

15. Conducted Emissions Tests

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

Test Procedure: ANSI C63.4 - 1992

Date of Test: 24 December 2002

Laboratory: Test Site #2 (Acme, WA)

15.1 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
- ⇒ Line Impedance Stabilization Networks: Solar Type 9408-50-R-24-BNC, Serial Number 941702, Calibrated: 08 November 2002, Calibration Due Date: 08 November 2003
- ⇒ Transient Limiter: Hewlett-Packard 11947A, Serial Number 3107A01879, Calibrated: 25 April 2002, Calibration Due Date: 25 April 2003
- ⇒ Line Conduction Test Site: Acme Testing Co., Test Site Number 2, Calibrated: 22 June 2002, Calibration Due Date: 22 June 2003

15.2 Purpose

The purpose of this test was to evaluate the level of conducted noise the EUT imposed on the AC Mains.

15.3 Test Procedures

The EUT was placed on a 1 meter long by 1.5 meters wide and 0.8 meter high nonconductive table that was placed directly on a flush-mounted turntable. The EUT was connected to its associated support equipment, with any excess I/O cabling bundled to approximately 1 meter. The EUT was connected to a dedicated LISN and all support equipment were connected to a second separate LISN circuit. The LISNs were bonded to the groundplane.

Prescan tests were performed to determine the “worst-case” mode of operation. With the EUT operating in “worst-case” mode, final conducted measurements were taken. Conducted measurements were made on each current carrying conductor with respect to ground.

Conducted Emissions Test Characteristics

Frequency range	0.15 MHz - 30.0 MHz
Test instrumentation resolution bandwidth	9 kHz
Lines Tested	Line 1/Line 2

15.4 Test Results

A summary of the highest amplitude conducted emissions is listed below.

FCC RULES: 47CFR PART 15, SUBPART B, SECTION 15.107,
CLASS B CONDUCTED EMISSIONS (CISPR LIMITS)
(0.15 MHz TO 30 MHz) 60 Hz/120 VAC

EUT IN RECEIVE MODE

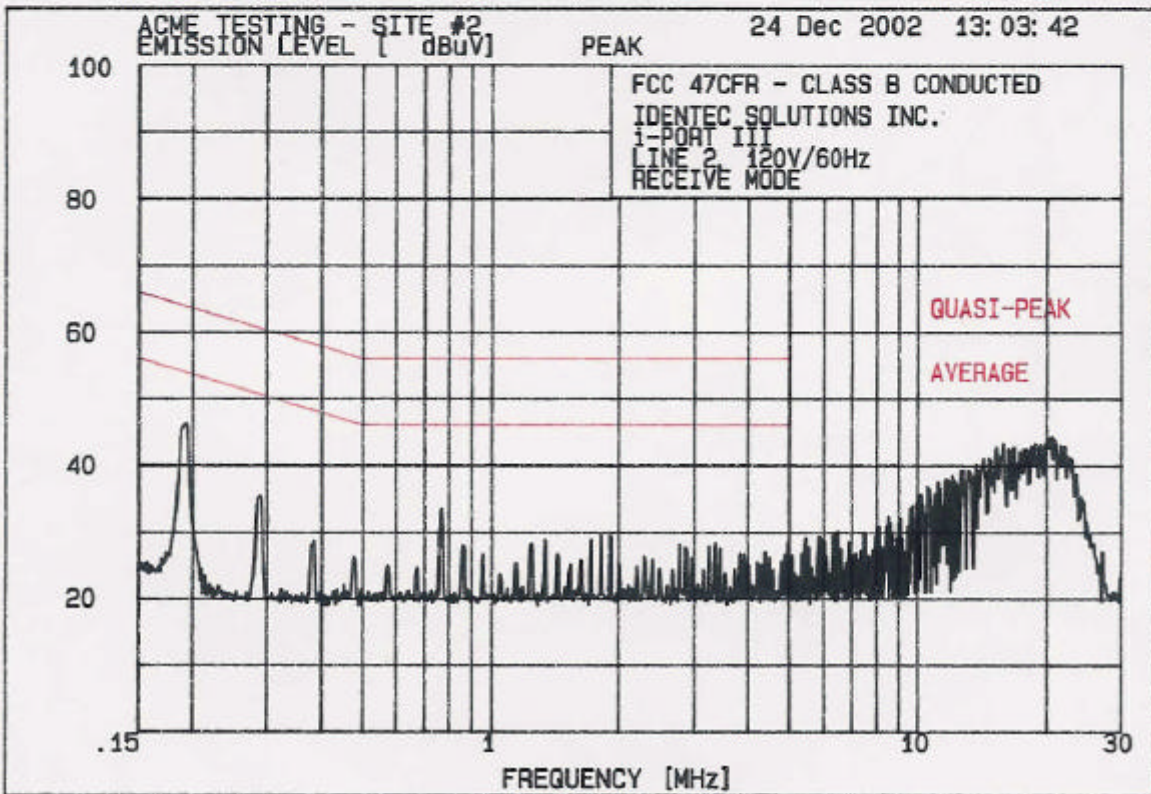
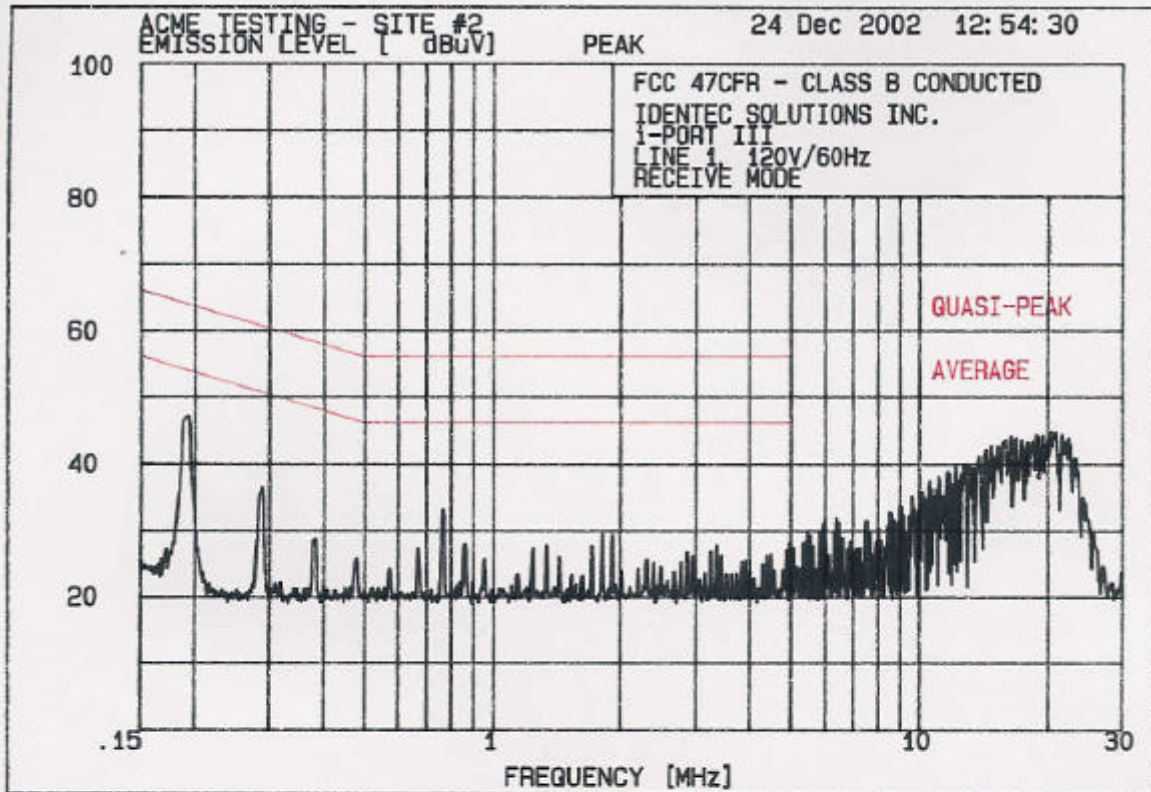
LINE 1 "HOT"

PEAK #	FREQ. (MHz)	AMPL (dB μ V)
1	0.1944	47.2
2	15.98	43.6
3	16.5	44.0
4	16.94	43.8
5	17.48	43.6
6	17.95	43.3
7	18.53	43.4
8	18.93	44.3
9	19.54	44.2
10	20.39	44.8
11	21.72	44.3

LINE 2 "NEUTRAL"

PEAK #	FREQ. (MHz)	AMPL (dB μ V)
1	0.1944	46.2
2	15.32	42.7
3	15.9	43.3
4	16.32	42.4
5	16.85	42.7
6	17.76	42.4
7	18.93	43.3
8	19.44	43.1
9	20.6	44.2
10	21.61	43.0

The EUT complied with the Class B Conducted Emissions Limits specified in 47CFR Part 15 Subpart B Section 15.107.



15.5 Test Setup Photographs



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 FREQUENCY MHz	SPEC LIMIT dBuV/m	MEASUREMENTS ABS dB	dLIM dB	MODE	POL	SITE HGT cm	AZM deg	CORR FACTOR 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.

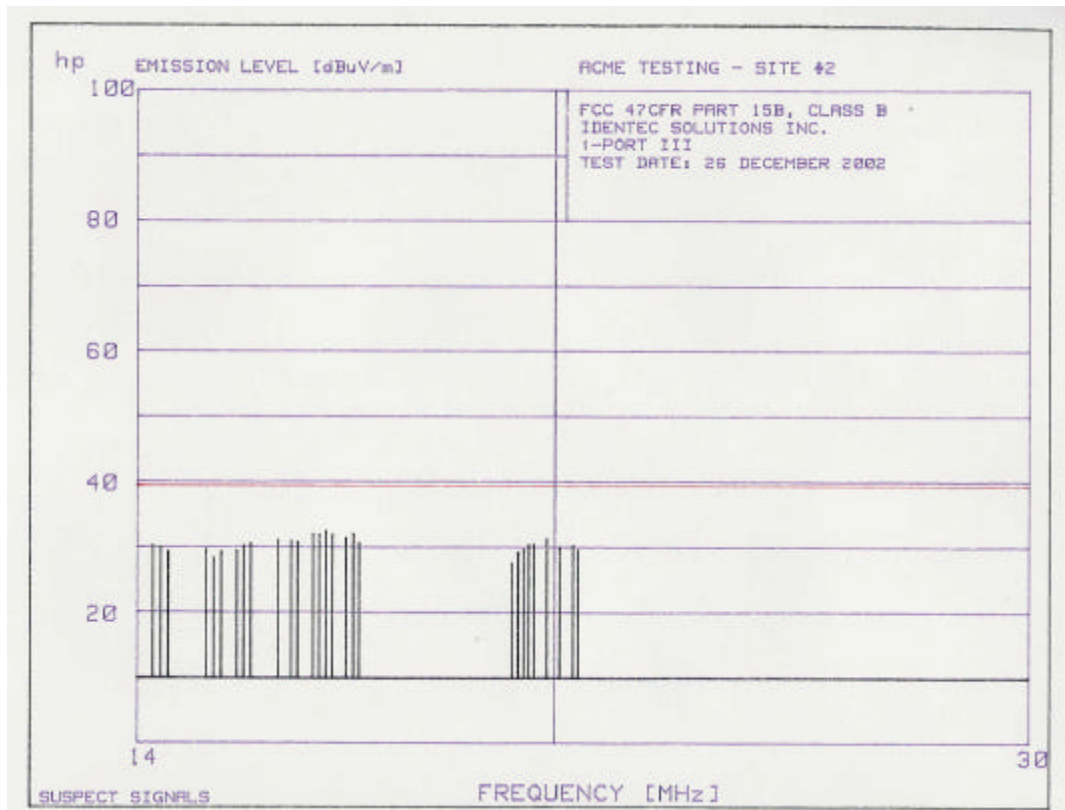
ACME TESTING - SITE #2
ALL SUSPECTS

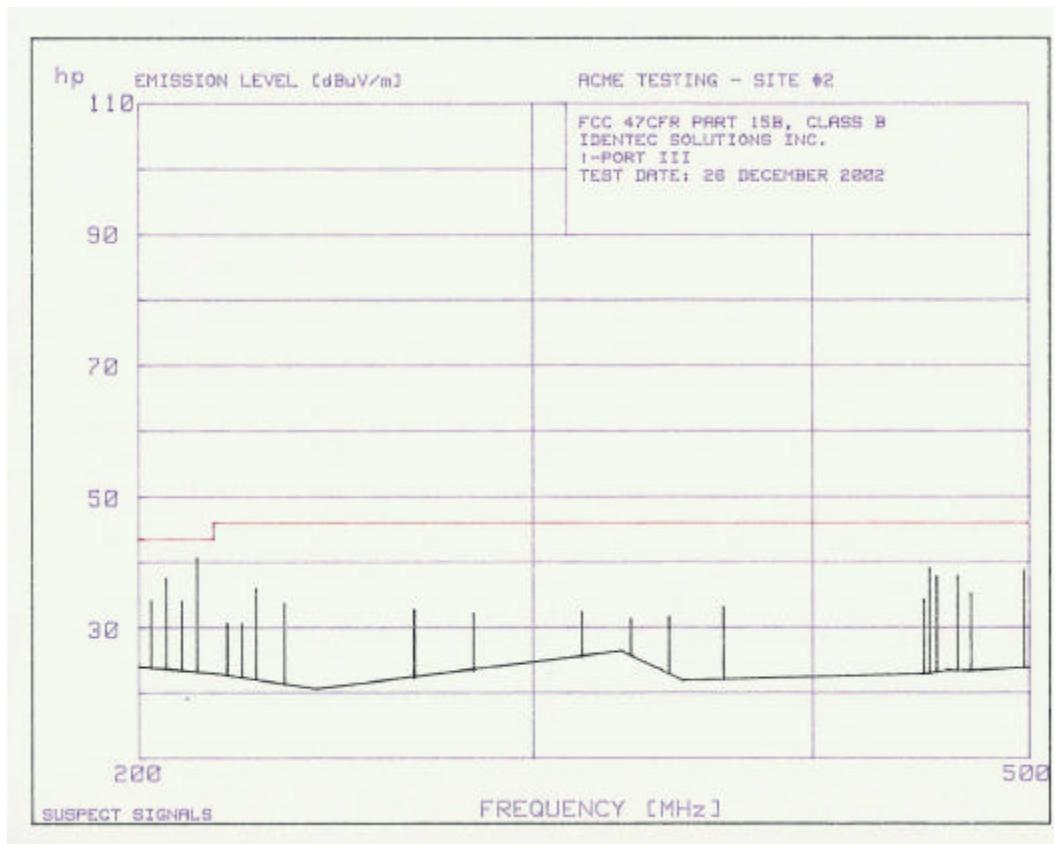
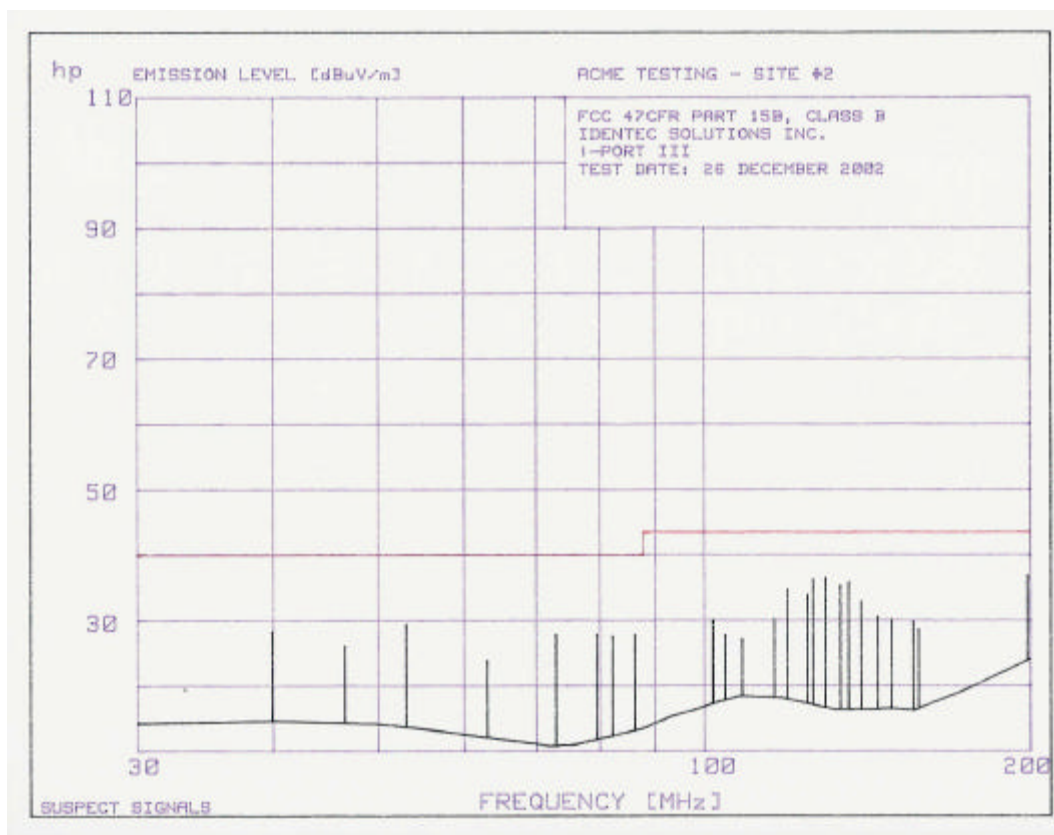
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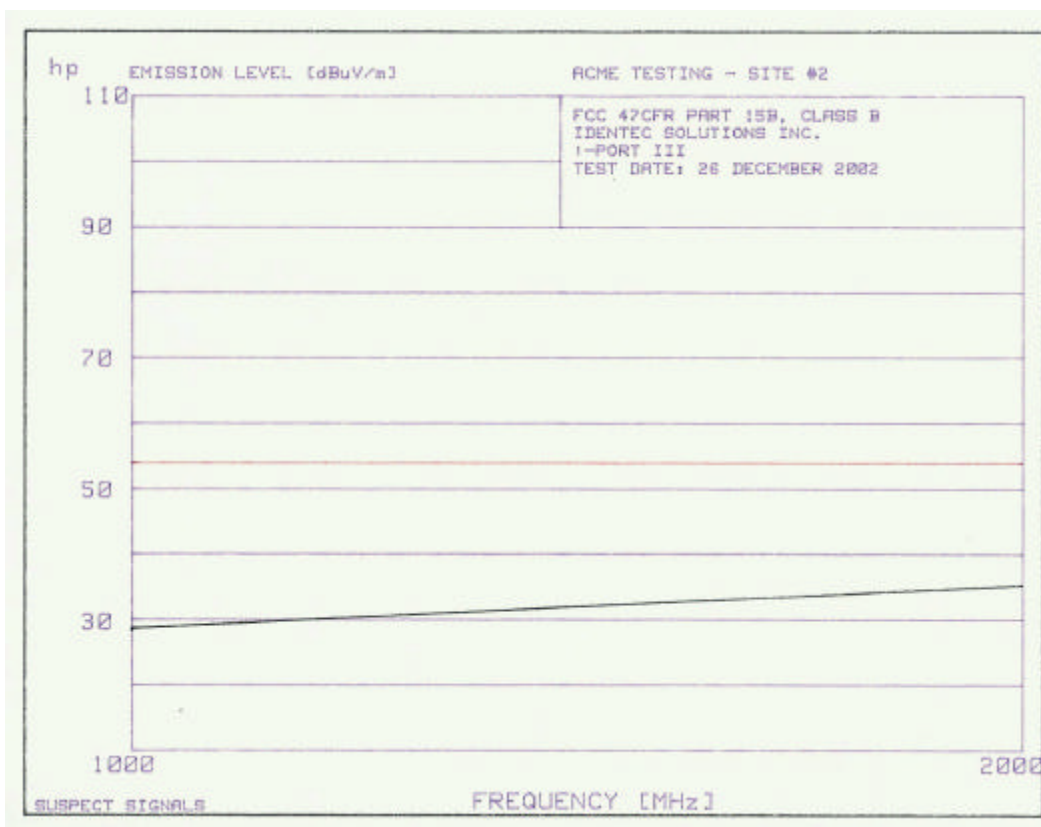
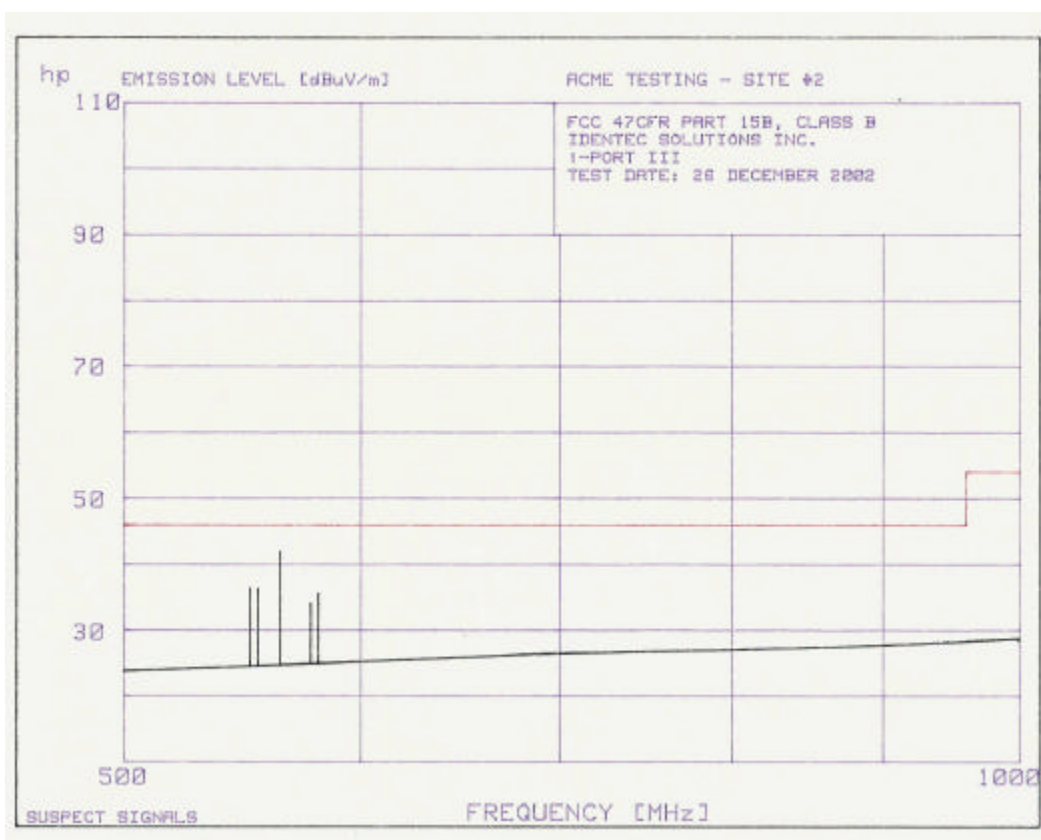
No	FREQ MHz	BND	PEAK LIM	ABS	ANT P	AZ cm deg	COMMENTS
1	14.192	22	-9	30.3	V150	189	
2	14.287	22	-9	30.0	V150	189	
3	14.378	22	-10	29.3	V150	189	
4	14.858	22	-10	29.7	V150	189	
5	14.949	22	-11	28.4	V150	189	
6	15.043	23	-10	29.3	V150	189	
7	15.246	23	-10	29.5	V150	189	
8	15.340	23	-9	30.3	V150	189	
9	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	

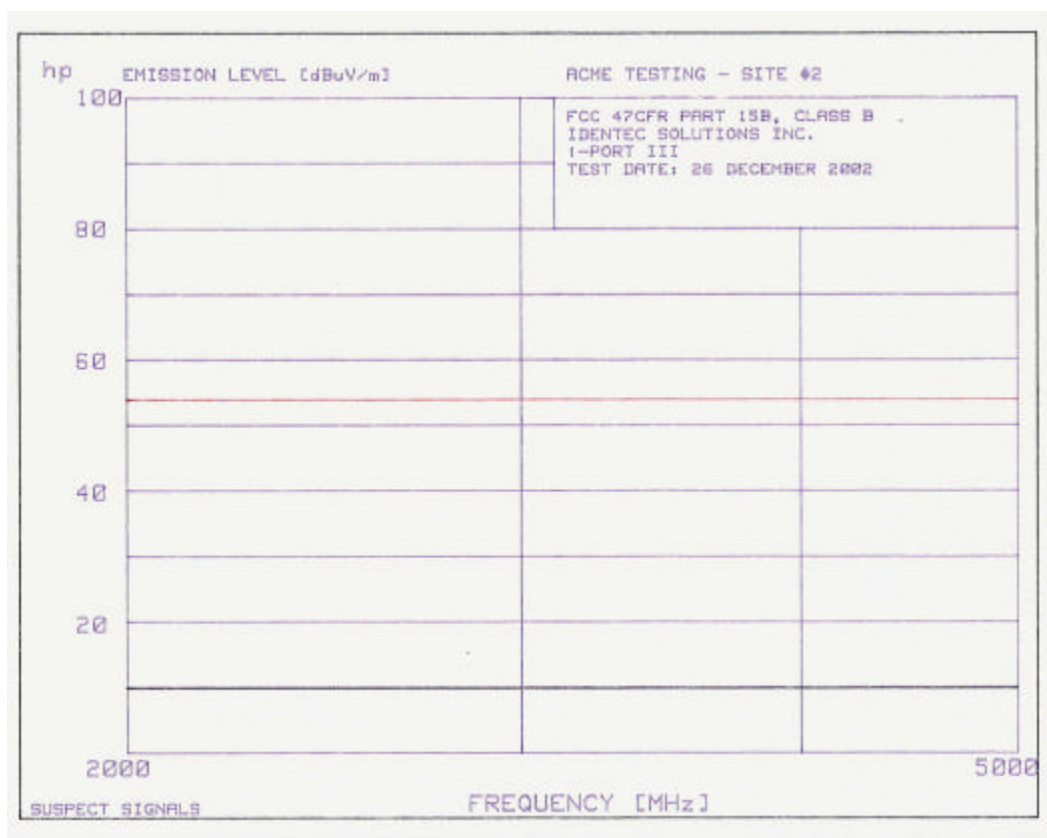
55	209.10	28	-9	34.0	H142	100
*	56	212.385	28	-2	41.4	H184 123
57	219.05	28	-15	30.7	H143	98
58	222.37	28	-15	30.6	H143	98
59	225.66	28	-10	36.1	H143	98
60	232.35	28	-12	33.7	H143	98
61	265.51	28	-13	32.7	H118	93
62	282.25	28	-14	32.2	H118	93
63	315.63	28	-14	32.4	H100	145
64	331.82	28	-15	31.4	H100	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



