

16. Radiated Emissions Tests

Test Requirement: FCC Rules: 47CFR Part 15, Subpart B

Test Procedure: ANSI C63.4 - 1992

Date of Test: 26 December 2002

Laboratory: Test Site #2 (Acme, WA)

16.1 Test Equipment

- ⇒ Spectrum Analyzer (blue): Hewlett-Packard 8566B, Serial Number 2410A00168, Calibrated: 17 April 2002, Calibration Due Date: 17 April 2003
- ⇒ RF Preselector (blue): Hewlett-Packard 85685A, Serial Number 2648A00519, Calibrated: 17 April 2002, Calibration Due Date: 17 April 2003
- ⇒ Quasi Peak Adapter (blue): Hewlett-Packard 85650A, Serial Number 2043A00327, Calibrated: 17 April 2002, Calibration Due Date: 17 April 2003
- ⇒ 1 GHz to 26 GHz Preamplifier: Hewlett Packard HP8449B/H02, Serial Number 2933A00198, Calibrated: 03 May 2001, Calibration Due Date: 03 May 2003
- ⇒ Loop Antenna (10 kHz – 30 MHz): EMCO 6502, Serial Number 2178 Calibrated: 26 December 2001, Calibration Due Date: 26 December 2002
- ⇒ Biconical Antenna (blue) (20 MHz to 200 MHz): EMCO 3110, Serial Number 1180, Calibrated: 14 June 2002, Calibration Due Date: 14 June 2003
- ⇒ Log Periodic Antenna (red) (200 MHz to 1000 MHz): EMCO 3146, Serial Number 9008-2853, Calibrated: 05 August 2002, Calibration Due Date: 05 August 2003
- ⇒ Double Ridge Guide Horn Antenna: (1 GHz to 18 GHz): EMCO 3115, Serial Number 9807-5534, Calibrated: 16 September 2002, Calibration Due Date: 16 September 2003
- ⇒ Turntable: Rothenbuhler Engineering, Custom, No Calibration Required
- ⇒ Turntable Position Controller: EMCO 1051, Serial Number 9002-1457, No Calibration Required
- ⇒ Antenna Mast and Controller: EMCO 1061, Serial Number 9003-1440, No Calibration Required
- ⇒ Open Area Test Site: Acme Testing Co., Test Site Number 2, Calibrated: 22 June 2002, Calibration Due Date: 22 June 2003

16.2 Purpose

The purpose of this test was to evaluate the radiated electromagnetic interference characteristics of the EUT.

16.3 Test Procedures

The EUT was placed on a 1 meter long by 1.5 meters wide by 0.8 meter high nonconductive table that was placed directly onto a flush mounted turn table. The EUT was connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter.

With the EUT operating in “Receive” mode, emissions from the EUT were maximized by manipulating the cables, and by adjusting the polarization and height of the Detection System’s receive antenna and rotating the EUT on the turntable.

Note: During Testing, the EUT’s antennas were oriented in accordance with the manufacturer’s installation requirement.

Radiated Emissions Test Characteristics

Frequency range	30 MHz - 5000 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz (30 Mhz – 1 GHz); 1 MHz (1 GHz – 5 GHz)
Receive antenna scan height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal

16.4 Test Results

A summary of the highest amplitude Radiated Emission is listed below:

FCC RULES: 47CFR PART 15 SUBPART SECTION 15.109 CLASS B (CISPR LIMITS)
(30 MHz – 5000 MHz) 60 Hz/120 VAC

EUT IN RECEIVE MODE

No	EMISSION	SPEC	MEASUREMENTS			POL	SITE	AZM	CORR
	FREQUENCY	LIMIT	ABS	dLIM	MODE		HGT		FACTOR
	MHz	dBuV/m		dB			cm	deg	dB
1	133.734	43.5	35.4	-8.1	QP	V	107	237	16.3
2	205.743	43.5	37.6	-5.9	QP	H	144	100	14.3
3	212.385	43.5	40.6	-2.9	QP	H	184	123	14.2
4	464.517	46.0	37.9	-8.1	QP	H	100	285	22.3
5	497.709	46.0	38.7	-7.3	QP	H	100	304	23.2
6	564.052	46.0	42.0	-4.0	QP	H	185	153	24.5

Only the 6 (six) highest amplitude radiated emissions are listed above.

The EUT complied with the Class B Radiated Emissions Limits specified in 47CFR Part 15 Subpart B Section 15.109.

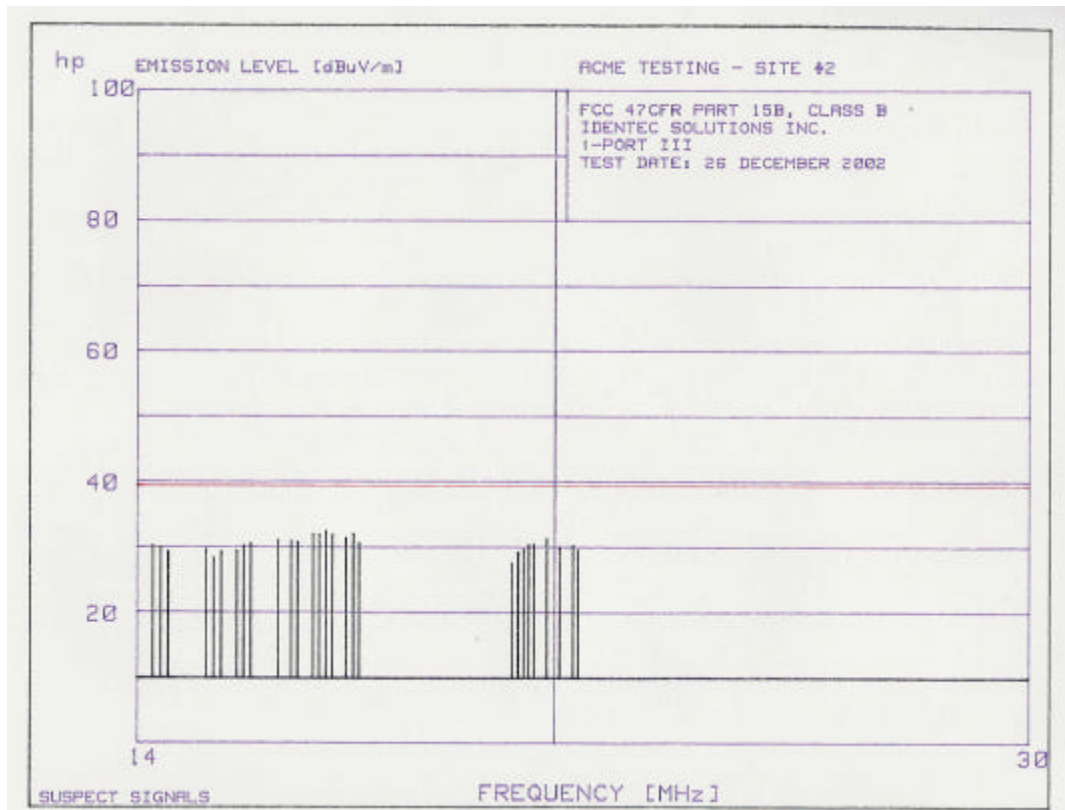
ACME TESTING - SITE #2
ALL SUSPECTS

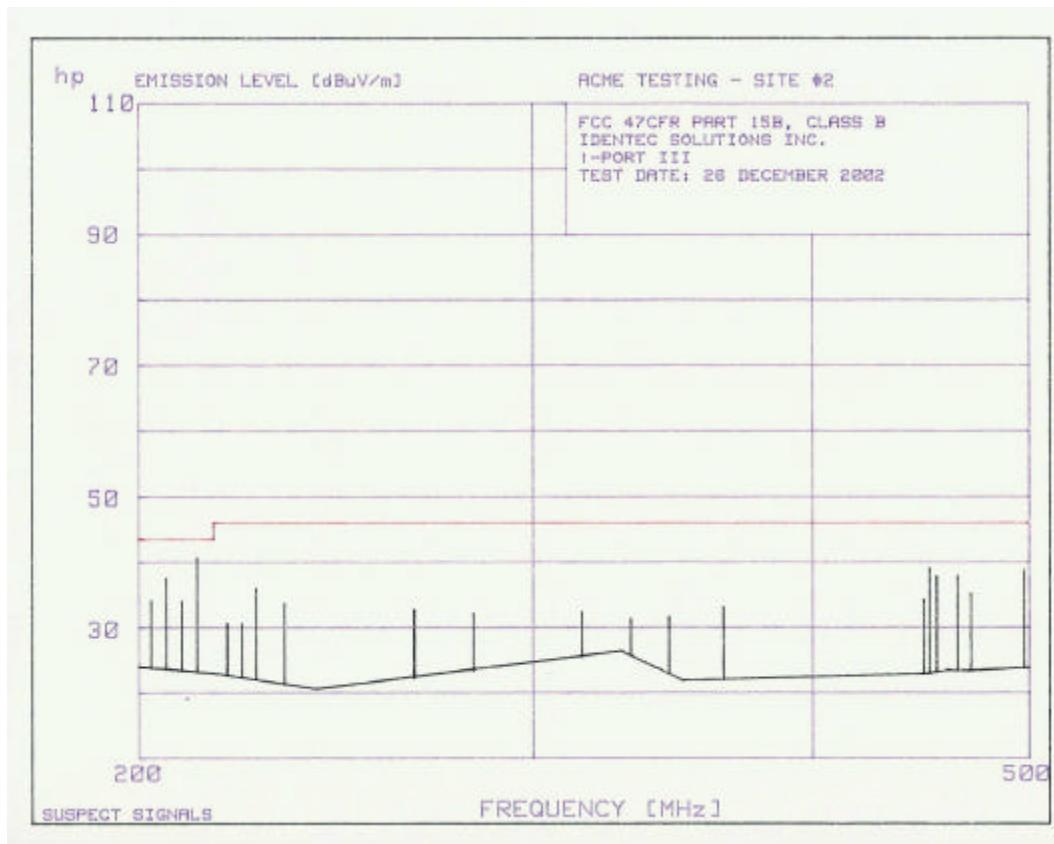
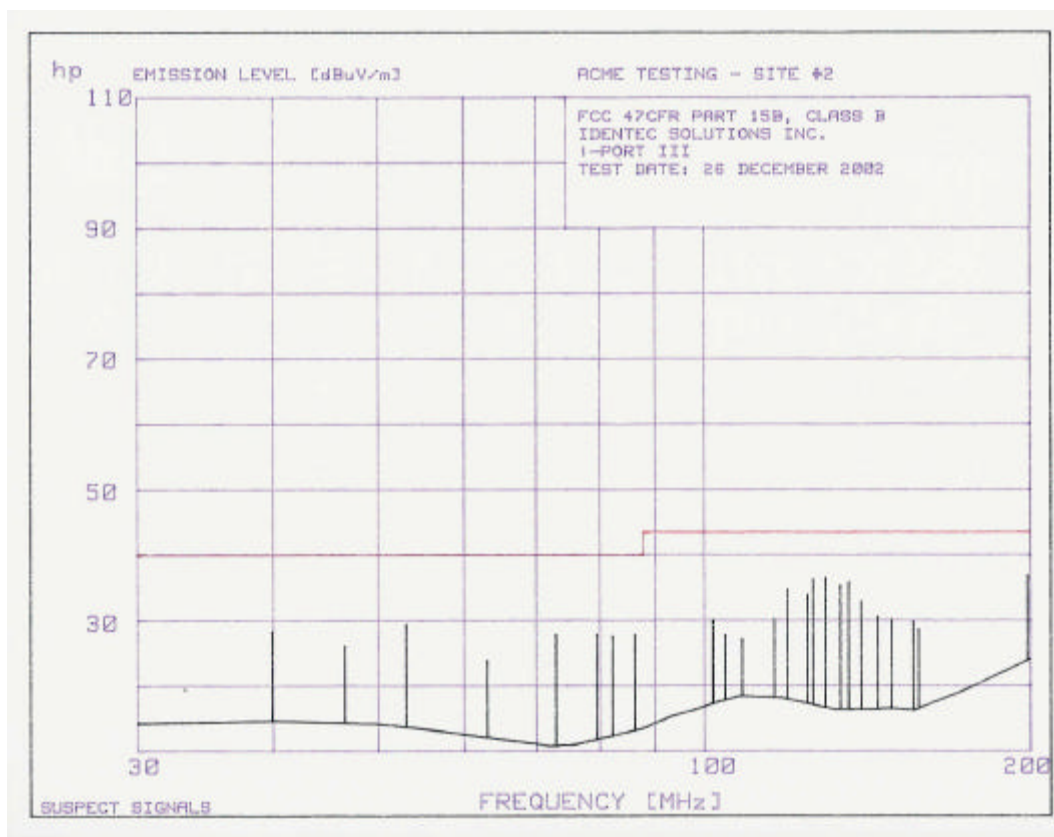
26 Dec 1902 13:40:25

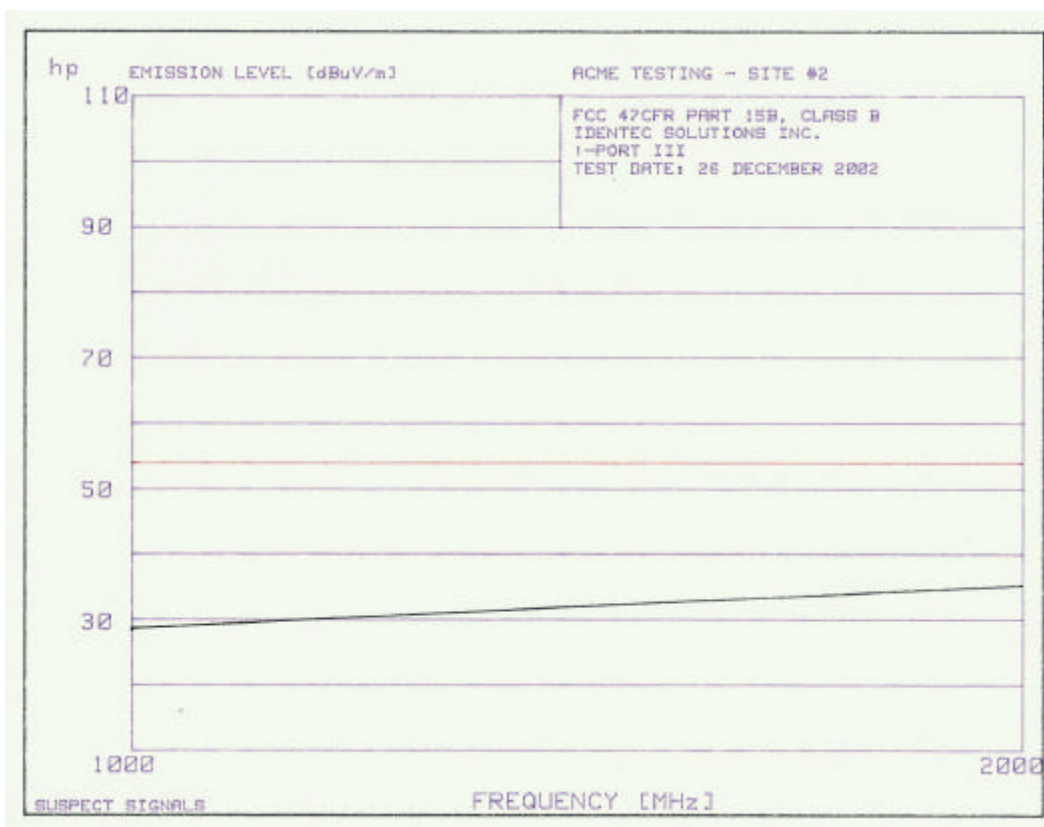
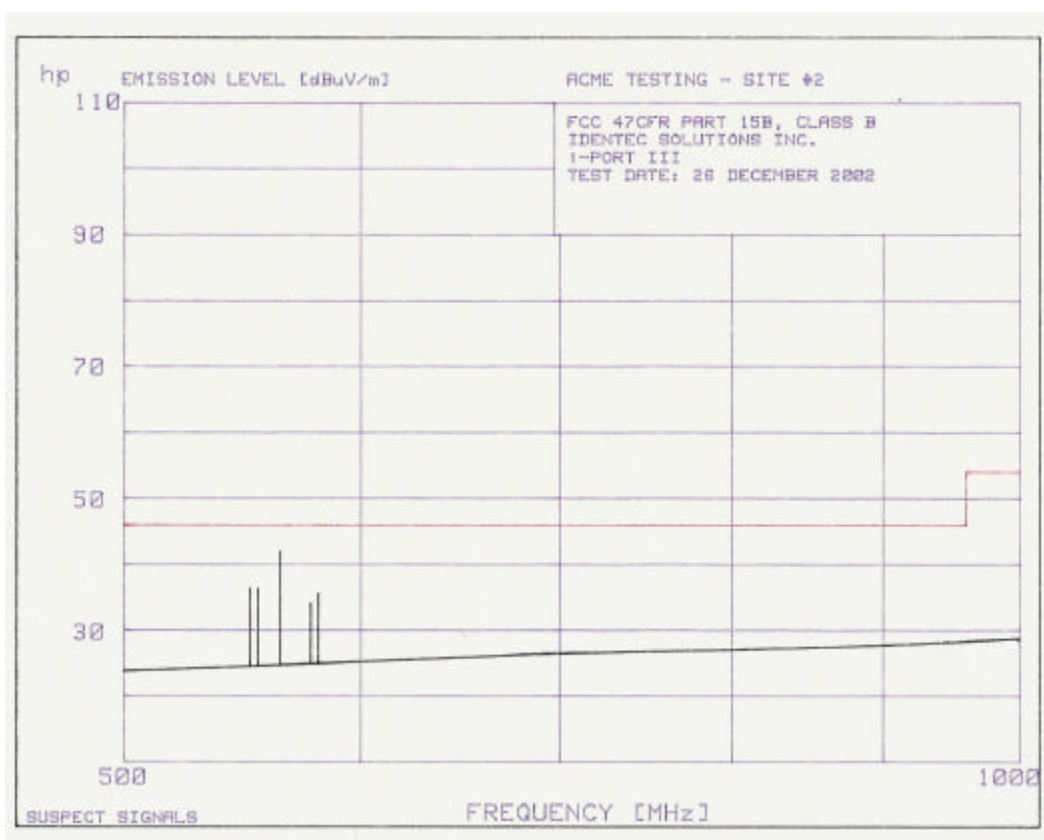
No	FREQ MHz	BND	PEAK LIM	ABS	ANT P	AZ cm deg	COMMENTS
1	14.192	22	-9	30.3	V150	189	
2	14.287	22	-9	30.0	V150	189	
3	14.378	22	-10	29.3	V150	189	
4	14.858	22	-10	29.7	V150	189	
5	14.949	22	-11	28.4	V150	189	
6	15.043	23	-10	29.3	V150	189	
7	15.246	23	-10	29.5	V150	189	
8	15.340	23	-9	30.3	V150	189	
9	15.429	23	-9	30.6	V150	189	
10	15.796	24	-8	31.1	V150	189	
11	15.974	24	-9	30.9	V150	189	
12	16.064	24	-9	30.7	V150	189	
13	16.273	24	-7	32.0	V150	189	
14	16.364	24	-8	31.9	V150	189	
15	16.454	24	-7	32.5	V150	189	
16	16.551	24	-8	31.9	V150	189	
17	16.744	24	-8	31.4	V150	189	
18	16.844	24	-7	32.1	V150	189	
19	16.933	24	-9	30.7	V150	189	
20	19.293	25	-12	27.5	V150	189	
21	19.395	25	-10	29.2	V150	189	
22	19.487	25	-10	29.7	V150	189	
23	19.573	25	-9	30.4	V150	189	
24	19.659	25	-9	30.5	V150	189	
25	19.873	25	-8	31.3	V150	189	
26	20.09	26	-9	30.1	V150	189	
27	20.32	26	-9	30.3	V150	189	
28	20.41	26	-10	29.6	V150	189	
29	39.92	27	-12	28.3	V107	274	
30	46.60	27	-14	26.1	V107	272	
31	53.125	27	-11	29.4	V107	315	
32	63.16	27	-16	23.9	V107	278	
33	73.016	27	-12	27.9	V107	31	
34	79.64	27	-12	27.9	V107	246	
35	82.34	27	-12	27.6	V107	246	
36	86.30	27	-12	27.8	V107	246	
37	101.988	27	-13	30.0	V107	224	
38	104.719	27	-16	27.8	V107	245	
39	108.43	27	-16	27.2	V107	245	
40	116.20	27	-13	30.2	V107	245	
41	119.49	27	-9	34.7	V107	240	
42	124.64	27	-10	34.0	V107	240	
43	126.15	27	-7	36.3	V107	240	
44	129.54	27	-7	36.6	V107	240	
* 45	133.734	27	-5	38.1	V107	237	
46	136.033	27	-8	35.9	V107	240	
47	139.684	27	-11	33.0	V107	240	
48	144.734	27	-13	30.6	V107	240	
49	149.022	27	-13	30.1	V107	209	
50	156.013	27	-14	29.8	V107	209	
51	157.89	27	-15	28.7	V107	217	
52	199.091	27	-7	36.9	V107	260	
53	202.46	28	-9	34.1	H142	100	
* 54	205.743	28	-3	40.0	H144	100	

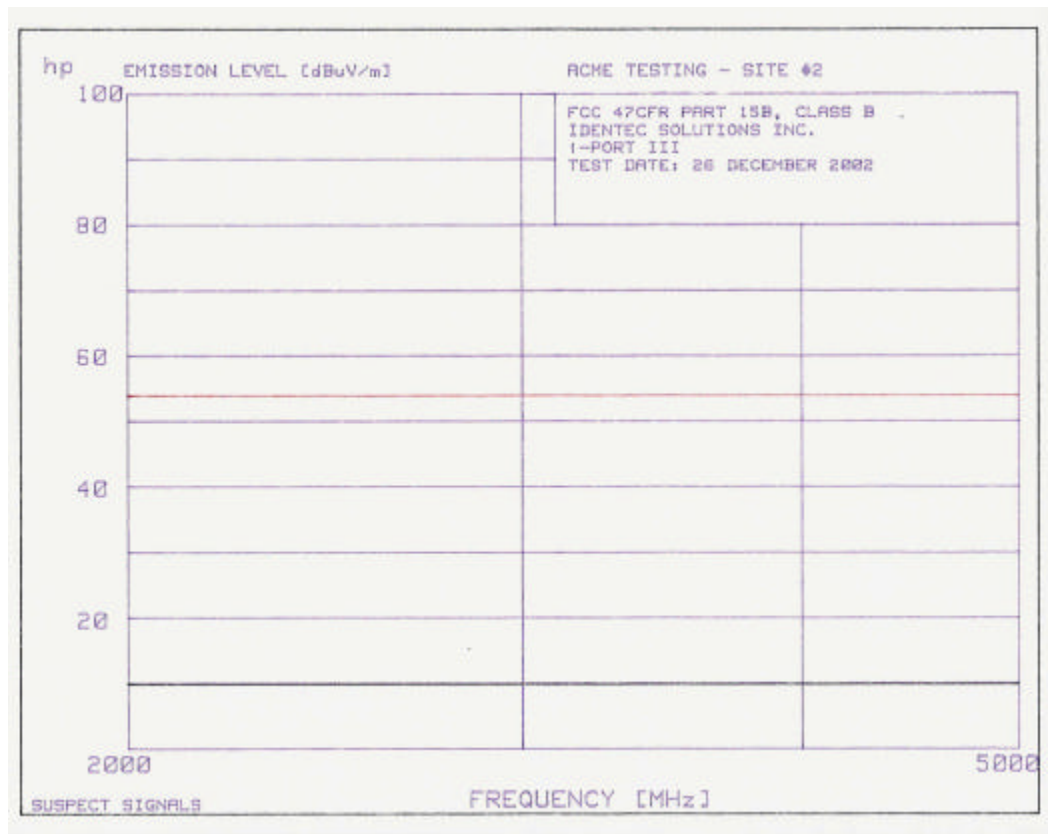
55	209.10	28	-9	34.0	H142	100
* 56	212.385	28	-2	41.4	H184	123
57	219.05	28	-15	30.7	H143	98
58	222.37	28	-15	30.6	H143	98
59	225.66	28	-10	36.1	H143	98
60	232.35	28	-12	33.7	H143	98
61	265.51	28	-13	32.7	H118	93
62	282.25	28	-14	32.2	H118	93
63	315.63	28	-14	32.4	H100	145
64	331.82	28	-15	31.4	H100	150
65	345.19	28	-14	31.7	H100	150
66	365.0	28	-13	33.2	H100	153
67	448.5	28	-12	34.3	H100	72
68	451.277	28	-7	39.0	H100	284
69	454.60	28	-8	37.9	H100	284
* 70	464.517	28	-6	39.8	H100	285
71	471.0	28	-11	35.2	H100	285
* 72	497.709	28	-6	40.0	H100	304
73	551.1	28	-10	36.4	H100	285
74	554.4	28	-10	36.3	H100	285
* 75	564.052	28	-3	43.0	H185	153
76	577.8	28	-12	34.1	H100	150
77	581.2	28	-10	35.6	H100	150

* denotes a Final List signal









16.5 Test Setup Photographs





17. Spurious Emission At Antenna Terminals

Test Requirement: FCC Rules: 47CFR Part 15, Subpart B, Section 15.111

Test Procedure: ANSI C63.4 - 1992

Date of Test: 26 December 2002

Laboratory: Test Site #2 (Acme, WA)

17.1 Test Requirement (Section 15.111)

In addition to the radiated emissions limits, receivers that operate (tune) in the frequency range 30 to 960 MHz and CB receivers that provide terminals for the connection of an external receiving antenna may be tested to demonstrate compliance with the provisions of 15.109 with the antenna terminals shielded and terminated with a resistive termination equal to the impedance specified for the antenna, provided these receivers also comply with the following: With the receiver antenna terminal connected to a resistive termination equal to the impedance specified or employed for the antenna, the power at the antenna terminal at any frequency within the range of measurements specified in 15.33 shall not exceed 2.0 nanowatts.

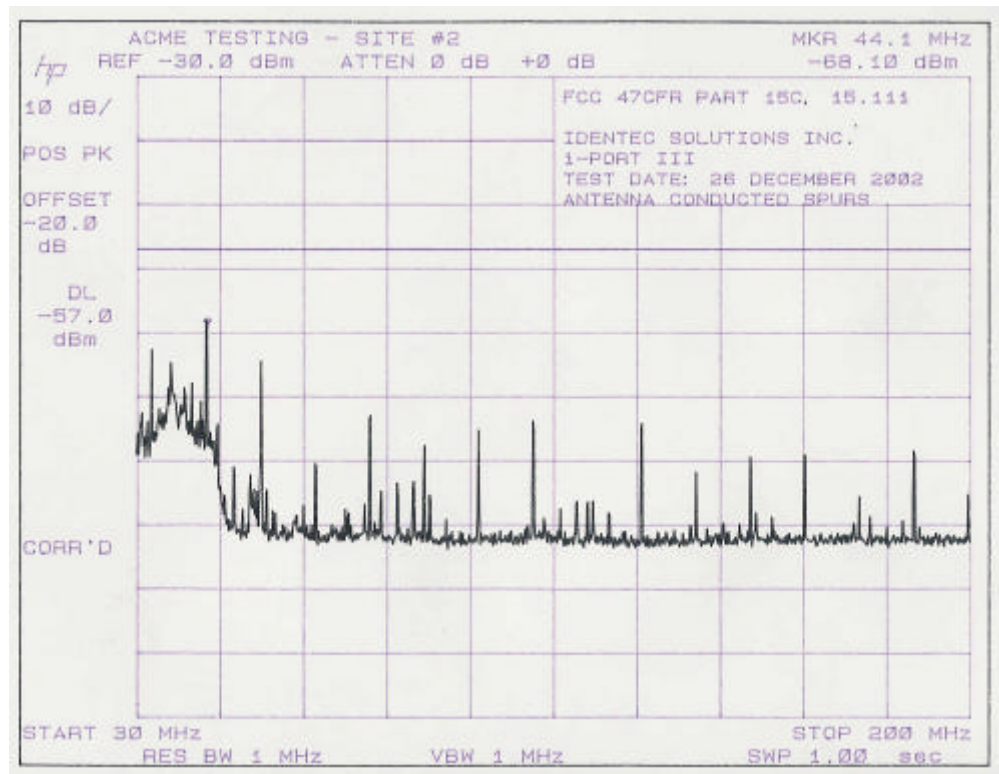
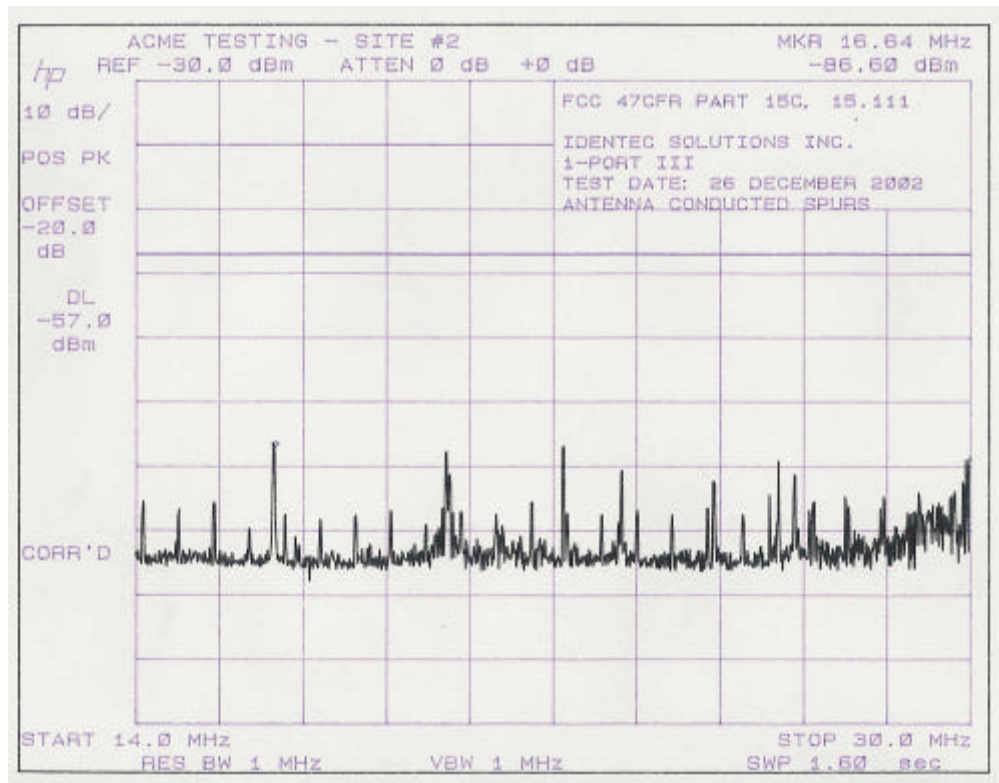
CB receives and receivers that operate (tune) in the frequency range of 30 to 960 MHz that are provided only with a permanently attached antenna shall comply with the radiated emission limitations in this part, as measured with the antenna attached.

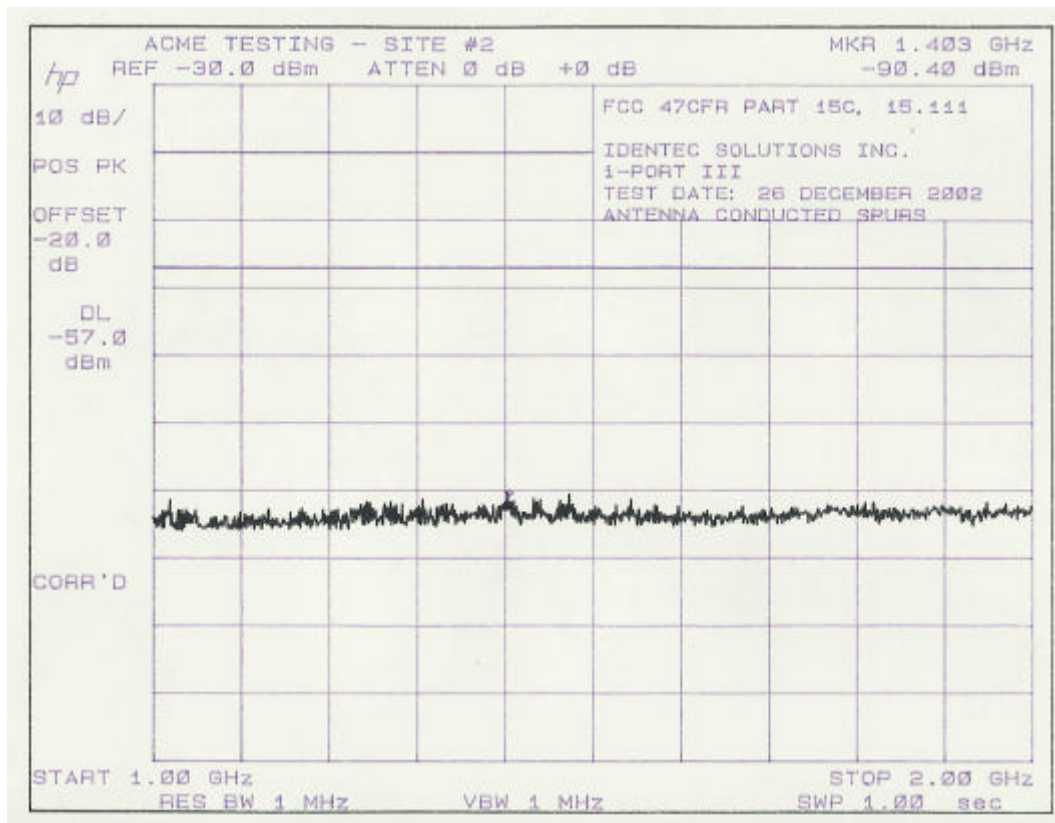
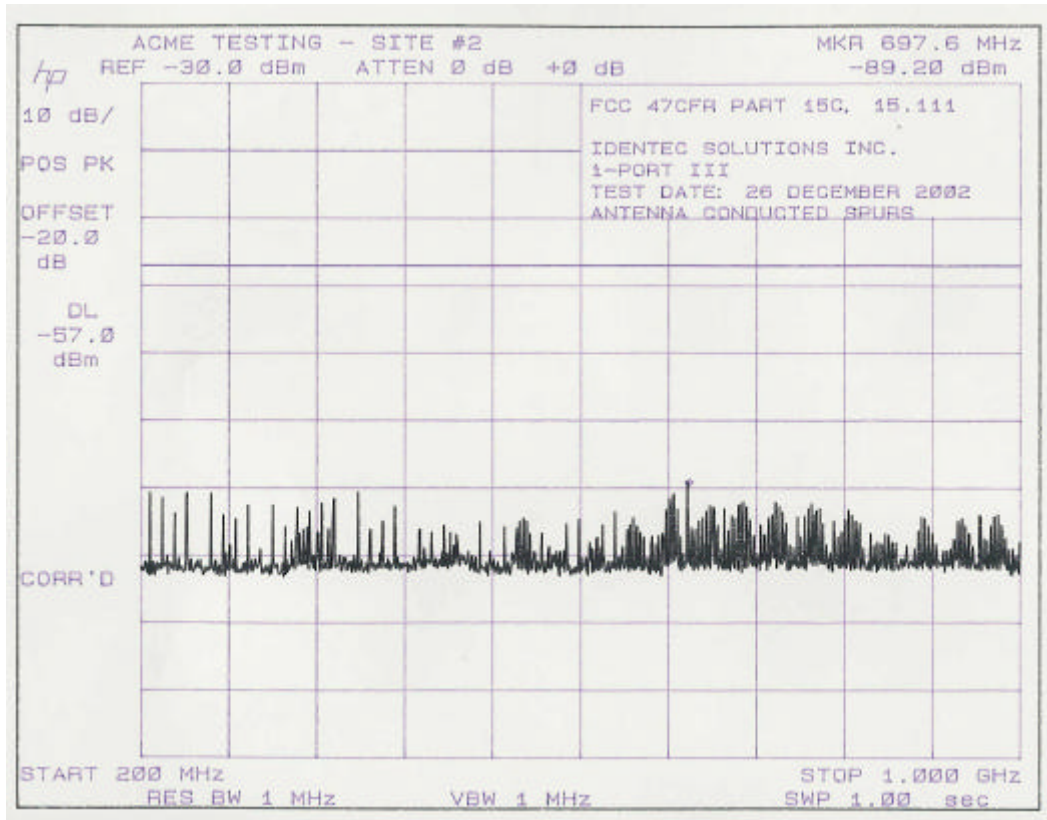
17.2 Test equipment

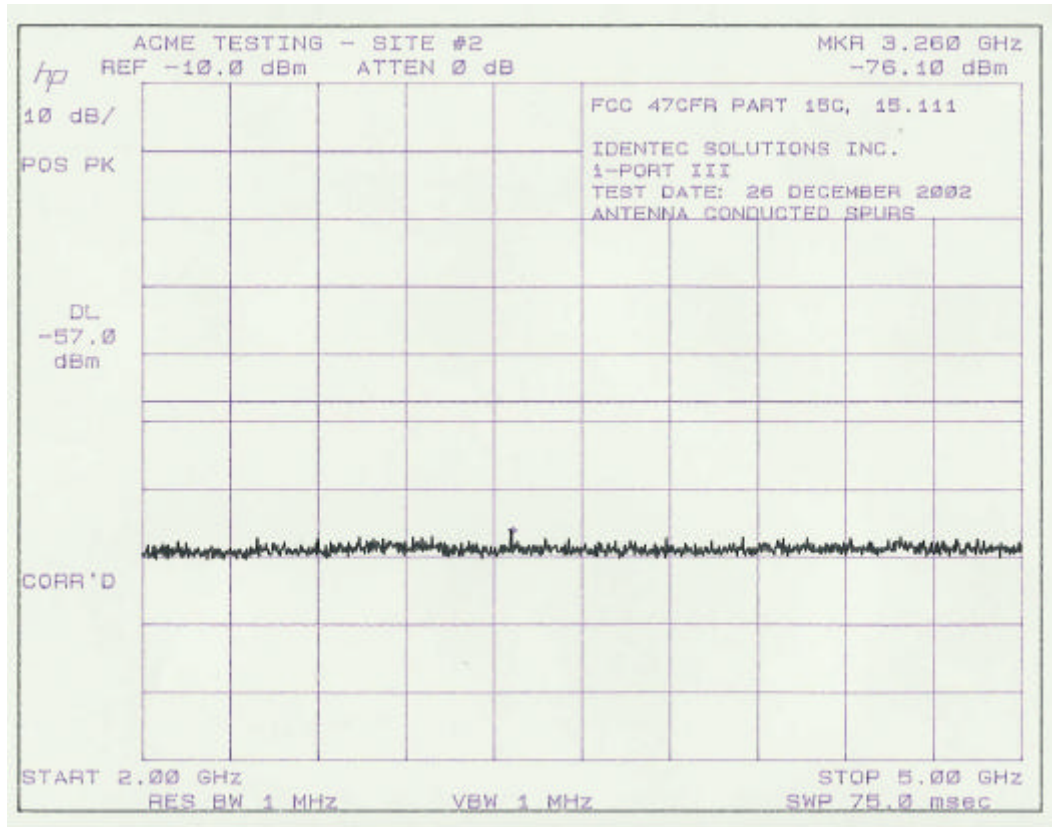
- ⇒ Spectrum Analyzer (blue): Hewlett-Packard 8566B, Serial Number 2410A00168, Calibrated: 17 April 2002, Calibration Due Date: 17 April 2003
- ⇒ RF Preselector (blue): Hewlett-Packard 85685A, Serial Number 2648A00519, Calibrated: 17 April 2002, Calibration Due Date: 17 April 2003
- ⇒ Quasi Peak Adapter (blue): Hewlett-Packard 85650A, Serial Number 2043A00327, Calibrated: 17 April 2002, Calibration Due Date: 17 April 2003

17.3 Test Results

The EUT complied with the Spurious Emissions at the antenna terminals limit of 2.0 Nanowatts (-57.0 dBm) specified in 47 CFR Part 15 Section 15.111(a).







17.4 Test Setup Photographs



18. Miscellaneous Comments and Notes

None.

19. Informative Information



American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999

ACME TESTING CO.
Site # 1 and Site # 2
P.O. Box 3,
2002 Valley Highway
Acme, WA 98220-0003
Harry H. Hodes Phone: 360 595 2785

ELECTRICAL (EMC)

Valid to: November 30, 2003 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:

<u>Test Technology</u>	<u>Test Method(s)</u>
<i>Basic Test Method Standards (Emissions):</i>	
Conducted & Radiated:	ANSI C63.4-1992 & ANSI C63.4-2000; EIA/TIA-603:1993 & TIA/EIA-603:2001; FCC OET MP-5:1986; CISPR 11:1991 & EN 55011:1992; CISPR 11:1997 + A1:1999 & EN 55011:1998 + A1:1999; CISPR 13:1996 + A1:1998; CISPR 13:2001 & EN 55013:2001 & EN 55013:1990 + A12:1994 + A13:1996 + A14:1999 CISPR 14-1:1993 + A1:1996 + A2:1998 & EN 55014-1:1993 + A1:1997 + A2:1999; CISPR 14-1:2000 + A1:2001 & EN 55014-1:2000 + A1:2001 CISPR 22:1993 + A1:1995 + A2:1996 & EN 55022:1994 + A1:1995 + A2:1997; CISPR 22:1997 + A1:2000 & EN 55022:1998 + A1:2000; Harmonic Current: IEC 61000-3-2:1995+A1:1997+A2:1998 & IEC 61000-3-2:2000 & EN 61000-3-2:1995+A1:A2:1998+A14:2000; IEC 61000-3-2:2000 & EN 61000-3-2:2000 Voltage Fluctuations & Flicker IEC 61000-3-3:1994+A1:2001 & EN 61000-3-3:1995+A1:2001
<i>Basic Test Method Standards (Immunity):</i>	
Audio Frequency Common Mode Electrostatic Discharge (ESD):	IEC 61000-2-1:1990; IEC 61000-2-2:2002 IEC 801-2:1991; IEC 1000-4-2:1995; IEC 61000-4-2:1995 + A1:1998 + A2:2001; EN 61000-4-2:1995 + A1:1998 + A2:2001;
Radiated RF Fields:	IEC 801-3:1984; ENV 50140:1994; IEC 1000-4-3:1995 & IEC 61000-4-3:1995; EN 61000-4-3:1996 + A1:1998; ENV 50204:1995;
Electrical Fast Transient/Burst:	IEC 801-4:1998; IEC 1000-4-4:1995; IEC 61000-4-4:1995; EN 61000-4- 4:1995;

Peter M. Hodes

(A2LA Cert. No. 829.01) 05/08/02 Page 1 of 4

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644 3248 • Fax: 301-662 2974

Test Technology

Surge:

Test Method(s)

IEC 801-5(D):1992 (single phase only, and excluding 10/700 surge testing);
ENV 50142:1994 (single phase only, and excluding 10/700 surge testing);
IEC 1000-4-5:1995 (single phase only, and excluding 10/700 surge testing);
IEC 61000-4-5:1995 (single phase only, and excluding 10/700 surge testing);
EN 61000-4-5:1995 (single phase only, and excluding 10/700 surge testing);

RF Common Mode (Conducted):

ENV 50141:1994; IEC 1000-4-6:1996; IEC 61000-4-6:1996;
EN 61000-4-6:1996;

Power Frequency Magnetic Fields:

IEC 1000-4-8:1994; IEC 61000-4-8:1994; EN 61000-4-8:1994; IEC 61000-4-8:2001

Voltage Dips, Short Interruptions,
& Variations:

IEC 1000-4-11:1994; IEC 61000-4-11:1994; EN 61000-4-11:1994;

Generic & Product Family Standards:

47 U.S. Code of Federal Regulations (47 CFR) FCC Methods, as follows:
Part 15 (using ANSI C63.4-1992 & ANSI C63.4-2000); &
Part 18 (using FCC OET MP-5:1986);

ICES-003 Issue 2 Revision 1;

CNS 13438:1997; CNS 13439:1994;

Bellcore [Telcordia] GR-1089-CORE Issue 2 Revision 1:1999

(Sections 2, 3, 4.5.9, 4.5.10 [1st level surge only], 9.10.5, & 9.10.6 Only);

AS/NZS 2064:1997; AS/NZS 3548:1995;
AS/NZS 4251.1:1994; AS/NZS 4252.1:1994;
AS/NZS 4268.2:1995

EN 50081-1:1992; EN 50081-2:1993; EN 50082-1:1997; EN 50082-2:1995;
IEC 61000-6-1:1997 & EN 61000-6-1:2001
IEC 61000-6-2:1999 & EN 61000-6-2:1999 & EN 61000-6-2:2001
IEC 61000-6-3:1996 & EN 61000-6-3:2001
IEC 61000-6-4:1997 & EN 61000-6-4:2001

EN 50083-2:1995 + A1:1997; EN 50091-2:1995;
EN 50130-4:1995 + A1:1998, EN 50199:1995; EN 50270:1999;
EN 50293:2000;

CISPR 11:1991 & EN 55011:1992;
CISPR 11:1997 + A1:1998 & EN 55011:1998 + A1:1999;
CISPR 13:1996 + A1:1998
& EN 55013:1990 + A12:1994 + A13:1996 + A14:1999
CISPR 13:2001 & EN 55013:2001;
CISPR 14-1:1993 + A1:1996 + A2:1998
& EN 55014-1:1993 + A1:1997 + A2:1999;
CISPR 14-1:2000 + A1:2001 & EN 55014-1:2000 + A1:2001
CISPR 14-2:1997 & EN 55014-2:1997



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Page 2 of 4

Test TechnologyTest Method(s)*Generic & Product Family Standards:*

CISPR 22:1993 + A1:1995 + A2:1996
& EN 55022:1994 + A1:1995 + A2:1997;
CISPR 22:1997 + A1:2000 & EN 55022:1998 + A1:2000;
CISPR 24: 1997 + A1:2001 & EN 55024:1998 + A1:2001
EN 55103-1:1996; EN 55103-2:1996;
IEC 60521:1988 & EN 60521:1995;
IEC 60555-2:1991 & EN 60555-2:1993;
IEC 60555-3:1990 & EN 60555-3:1991;
EN 60601-1-2:1984 (*EMC Requirements Only*);
IEC 60601-1-2:2001 (2nd Edition) (*EMC Requirements Only*)
& EN 60601-1-2:2001 (2nd Edition) (*EMC Requirements Only*)
IEC 60687:1992 & EN 60687:1992;
IEC 60870-2-1:1995 & EN 60870-2-1:1996
IEC 60945:1996 (*Clauses 9, 10, 11.2, 12.2, & 12.3 Only*),
& EN 60945:1996 (*Clauses 9, 10, 11.2, 12.2, & 12.3 Only*);
IEC 61000-3-2:1995+A1:1997+A2:1998
& EN 61000-3-2:1995+A1,A2:1998+A14:2000;
IEC 61000-3-2:2000 & EN 61000-3-2:2000;
IEC 61000-3-3:1994 + A1:2001 & EN 61000-3-3:1995 + A1:2001;
IEC 61036:1996 + A1:2000 & EN 61036:1996 + A1:2000;
IEC 61131-2:1992 & EN 61131-2:1994 + A11:1996 + A12:2000;
IEC 61204-3:2000 & IEC 61204-3:2000;
IEC 61268:1995 & EN 61268:1996;
IEC 61326:1997 + A1:1998 + A2:2000
& EN 61326:1997 + A1:1998 + A2:2000;
IEC 61800-3:1996 & EN 61800-3:1996 + A11:2000;

EN 300 339:1998
EN 300 386 V1.3.1(09-2001),
EN 301 489-01 (09-2001)
ETS 300 683:1997
EN 301 489-03 (11-2001)
EN 300 385:1999
EN 301 489-04 (07-2000)
EN 300 279:1999
EN 301 489-05 (07-2000)
EN 301 489-09 (09-2000)
ETS 300 684:1997
EN 301 489-15 (09-2000)
EN 301 489-22 (11-2000)



Radio Test Standards:

47 U.S. Code of Federal Regulations (47 CFR) FCC Methods, as follows:
Part 15 (using ANSI C63.4-1992 & ANSI C63.4-2000), &
Part 90 (using ANSI C63.4-1992, ANSI C63.4-2000, & TIA/EIA-603);

Industry Canada, as follows:

RSS-119 Issue 6: March 2000;
RSS-125 Issue 2: August 1996;
RSS-210 Issue 4: December 2000;

European Union [EU] & European Economic Area [EEA], as follows:

EN 300 086-1 V.1.2.1 (2001-03) & EN 300 086-2 V.1.2.1 (2001-02);
EN 300 113-1 V1.3.1 (2001-03) & EN 300 113-2 V1.3.1 (2001-03);
EN 300 219-1 V1.2.1 (2001-03) & EN 300 219-2 V1.2.1 (2001-03);
EN 300 220-1 V1.3.1 (2000-09) & EN 300 220-2 V1.3.1 (2000-09)
& EN 300 220-3 V1.1.1 (2000-03);
EN 300 296-1 V1.1.1 (2001-03) & EN 300 296-2 V1.1.1 (2001-02);
EN 300 330-1 V1.3.1 (2001-06) & EN 300 330-2 V1.1.1 (2001-06);
EN 300 422-1 V1.2.1 (2000-08) & EN 300 422-2 V1.1.1 (2000-08);
EN 300 440-1 V1.3.1 (2001-09) & EN 300 440-2 V1.1.1 (2001-09);
EN 301 751 V1.2.1 (2000-12);
EN 301 753 V1.1.1 (2001-03);
EN 301 783-1 V1.1.1 (2000-09) & EN 301 783-2 V1.1.1 (2000-07)

On the following materials and products:

Electrical and electronic equipment for: information technology; industrial, scientific, and medical applications; residential service; receivers; licensed and unlicensed transmitters/transceivers; UPS systems; alarm/security systems; heavy industrial equipment; marine equipment; professional audio/video equipment; arc welders; PLC controllers; and scientific and laboratory apparatus.





**THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION**

ACCREDITED LABORATORY

A2LA has accredited

ACME TESTING CO.
Acme, WA

for technical competence in the field of

Electrical Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing. Testing and calibration laboratories that comply with this International Standard also operate in accordance with ISO 9001 or ISO 9002 (1994).

Presented this 30th day of April, 2002.



President
For the Accreditation Council
Certificate Number 829.01
Valid to November 30, 2003

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

July 26, 2002

Registration Number: 90420

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

Attention: Harry Hodes

Re: Measurement facility located at Acme
Sites 1 & 2 (3, 10 & 30 meters)
Date of Renewal: July 26, 2002

Gentlemen:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the 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 the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,



Phyllis Parrish
Information Technician