 1 MHz
SWP 200 msec


ACME TESTING - SITE #1
MKR 170.8 msec
REF 20.0 dBm
ATTEN 40 dB + 10 dB
-6.80 dBm
10 dB/
POS PK
OFFSET
-10.0
dB
FCC PART 15C (15.247)
OMNEX
OEM-900
TIME OF OCCUPANCY = 35msec
PAD LOSS = 20dB
CORR'D
CENTER 927.496 798 MHz
SPAN 0 Hz
RES BW 1 MHz
VBW 1 MHz
SWP 200 msec


ACME TESTING - SITE #1
MKR 905.000 MHz
REF 30.0 dBm
ATTEN 20 dB + 40 dB
-3.30 dBm
10 dB/
POS PK
OFFSET
20.0
dB
FCC PART 15C (15.247)
OMNEX
OEM-900
NUMBER OF HOPPING CHANNELS
PAD LOSS = 30dB
START 902.00 MHz
RES BW 1 MHz
VBW 1 MHz
STOP 908.00 MHz
SWP 100 msec


ACME TESTING - SITE #1
MKR 911.000 MHz
REF 30.0 dBm
ATTEN 20 dB + 40 dB
-4.30 dBm
10 dB/
POS PK
OFFSET
20.0
dB
FCC PART 15C (15.247)
OMNEX
OEM-900
NUMBER OF HOPPING CHANNELS
PAD LOSS = 30dB
START 908.00 MHz
RES BW 1 MHz
VBW 1 MHz
STOP 914.00 MHz
SWP 100 msec


ACME TESTING - SITE #1
MKR 917.000 MHz
REF 30.0 dBm
ATTEN 20 dB + 40 dB
-4.60 dBm
10 dB/
POS PK
OFFSET
20.0
dB
FCC PART 15C (15.247)
OMNEX
OEM-900
NUMBER OF HOPPING CHANNELS
PAD LOSS = 30dB
START 914.00 MHz
RES BW 1 MHz
VBW 1 MHz
STOP 920.00 MHz
SWP 100 msec


ACME TESTING - SITE #1
MKR 924.000 MHz
REF 30.0 dBm
ATTEN 20 dB + 40 dB
-40.70 dBm
10 dB/
POS PK
OFFSET
20.0
dB
FCC PART 15C (15.247)
OMNEX
OEM-900
NUMBER OF HOPPING CHANNELS
PAD LOSS = 30dB
START 920.00 MHz
RES BW 1 MHz
VBW 1 MHz
STOP 928.00 MHz
SWP 100 msec

7. Power Output Level And Variation of Power Output Level With Supply Voltage

Date of Test: 17 October 2001

Laboratory: Test Site #2 (Acme, WA)

7.1 Regulations

15.247(b)(1) The maximum peak output power of the intentional radiator shall not exceed the following: For frequency hopping systems operating in the 2400-2483.5 MHz or 5725-5850 MHz band and for all direct sequence systems: 1 watt.

15.31(e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery-operated equipment, the equipment tests shall be performed using a new battery.

7.2 Test Equipment

⇒ RF Power Meter: Amplifier Research Model PM2002, Serial Number 301552, Calibration Date: 23 June 2001, Calibration Due Date: 23 June 2002

⇒ RF Power Head (10 kHz to 8 GHz) Amplifier Research Model PH2000, Serial Number 301199, Calibration Date: 23 June 2001, Calibration Due Date: 23 June 2002

⇒ 40dB Directional Coupler: Werlatone Model C6021, Serial Number 9679, Calibration Date: 15 May 2001, Calibration Due Date: 15 May 2002

⇒ 30dB High Power Attenuator: Weinschel Model 40-30-34, Serial Number A8024, Calibration Date: 11 May 2001, Calibration Due Date: 11 May 2002

⇒ 50 Ohm Terminators (Quantity=2) Texscan Corporation Model 9000NC010V1 96400 Serial Number None, No Periodic Calibration Required.

⇒ DC Power Supply (Variable Voltage): GW Model GPR-6030D, Serial Number 8661470 No Calibration Required

⇒ True RMS Multimeter, Fluke Model 189, Serial Number 7B110683, Calibration Date: 29 March 2001, Calibration Due Date: 29 March 2002

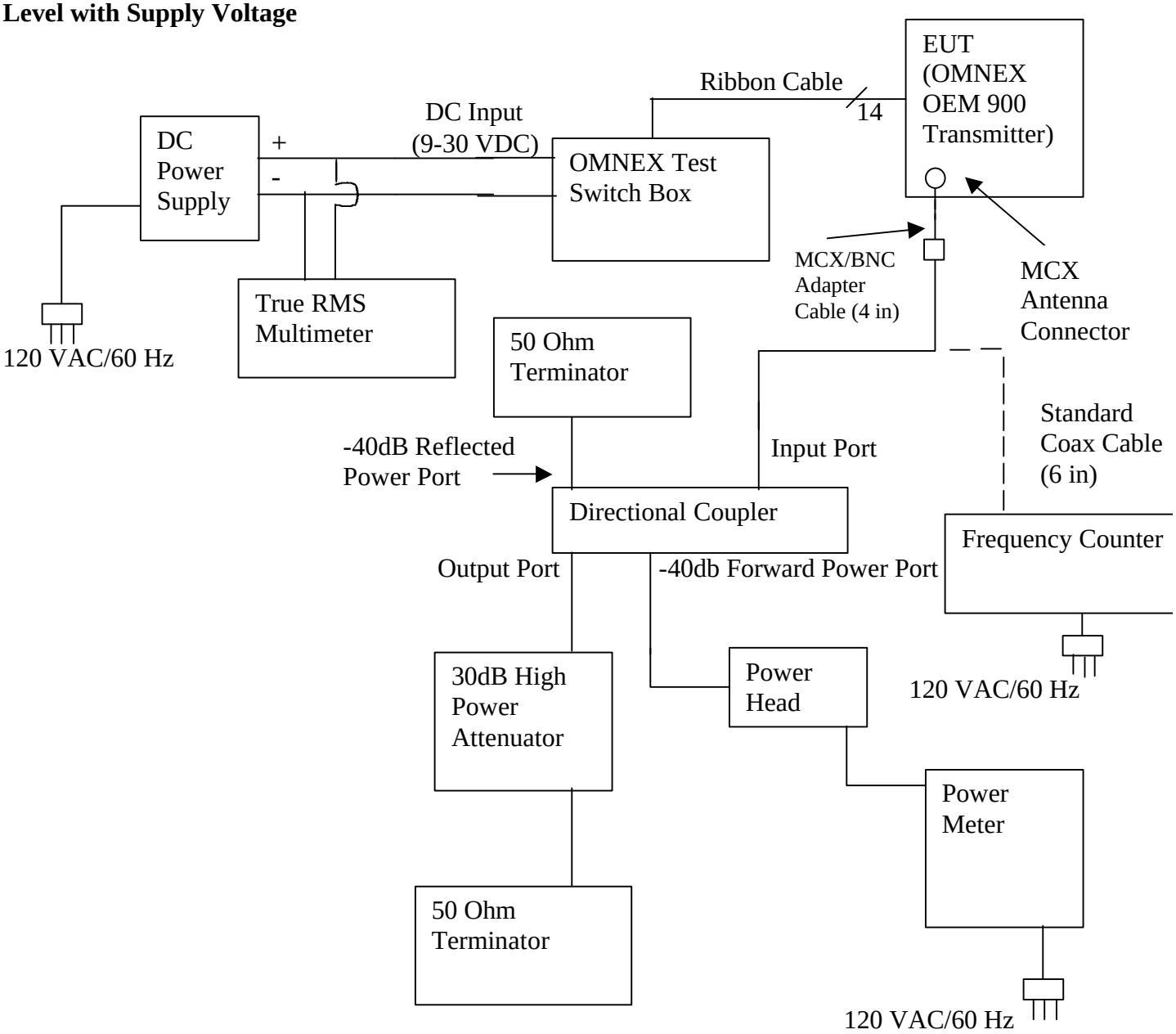
⇒ 20 Hz to 18 GHz Frequency Counter: Systron Donner Model 6054B with Option 1813, Serial Number: 26010-0, Calibration Date: 6 April 2001, Calibration Due Date: 6 April 2002

7.3 Test Procedures

The RF Power output levels and the variations in RF Power output levels were measured using a Calibrated Power Meter/Power Head, using the test setup shown in figure 7.3-1

Testing was performed at the Nominal voltage input (i.e. +12 VDC) and at the extreme voltage limits of the EUT (i.e. + 9VDC and + 30VDC), and at the two most common alternate voltages (i.e. + 24VDC and + 28 VDC). It should be noted that the EUT becomes inoperative when the input voltage is less than 9 VDC, and suffers fatal damage (and becomes inoperative) at input voltages greater than 30 VDC.

Figure 7.3-1 Test Setup Block Diagram For Power Output Level and Variation of Power Output Level with Supply Voltage



Note 1: The Frequency Counter was used to verify which channel the EUT was set to (i.e. f-Low=902.2 MHz, f-Middle=915.0 MHz, f-High=927.7 MHz)

Note 2: Standard Coax Cable was RG-223/U, Length: 6 inches, IL @ 900 MHz=0.8dB

7.4 Test Results

The highest measured RF power output levels of the EUT were as follows:

Channel #	Frequency (MHz)	DC Input Voltage	RF Output Power (dBm)
Channel 1	902.2 MHz	+9	+27.18
Channel 1	902.2 MHz	+12	+27.19
Channel 1	902.2 MHz	+24	+27.21 *
Channel 1	902.2 MHz	+28	+27.21 *
Channel 1	902.2 MHz	+30	+27.19
Channel 6	915.0 MHz	+9	+25.87
Channel 6	915.0 MHz	+12	+25.90
Channel 6	915.0 MHz	+24	+25.90
Channel 6	915.0 MHz	+28	+25.90
Channel 6	915.0 MHz	+30	+25.90
Channel 11	927.7 MHz	+9	+25.01
Channel 11	927.7 MHz	+12	+25.11
Channel 11	927.7 MHz	+24	+25.11
Channel 11	927.7 MHz	+28	+25.01
Channel 11	927.7 MHz	+30	+25.01

* Highest Output RF Power Level

Conclusion:

The EUT complies with the requirements of sections 15.247(b)(1) and 15.31 (e).

8. Antenna Gain Requirements

Date of Test: 28 June 2001

Laboratory: Test Site #2 (Acme, WA)

8.1 Regulation

15.247(b3) Except as shown below, 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 above stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.2 Result

The transmitter used a ¼ wave whip antenna with a directional gain of 2.14 dBi.

9. Radio Frequency Exposure

Date of Test: 28 June 2001

Laboratory: Test Site #2 (Acme, WA)

9.1 Regulation

15.247(b4) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. *See* §1.1307(b)(1) of this Chapter.

9.2 Result

According to Section 1.1307b(1), the EUT does not require an environmental evaluation.

1. This equipment classification is not listed within Table 1 of Section 1.1307 and is not listed in Section 1.1307b(2).
2. The EUT is categorically exempt from routine environmental evaluation per Section 2.1093.

Included are calculations that determine that minimum distance from the transmitter antenna that will ensure an exposure limit at or below the guidelines given in Table 1 of Section 1.1310 for the general population. The formula for these calculations are taken from OET Bulletin 65, edition 97-01, August 1997; "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields".

9.3 Calculations

Per Table 1 of Section 1.1310, the limit for General Population/Uncontrolled Exposure at 900 – 928 MHz is 0.6 mW/cm^2.

Per OET Bulletin 65, Edition 97-01, the formula for calculating power density is: $S=P*G/4ÐR^2$ with:

Power = 27.21 dBm = 526 mW

Gain of ¼ Wave Whip Antenna = 2.14 dBi or a numeric gain of 1.637

Therefore, solving for R gives a minimum safe distance of 10.7 cm.

Similarly, if the FCC-specified maximum 6 dBi Gain Antenna (Numeric Gain 3.981) would be used, the maximum safe distance would be 20.2 cm.

9.4 Conclusion

The manufacturer has specified 20 cm as the minimum safe distance in the EUT's User Manual.

10. Conducted Spurious Emissions

Date of Test: 28 June 2001

Laboratory: Test Site #1 (Acme, WA)

10.1 Regulation

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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

10.2 Test Equipment

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2503A06519, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ Quasi Peak Adapter (yellow): Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

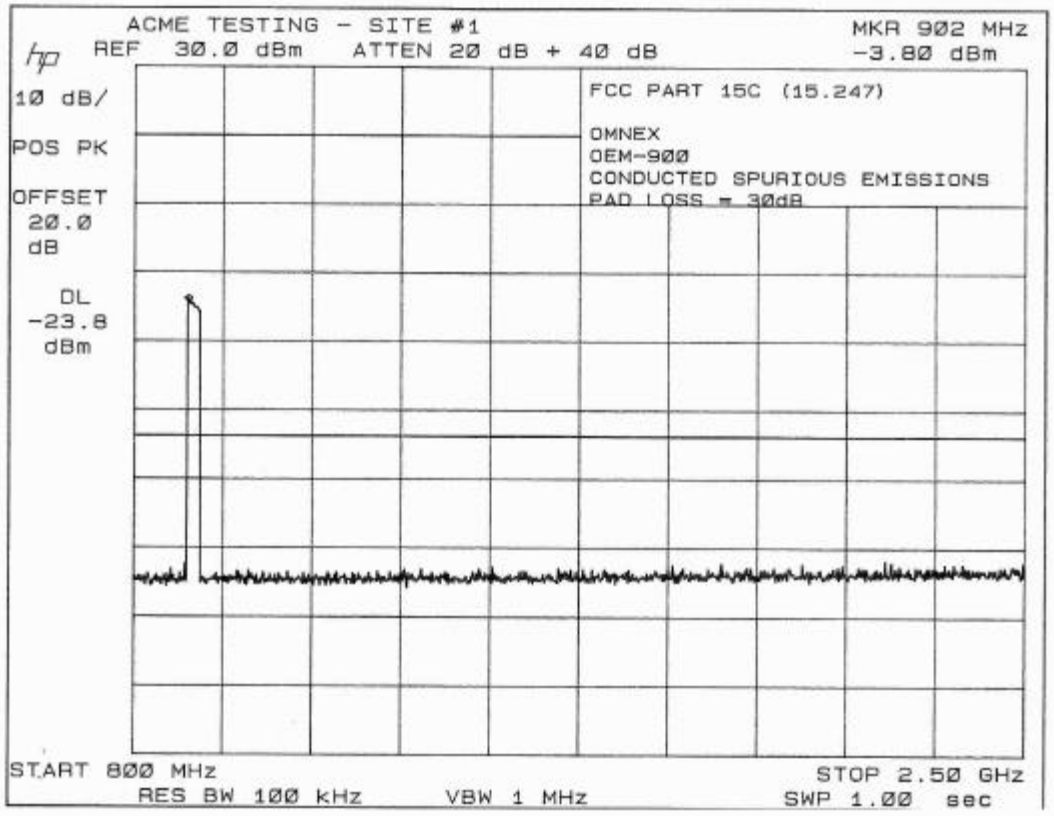
⇒ 30 dB High Power Attenuator: Weinschel 403034, Serial Number AS024, Calibrated: 11 May 2001, Calibration due Date: 11 May 2002

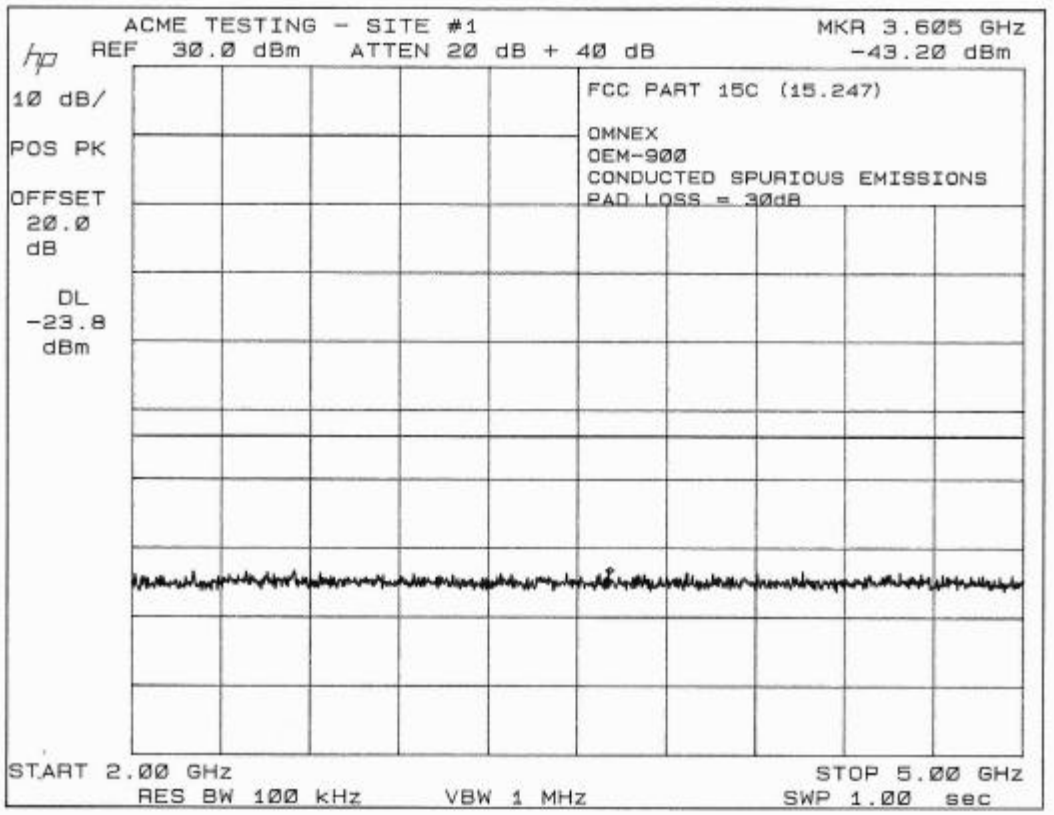
10.3 Test Procedures

The RF output of the EUT was connected to the RF input port of the RF Preselector. The following measurements were made with a RBW = 100 kHz and VBW = 1 MHz.

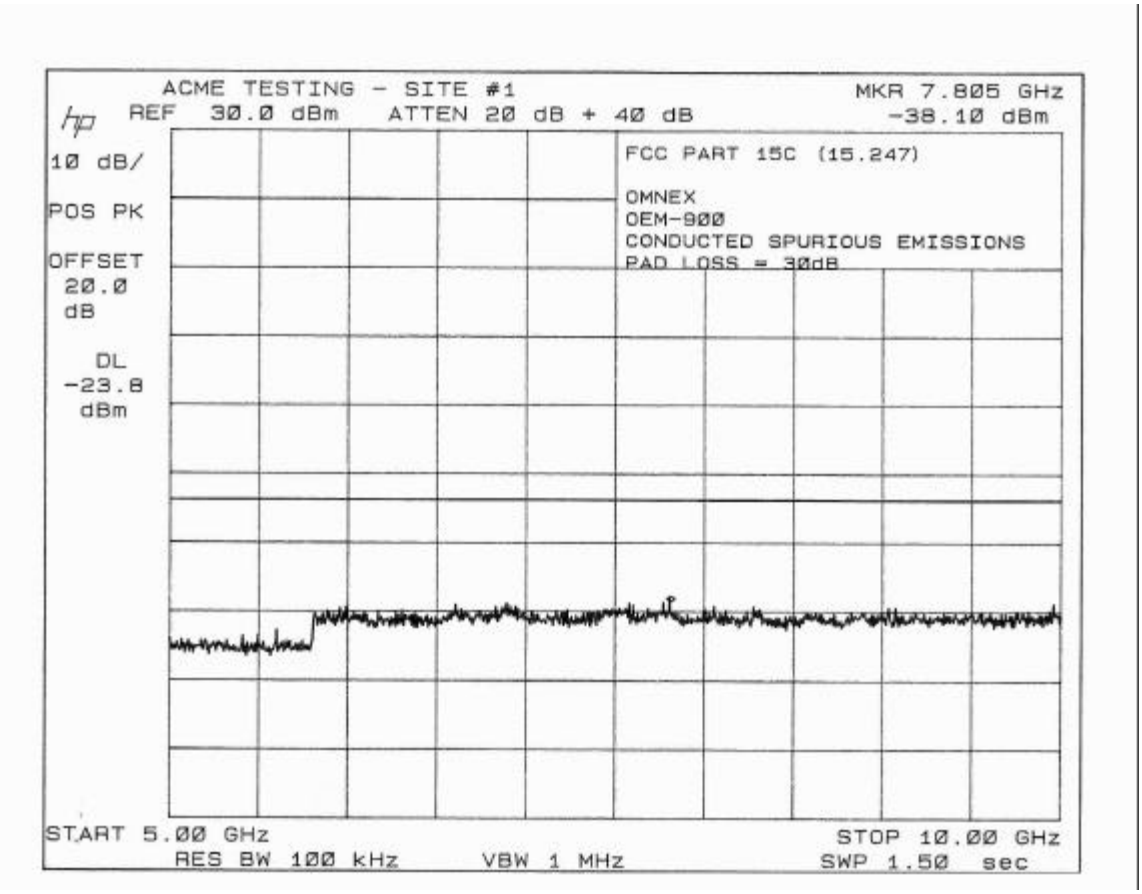
10.4 Test Results

No out of band conducted emissions were detected within 40 dB of the carrier power.


ACME TESTING - SITE #1
REF 30.0 dBm ATTEN 20 dB + 40 dB
MKR 902 MHz
-3.80 dBm
10 dB/
POS PK
OFFSET
20.0
dB
DL
-23.8
dBm
FCC PART 15C (15.247)
OMNEX
OEM-900
CONDUCTED SPURIOUS EMISSIONS
PAD LOSS = 30dB
START 800 MHz
RES BW 100 kHz
VBW 1 MHz
STOP 2.50 GHz
SWP 1.00 sec


ACME TESTING - SITE #1
REF 30.0 dBm ATTEN 20 dB + 40 dB
MKR 3.605 GHz
-43.20 dBm
10 dB/
POS PK
OFFSET
20.0
dB
DL
-23.8
dBm
FCC PART 15C (15.247)
OMNEX
OEM-900
CONDUCTED SPURIOUS EMISSIONS
PAD LOSS = 30dB
START 2.00 GHz
RES BW 100 kHz
VBW 1 MHz
STOP 5.00 GHz
SWP 1.00 sec

2002 Valley Highway PO Box 3 Acme WA 98220-0003
phone:888 226-3837 fax: 360 595-2722



11. Radiated Spurious Emissions

Date of Test: 29 June 2001

Laboratory: Test Site #2 (Acme, WA)

11.1 Regulation

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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

11.2 Test Equipment

⇒ Broadband Log Periodic Antenna (blue) (200 MHz to 1000 MHz): EMCO 3146, Serial Number 2852, Calibrated: 21 May 2001, Calibration due Date: 21 May 2002

⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2503A06519, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ Quasi Peak Adapter (yellow): Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

⇒ Double Ridge Guide Horn Antenna: EMCO 3115, Serial Number 9807-5534, Calibrated: 5 January 2001, Calibration due Date: 25 January 2002

⇒ 1 GHz to 26 GHz Preamplifier: Hewlett Packard HP8449B/H02, Serial Number 2933A00198, Calibrated: 03 May 2001, Calibration Due Date: 03 May 2003

⇒ High-Pass Filter: Microphase Model CR220HIB, Serial Number: 1119, Calibration Date: 12 October 2001, Calibration Due Date: 12 October 2002

⇒ Open Area Test Site: Acme Testing Co., Test Site Number 2, Calibrated: 24 June 2001, Calibration due Date: 24 June 2002

11.3 Test Procedures

The EUT was placed on a 1 meter by 1.5 meters wide and 0.8-meter high nonconductive table that was placed directly onto a flush mounted turntable. The EUT was connected to its support equipment with any excess I/O cabling bundled to approximately 1 meter.

Prescan tests were performed to determine the “worst-case” orientation of the EUT (By Manipulating the EUT’s position through all three orthogonal axes). With the EUT positioned in the “worst case” orientation, emissions from the unit were maximized by manipulating the cables, and by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable.

Radiated Emissions Test Characteristics

Frequency range	30 MHz – 22000 MHz **15.205 RESTRICTED BANDS ONLY**
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz (30 MHz – 1000 MHz) 1 MHz (1000 MHz – 10,000 MHz)

Note: Per Section 15.205(b), compliance with the limits in Section 15.209 shall be demonstrated using measurements made with a Quasi-Peak CISPR Detector (for frequencies less than or equal to 1000 MHz) and using an average detector (for frequencies above 1000 MHz). In addition, per Section 15.35 (b), compliance must also be demonstrated to a peak limit that is 20dB above the average limit in Section 15.209.
Note: At frequencies above 1 GHz, Average measurements were made with RBW=1 MHz, VBW=10 Hz

Receive antenna scan height	1 m – 4 m
Receive antenna polarization	Vertical/Horizontal

11.4 Test Results

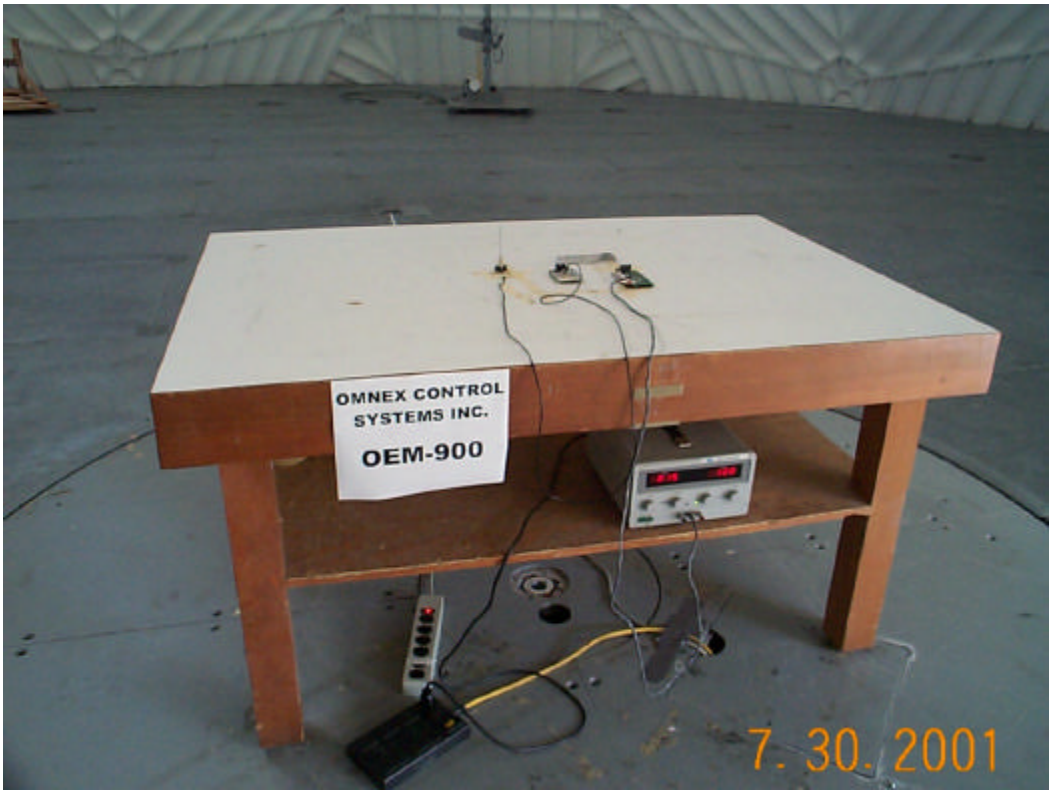
OEM-900 with ¼ Wave Whip Antenna
No spurious signals were detected from 900 MHz to 10 GHz
The noise floor levels in the restricted bands are shown below:

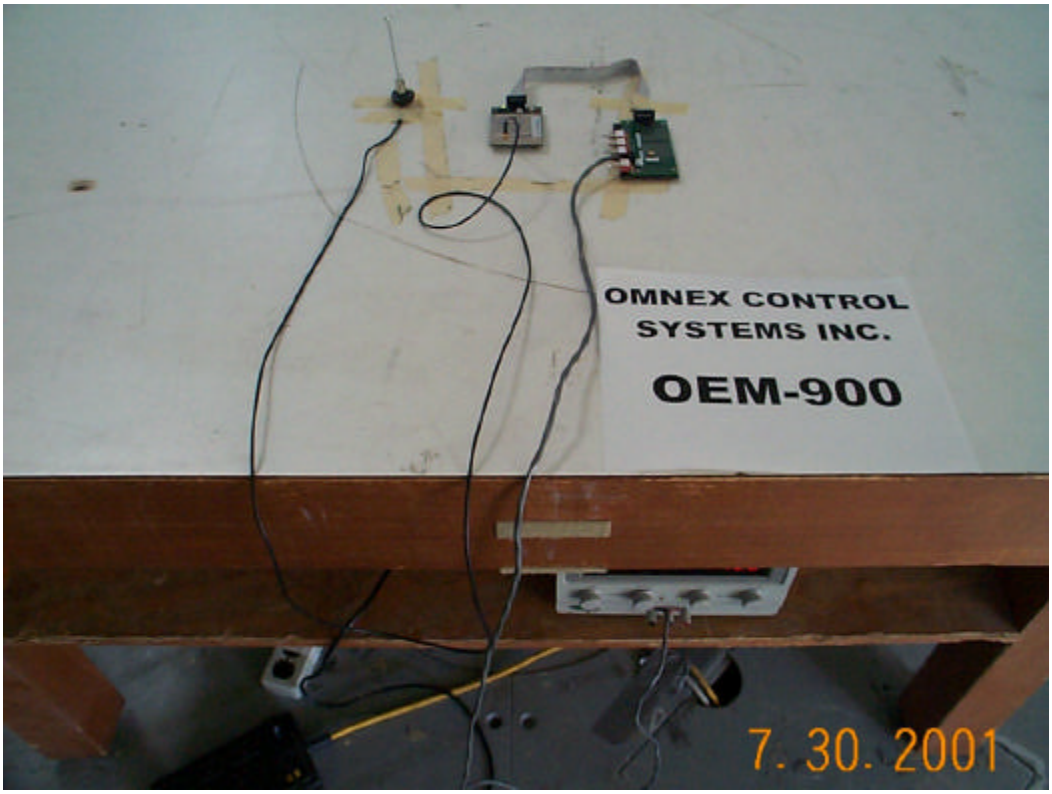
PRODUCT EMISSIONS

ACME TESTING - SITE #1
47 CFR, PART 15C, 15.247 Data File: OEM-900, 2-10GHz, AVG 17 OCT 2001

No	EMISSION FREQUENCY MHz	SPEC LIMIT dBuV/m	MEASUREMENTS ABS	dLIM dB	POL	SITE HGT cm	AZM deg	CORR FACTOR dB	COMMENTS
1	2706.33	54.0	30.6	-23.4	V	101	0	-4.9	NOISE FLOOR
2	2745.12	54.0	29.7	-24.3	V	101	0	-4.9	NOISE FLOOR
3	2781.86	54.0	31.8	-22.2	V	101	0	-4.8	NOISE FLOOR
4	3609.80	54.0	33.4	-20.7	V	101	0	-2.2	NOISE FLOOR
5	3660.10	54.0	33.1	-20.9	V	101	0	-1.9	NOISE FLOOR
6	3711.64	54.0	33.5	-20.5	V	101	0	-1.6	NOISE FLOOR
7	4510.48	54.0	33.5	-20.5	V	101	0	-1.1	NOISE FLOOR
8	4574.67	54.0	37.5	-16.5	V	101	0	-1.	NOISE FLOOR
9	4634.57	54.0	35.9	-18.1	V	101	0	-0.9	NOISE FLOOR
10	5412.98	54.0	37.8	-16.2	V	101	0	1.5	NOISE FLOOR
11	5489.86	54.0	38.2	-15.8	V	101	0	1.8	NOISE FLOOR
12	5566.03	54.0	35.7	-18.3	V	101	0	1.7	NOISE FLOOR
13	6315.77	54.0	37.2	-16.8	V	101	0	1.6	NOISE FLOOR
14	6404.56	54.0	38.0	-16.0	V	101	0	1.7	NOISE FLOOR
15	6493.65	54.0	29.3	-24.7	V	101	0	1.7	NOISE FLOOR
16	7217.57	54.0	39.5	-14.5	V	100	0	4.3	NOISE FLOOR
17	7319.86	54.0	39.7	-14.3	V	101	0	4.6	NOISE FLOOR
18	7421.83	54.0	38.4	-14.6	V	101	0	4.8	NOISE FLOOR
19	8119.78	54.0	41.4	-12.6	V	101	0	6.	NOISE FLOOR
20	8235.22	54.0	43.7	-10.3	V	101	0	7.8	NOISE FLOOR
21	8349.38	54.0	42.8	-11.2	V	101	0	6.8	NOISE FLOOR
22	9022.17	54.0	42.7	-11.3	V	101	0	7.2	NOISE FLOOR
23	9150.00	54.0	41.0	-13.0	V	101	0	6.4	NOISE FLOOR
24	9276.92	54.0	38.8	-15.1	V	101	0	5.8	NOISE FLOOR

11.5 Test Setup Photographs





12. Continuous Data and Short Transmissions

Date of Test: 28 June 2001

Laboratory: Test Site #2 (Acme, WA)

12.1 Regulation

15.247(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

12.2 Test Results

When required to send continuous data, all frequencies of a sequence (i.e. 63) were used once before any re-use of frequencies occurred. When presented with a short burst, any one frequency is not re-used until all 63 frequencies of the sequence have been used. In no case is a sequence truncated and restarted.

13. Coordination of Frequency Hopping

Date of Test: 28 June 2001

Laboratory: Test Site #2 (Acme, WA)

13.1 Regulation

15.247(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

13.2 Result

This system did not incorporate intelligence to avoid interfering carriers. It progressed linearly through the hopping sequence.

14. Band Edge Compliance

Date of Test: 29 June 2001

Laboratory: Test Site #2 (Acme, WA)

14.1 Regulation

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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

14.2 Test Equipment

⇒ Broadband Log Periodic Antenna (blue) (200 MHz to 1000 MHz): EMCO 3146, Serial Number 2852, Calibrated: 21 May 2001, Calibration due Date: 21 May 2002

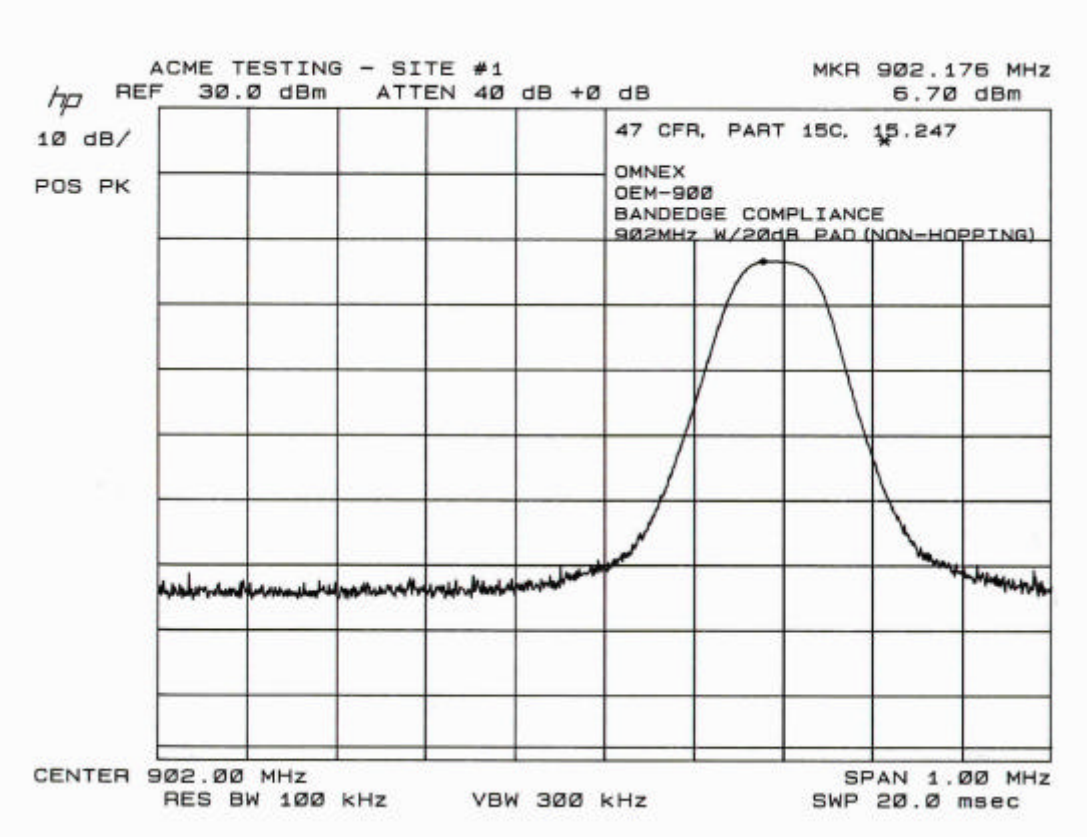
⇒ Spectrum Analyzer (yellow): Hewlett-Packard 8566B, Serial Number 2503A06519, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

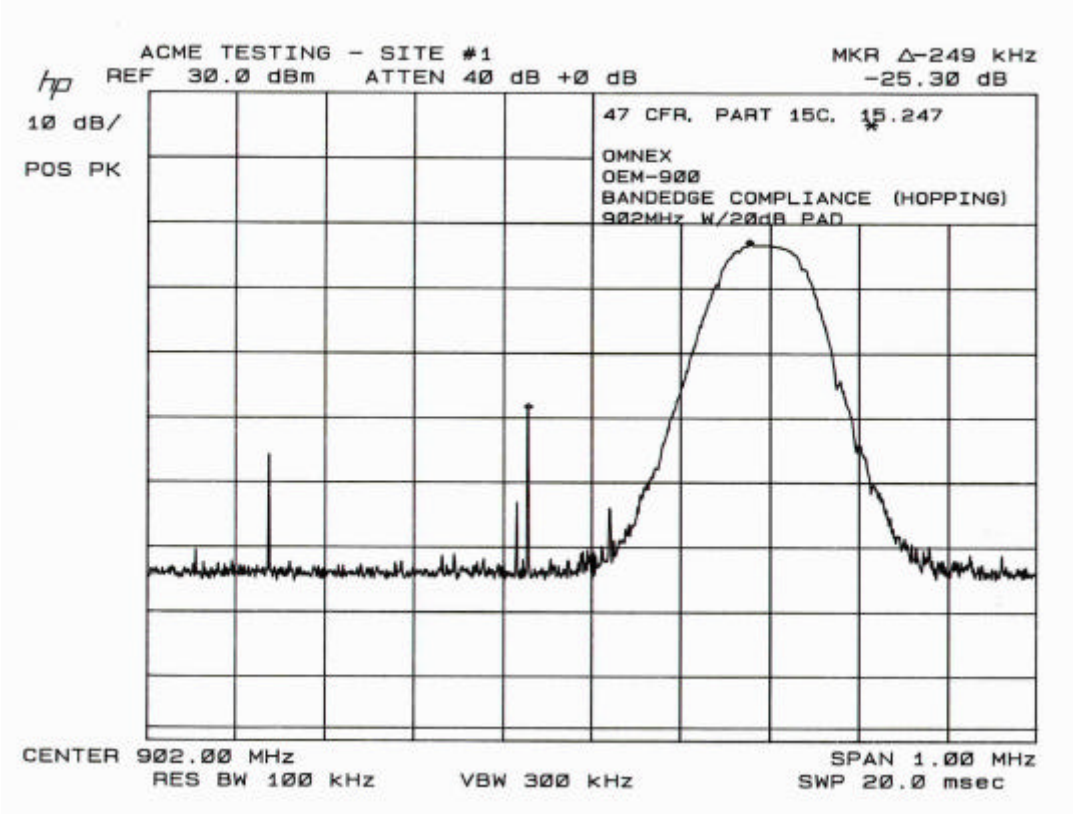
⇒ RF Preselector (yellow): Hewlett-Packard 85685A, Serial Number 2648A00392, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

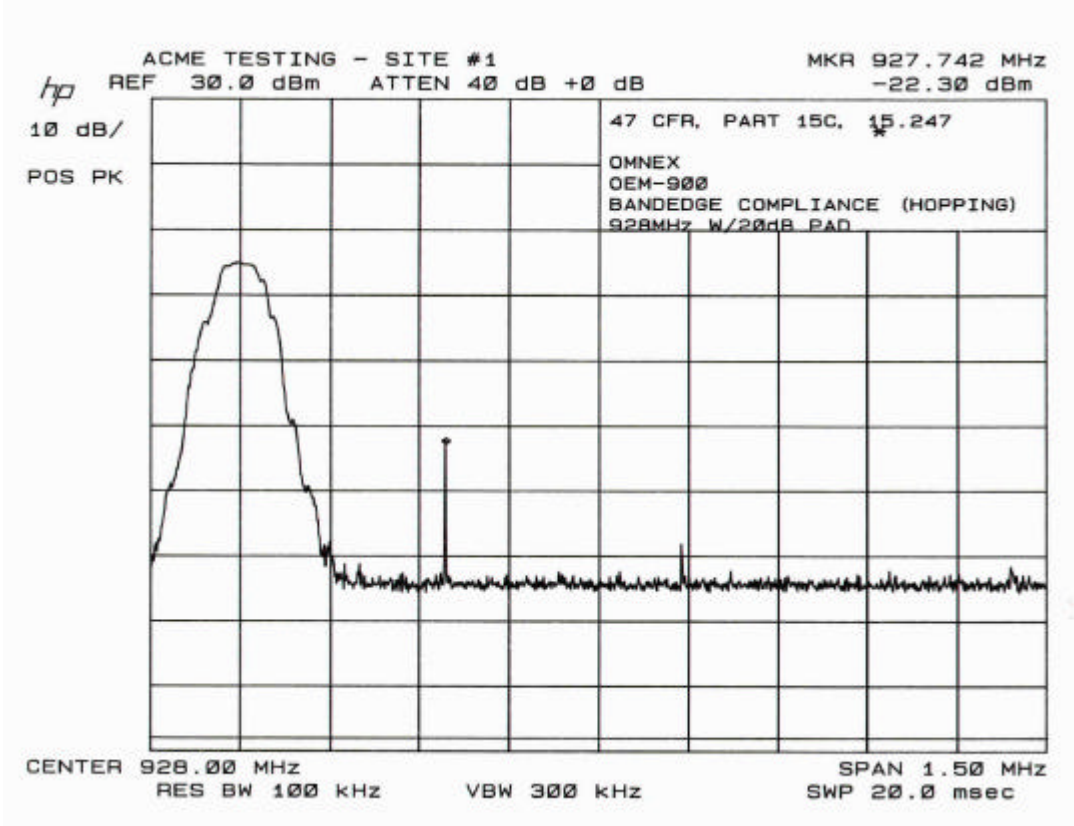
⇒ Quasi Peak Adapter (yellow): Hewlett-Packard 85650A, Serial Number 2521A-00689, Calibrated: 20 November 2000, Calibration due Date: 20 November 2001

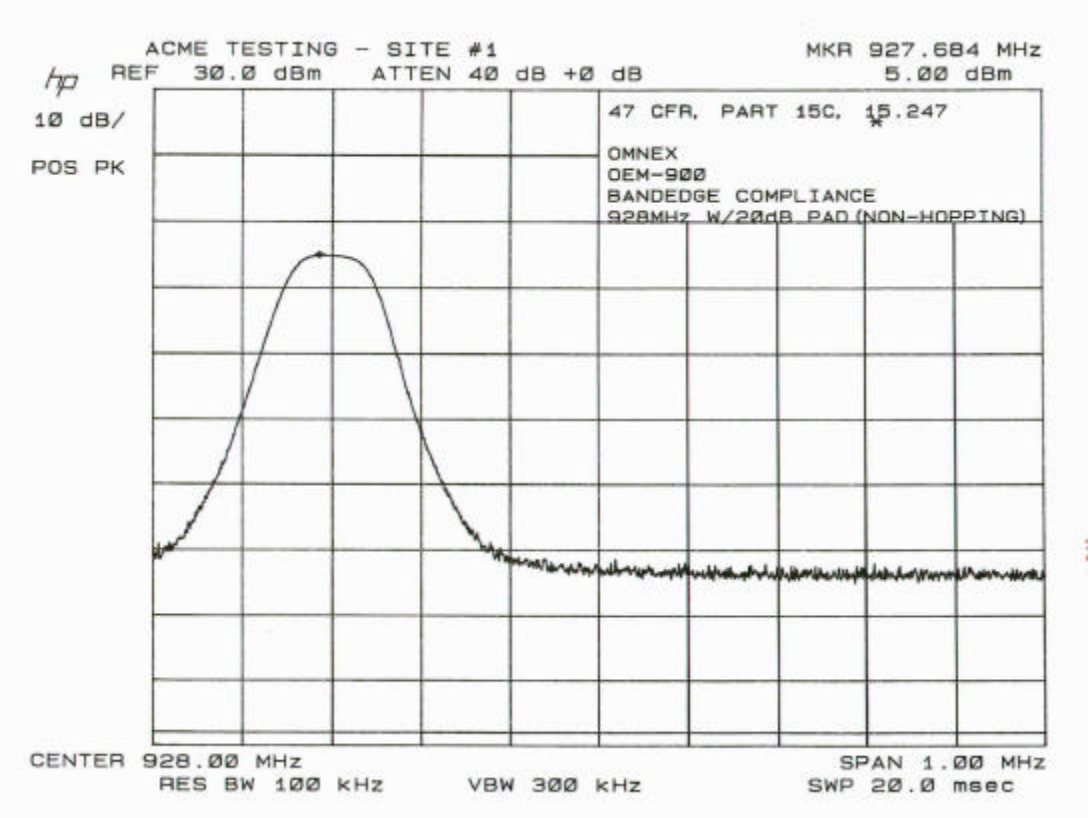
14.3 Test Results

All Out-of-band-Emissions were attenuated below the level of the carrier by at least 20 dB.


ACME TESTING - SITE #1
MKR 902.176 MHz
REF 30.0 dBm ATTEN 40 dB +0 dB
6.70 dBm
10 dB/
POS PK
47 CFR, PART 15C, 15.247
OMNEX
OEM-900
BANDEDGE COMPLIANCE
902MHz W/20dB PAD (NON-HOPPING)
CENTER 902.00 MHz
SPAN 1.00 MHz
RES BW 100 kHz
VBW 300 kHz
SWP 20.0 msec


ACME TESTING - SITE #1
MKR Δ-249 kHz
REF 30.0 dBm ATTEN 40 dB +0 dB
-25.30 dB
10 dB/
POS PK
47 CFR, PART 15C, 15.247
OMNEX
OEM-900
BANDEDGE COMPLIANCE (HOPPING)
902MHz W/20dB PAD
CENTER 902.00 MHz
SPAN 1.00 MHz
RES BW 100 kHz
VBW 300 kHz
SWP 20.0 msec


ACME TESTING - SITE #1
MKR 927.742 MHz
REF 30.0 dBm
ATTEN 40 dB +0 dB
-22.30 dBm
10 dB/
POS PK
47 CFR, PART 15C, 15.247
OMNEX
OEM-900
BANDEDGE COMPLIANCE (HOPPING)
928MHz W/20dB PAD
CENTER 928.00 MHz
SPAN 1.50 MHz
RES BW 100 kHz
VBW 300 kHz
SWP 20.0 msec


ACME TESTING - SITE #1
MKR 927.684 MHz
REF 30.0 dBm
ATTEN 40 dB +0 dB
5.00 dBm
10 dB/
POS PK
47 CFR, PART 15C, 15.247
OMNEX
OEM-900
BANDEDGE COMPLIANCE
928MHz W/20dB PAD (NON-HOPPING)
CENTER 928.00 MHz
SPAN 1.00 MHz
RES BW 100 kHz
VBW 300 kHz
SWP 20.0 msec

15. Miscellaneous Comments and Notes

1. None.

16. Informative Information

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC GUIDE 25-1990 (EN45001)

ACME TESTING
2002 Valley Highway
Acme, WA 98220-0003
Steve Fitzgerald Phone: 360 595 2785

ELECTRICAL (EMC)

Valid to: November 30, 2001 Certificate Number: 0829-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following Electromagnetic Compatibility (EMC) tests:

Radiated & Conducted Emissions
Immunity
Voltage sags
Harmonics
Flicker

On the following materials and products:
Electrical and electronic equipment for information technology; industrial, scientific, and medical applications; residential service; receivers; and licensed and unlicensed transmitters.

Using the following standards:
U.S. Code of Federal Regulations (CFR) 47, FCC Method Parts 15 (using ANSI C63.4-1992), 18 & 90
CISPR: 11; 13; 14 (*excluding click measurements*); 22 (*including Amendments 1 and 2*)
CNS: 13439; 13438
EN: 50081-1; 50081-2; 50082-1; 50082-2; 55011; 55013; 55014-1 (*excluding click measurements*); 55014-2; 55022; 55103-1; 55103-2; 60601-1-2; 60945 (*sections 9 & 10 only*); 61000-4-2; 61000-4-3; 61000-4-4; 61000-4-5 (*single phase only, excluding 10/700 surge testing*); 61000-4-6; 61000-4-8; 61000-4-11; 61000-3-2; 61000-3-3
AS/NZS: 3548, 2064.1/2, 4251.1, 4252.1
IEC: 801-2; 801-3; 801-4; 801-5; 1000-4-2; 1000-4-3; 1000-4-4; 1000-4-5; 1000-4-6
ENV: 50140; 50204
ICES-003 Issue 2 Revision 1
RSS-210 Issue 2
Bellcore GR-1089-CORE (*Sections 2 through 3.2.4*)

Peter Mayer

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8370 • Phone: 301 644 3248 • Fax: 301 662 2974

2002 Valley Highway PO Box 3 Acme WA 98220-0003
phone:888 226-3837 fax: 360 595-2722

Laboratory Division
7435 Oakland Mills Road
Columbia, MD. 21046

November 22, 1999

Registration Number: 90420

Acme Testing Company
P.O. Box 3
2002 Valley Highway
Acme, WA 98220-0003

Attention: Paul Slavens

Re: Measurement facility located at Acme, Sites 1 & 2
3, 10 & 30 meter sites
Date of Listing: November 22, 1999

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that this filing must be updated for any changes made to the facility, and at least every three years from the date of listing the data on file must be certified as current.

If requested, the above mentioned facility has been added to our list of those who perform these measurement services for the public on a fee basis. An up-to-date list of such public test facilities is available on the Internet on the FCC Website at WWW.FCC.GOV, E-Filing, OET Equipment Authorization Electronic Filing.

Sincerely,

Thomas W Phillips
Electronics Engineer