5. DESCRIPTION OF TESTING METHODS

5.1 Introduction

As required in 47 CFR, Parts 2 and 15, the methods employed to test the radiated and conducted emissions (as applicable) of the EUT are those contained within the American National Standards Institute (ANSI) document C63.4-1992, titled "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz." All applicable FCC Rule Sections that provide further guidance for performance of such testing are also observed.

For General Test Configuration please refer to Figure 1 on page 6.

5.2 Configuration and Methods of Measurements for Radiated Emissions

Section 8 of ANSI C63.4 determines the general configuration and procedures for measuring the radiated emissions of equipment under test. Initially, the primary emission frequencies are identified inside the test lab by positioning a broadband receive antenna one meter from the EUT to locate frequencies of significant radiation. Normally this is done inside a shielded anechoic chamber to eliminate ambients. Next, the EUT and associated system are placed on a turntable on an 10 meter open area test site (registered with the FCC in accord with its Rules and ANSI C63.4) and the receive antenna is located at a distance of ten or three meters from the EUT.

The EUT and associated system are configured to operate with a series of periodic transmissions, representing a "normally operating" mode. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to produce horizontal and vertical polarities, and the turntable is also rotated to determine the worst emitting configuration.

For Frequency ID and Radiated Emissions test configurations please refer to Figures 2 and 3 on pages 7-8.

5.3 Radiated Emission Field Strength

47 CFR sections §15.201, §15.203, §15.205, §15.209, §15.231, §15.31 and §15.33 specify the general emission specification limits and several specific parameter measures for low power periodic transmitters operating in the frequency ranges 40.66-40.70 MHz, and above 70 MHz. Compliance to the specific sections are listed below.

§15.203: The device under test has an external antenna. The user has no practical means to attach an additional external antenna or attach a different external antenna to the transmitter other than the antenna provided by the manufacturer. This complies with the requirements of this section.

§15.205: All harmonics falling within the restricted bands of this section meet the limit of §15.209. Representative data has been provided on page 9.

§15.209: General radiated emission limits were used as appropriate. Representative data has been provided on page 9.

§15.231 (a): The device under test operates at 418.0 MHz frequency and emits control signals for a wildlife feeder system. No continuous transmission is possible with this device. Thus the provisions of this section are met.

§15.231 (a) (1): The device is manually operated and stops transmitting immediately upon release (less than 5 seconds).

§15.231 (a) (2): EUT does not operate automatically.

§15.231 (a) (3): Periodic transmissions do not occur at predetermined intervals.

§15.231 (a) (4): EUT is not used for radio control purposes.

§15.231 (b): This section specifies the specific radiated emissions limits for this intentional radiator. Please refer to the data sheet on page 9 of this report for a tabulated list of the emission frequencies and their compliance status.

In order to obtain the true field strength reading, the spectrum analyzer reading is corrected for amplifier gain, antenna factor and cable loss. In addition, for periodic transmitters an **averaging factor** is also allowed for the transmitter duty cycle. From the test plots of the fundamental harmonic (seen at zero span on a spectrum analyzer), the averaging factor is calculated as follows:

Number of short pulses in worst case 100 msec (per §15.35):	48 pulses
Number of long pulses in worst case 100 msec (per §15.35):	26 pulses
Duration of each short digital pulse (SDP):	.400 msec
Duration of each long digital pulse (LDP):	.800 msec
Duration of digital pulses in the transmission sequence:	100 msec
Total number of digital pulses in each transmission sequence:	74 pulses

Total 'ON' time = (48 x 400 μsec) + (26 x 800 μsec) = 0.040 sec
Pulse Repetition Period = 0.100 sec

Duty cycle = (total 'ON' time)/(pulse repetition period) = (40/0.100) = 0.40 = 40%

Averaging factor = 20*log(duty cycle) = 20*log(0.40) = -7.96 dB

As per §15.231 (b), the emission specification limit for transmitters operating in the 260-470 MHz frequency range is 1.5 to 5.0 mV/m (linearly interpolated) at 3 meters for the fundamental harmonic and 0.15 to 0.5mV/m (linearly interpolated) at 3 meters for the spurious emissions, unless a spurious emission falls within a the restricted bands as defined in §15.205, in which case the general limits given in §15.209 apply. The limit is calculated as follows:

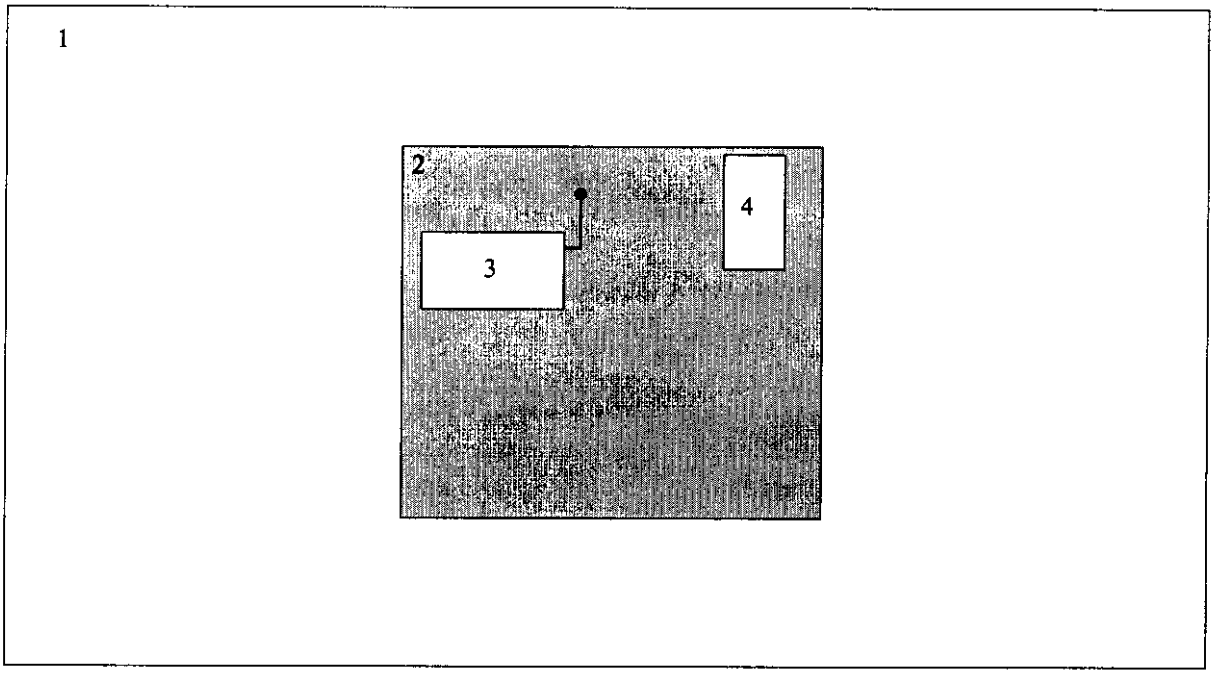
$$((418 - 260) / (470 - 260) \times (5{,}000 - 1{,}500) + 1{,}500 = 4{,}133\ \mu V/m = 72.3\ dB\mu V/m$$

§15.231 (c): The bandwidth of the fundamental harmonic (defined at the points 20 dB below the peak) was measured to be 141 kHz. This meets the requirement of this section that the bandwidth shall not be greater than 0.25% of the center frequency (which is 1.045 MHz for a center frequency of 418 MHz).

§15.31: The EUT uses one channel for transmission.

§15.33: The EUT transmits at 418 MHz; the RF spectrum was investigated up to the 10th harmonic of the device (4.2GHz).

Figure 1. General EUT Test Setup Diagram

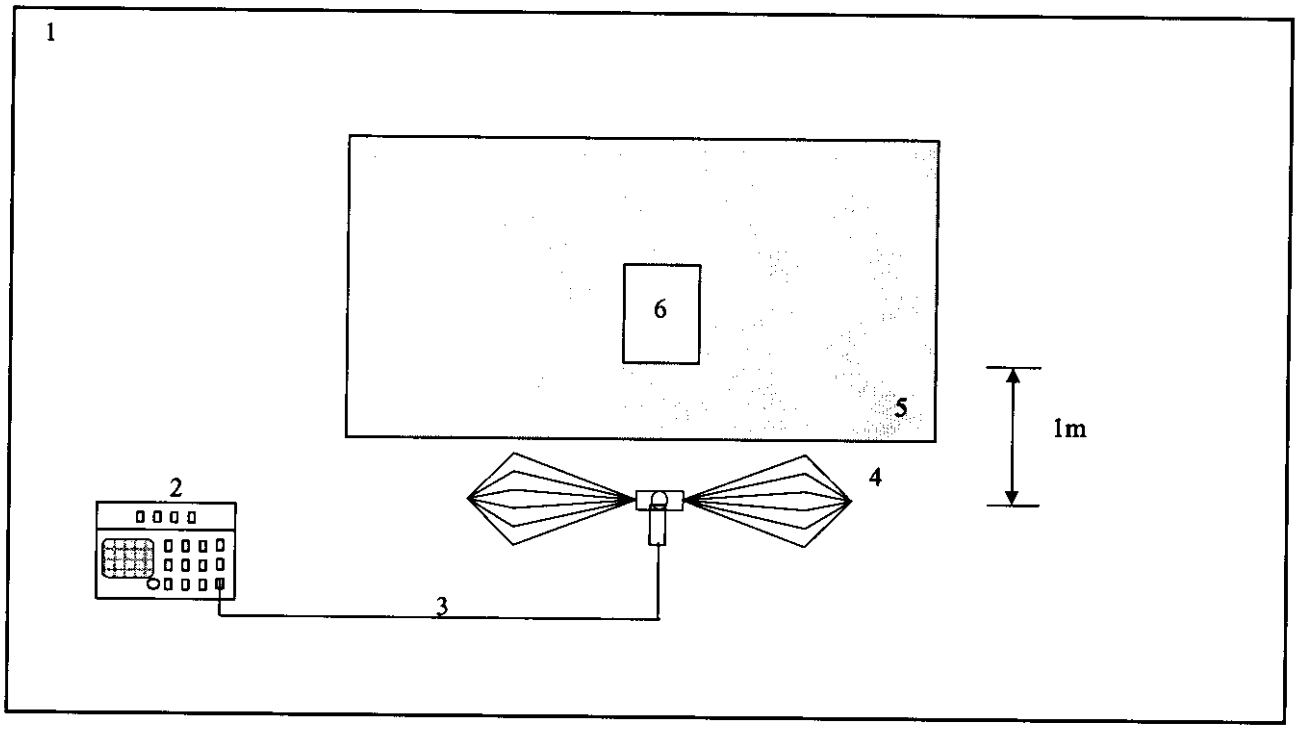


NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory
2. Non-Conducting tables 80 cm above ground plane
3. Receiver (part of EUT's system)
4. EUT: Transmitter

Figure 2. Radiated Emissions Frequency ID Test Setup Diagram

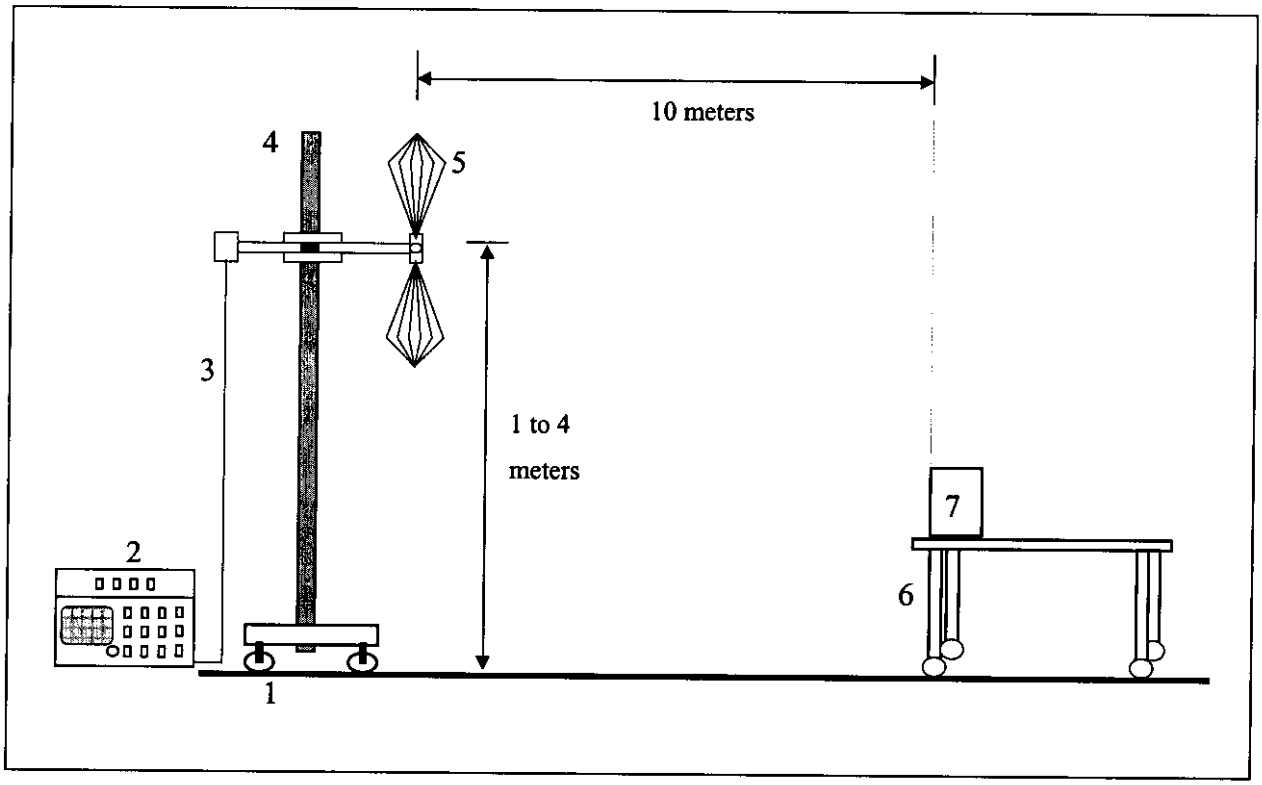


NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Antenna to Spectrum Analyzer
4. Receive Antenna (basic relative position)
5. Non-Conducting table 80 cm above ground plane
6. EUT: Transmitter

Figure 3. Radiated Emissions (OATS) Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Ground plane (11 X 17 meters)
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Receive Antenna to Spectrum Analyzer
4. Antenna Mast with motorized mounting assembly
5. Receive Antenna (basic relative position)
6. Non-Conducting table 80 cm above ground plane
7. EUT: Transmitter

6. TEST RESULTS

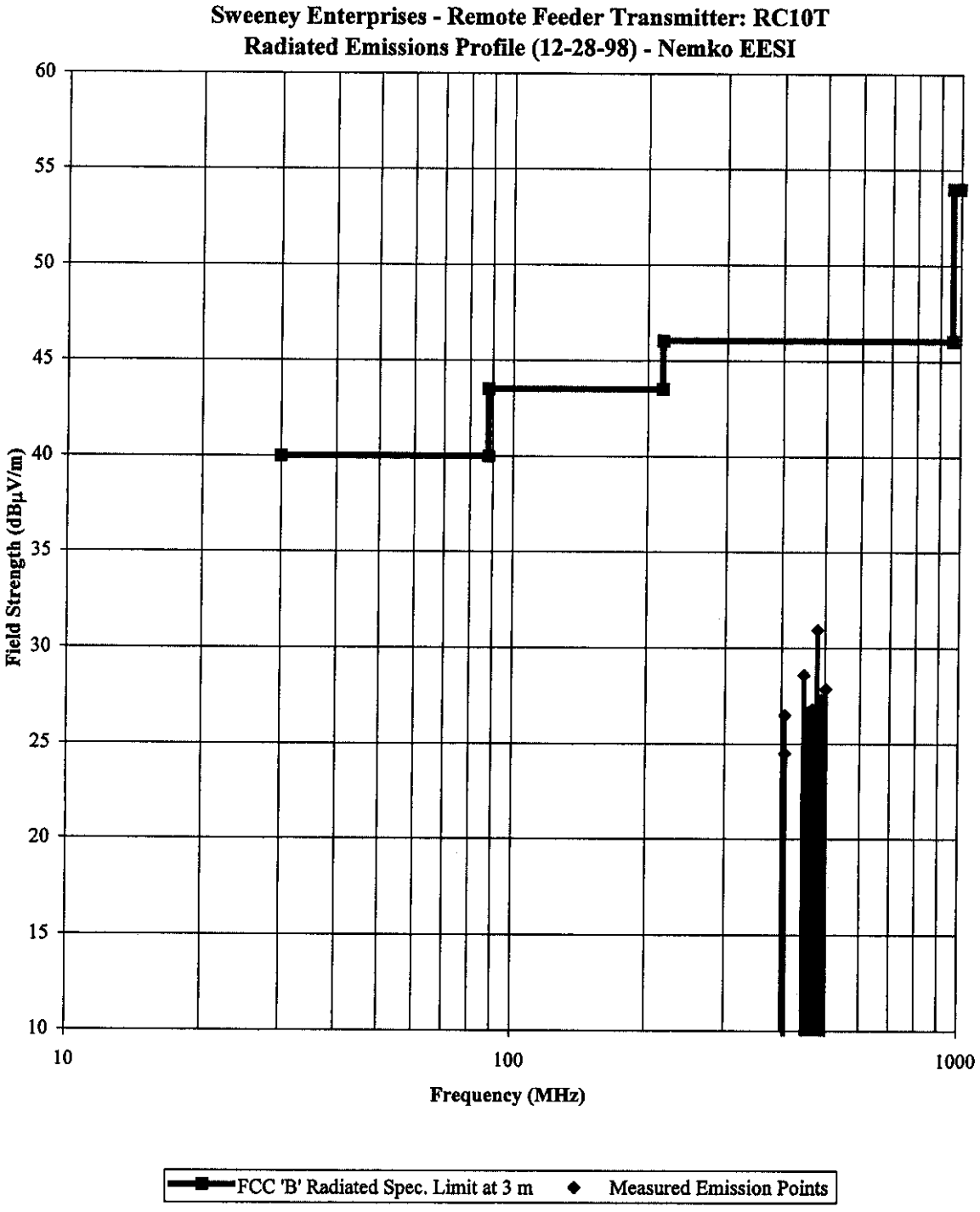
6.1 Radiated Emissions Test Data

Nemko EESI, Inc.
FCC, Part 15B, Section 15.209 Radiated Emissions Data Sheet
(3m Open Area Test Site)

Client: **Sweeney Enterprises** *Conducted by:*
EUT: **Remote Feeder Transmitter** *Date of Test:* **12-28-98**
Model #: **RC10T** *Test Distance, Amp. gain:* **3 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading at 3m (dBμV)	Antenna Polori-zation (vertical or horizontal)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 3 m (dBuV/m)	Total Interference Level at 3 m (dBμV/m)	Emission Spec. Limit at 3 m (dBμV/m)	Difference Margin (dB)
407.250	3.8	v	22.7	26.5	46.0	-19.6
408.300	1.8	v	22.7	24.5	46.0	-21.5
449.000	4.6	v	24.0	28.6	46.0	-17.5
459.600	2.5	v	24.1	26.6	46.0	-19.4
470.200	2.5	v	24.3	26.8	46.0	-19.2
480.800	6.5	v	24.4	30.9	46.0	-15.1
491.400	2.7	v	24.6	27.3	46.0	-18.7
502.000	3.1	v	24.7	27.8	46.0	-18.2

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.


Sweeney Enterprises - Remote Feeder Transmitter: RC10T
Radiated Emissions Profile (12-28-98) - Nemko EESI
Field Strength (dBµV/m)
60
55
50
45
40
35
30
25
20
15
10
10
100
1000
Frequency (MHz)
FCC 'B' Radiated Spec. Limit at 3 m
Measured Emission Points

6.2 Spurious Radiated Emissions Test Data

Nemko EESI, Inc.
FCC, Part 15C, 15.231 Radiated Emissions Data Sheet
(3m Open Area Test Site)

Client: Sweeney Enterprises
EUT: Remote Feeder Transmitter
Model #: RC10T

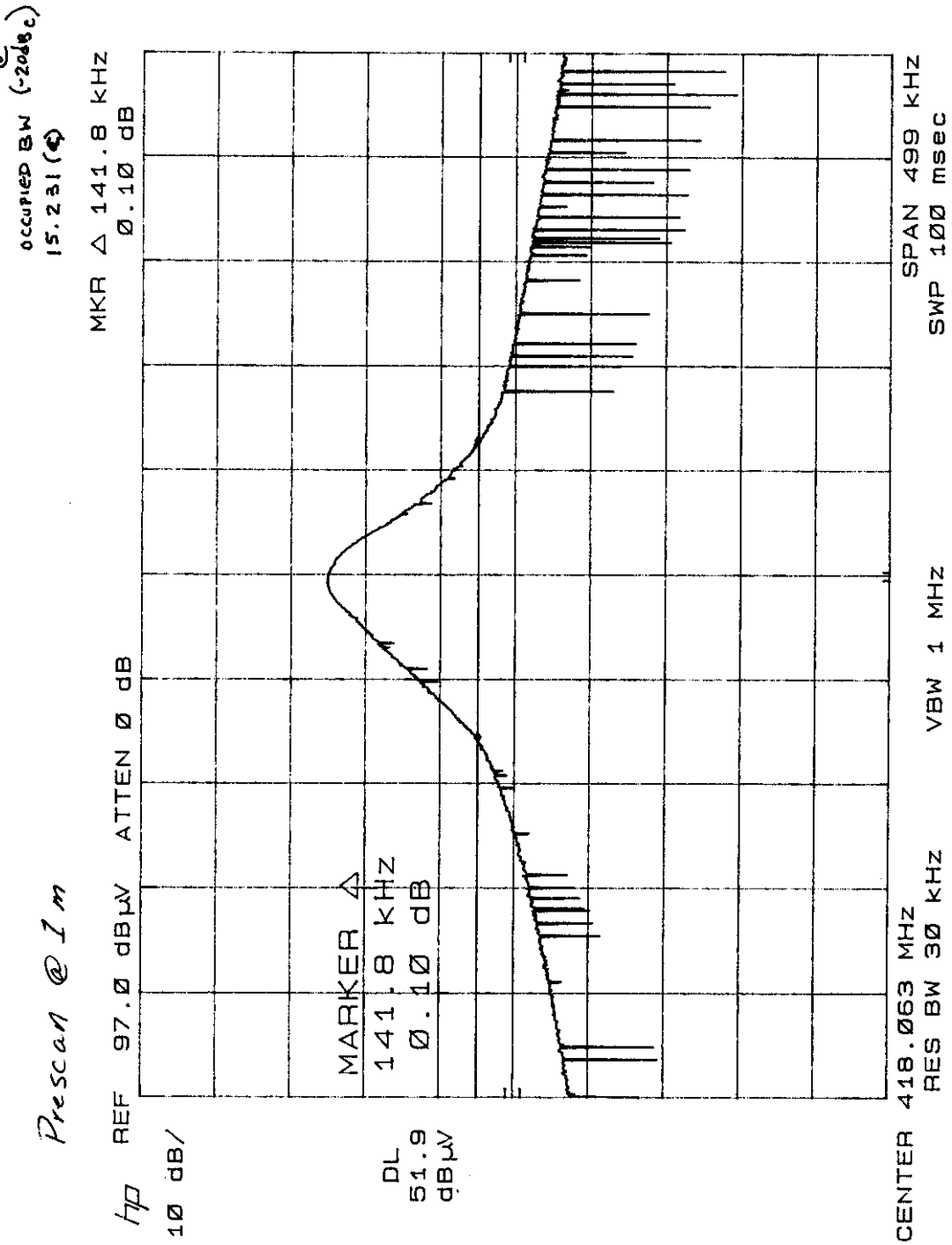
Conducted by:
Date of Test: 12-28-98
Test Distance, Amp. gain: 3 m, 0 dB

Frequency (MHz)	Spectrum Analyzer Reading at 3m (dBμV)	Antenna Polori-zation (vertical or horizontal)	f_O	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 3 m (dBuV/m)	Total Interference Level at 3 m (dBμV/m)	Emission Spec. Limit at 3 m (dBμV/m)	Difference Margin (dB)
418.070	55.2	v	f_0	22.9	78.1	80.3	-2.2
836.011	4.0	v	f_1	31.7	35.7	60.3	-24.6
1254.194	1.5	v	f_2	28.4	29.9	60.3	-30.4
1672.281	9.4	v	f_3	28.2	37.6	54.0	-16.4
2090.351	9.1	v	f_4	30.3	39.4	60.3	-20.9
2508.421	5.6	v	f_5	31.2	36.8	60.3	-23.5
2926.491	-2.4	v	f_6	32.6	30.2	60.3	-30.1
3344.561	3.4	v	f_7	33.4	36.8	60.3	-23.5
3762.642	2.7	v	f_8	35.2	37.9	54.0	-16.1
4180.712	1.9	v	f_9	36.2	38.1	54.0	-15.9

Note: Frequencies located within restricted bands have a reduced emission limit per 15.209

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

6.3 Occupied Bandwidth Test Data



APPENDIX A
NEMKO EESI, INC.'S TEST EQUIPMENT & FACILITIES CALIBRATION PROGRAM

Nemko EESI, Inc. operates a comprehensive equipment calibration program in order to ensure the validity of all test data. Nemko EESI, Inc.'s calibration program is fully compliant to the requirements of ANSI/NCSL Z540-1 (1994) and of ISO 10012-1 (1993-05-01). Nemko EESI, Inc.'s calibration program therefore meets or exceeds the US national commercial and military requirements (N.B. ANSI/NCSL Z540-1 (1994) replaces MIL-STD-45662A) and meets the requirements of ISO-9000. Specifically, all of Nemko EESI, Inc.'s primary reference standard devices (e.g., resistor and capacitor decade boxes, vector voltmeters, multimeters, attenuators and terminations, RF power meters (and their detector heads), oscilloscope mainframes and plug-ins, spectrum analyzers, RF preselectors, quasi-peak adapters, interference analyzers, impulse generators, signal generators and pulse/function generators, etc.) and certain secondary standard devices (e.g., RF preamplifiers used in CISPR 11/22 and FCC Part 15/18 tests) are calibrated by Nemko EESI, Inc.-approved independent (third party) metrology laboratories, using NIST-traceable standards. In all cases, the metrology laboratory furnishes Nemko EESI, Inc. with Certificates Of Calibration on each item of equipment that has been successfully recalibrated.

Calibration intervals are normally one year, except when the manufacturer advises a shorter interval (e.g., the HP 8568B Spectrum Analyzer is recalibrated every 6 months) or if US Government directives demand a shorter interval (e.g., the Eaton 533X-11 Impulse Generator is required to be recalibrated every six months for use in TEMPEST testing). Items of equipment which fail during routine use, or which suffer visible mechanical damage (during use or while in transit), are sidelined pending repair and recalibration. (Repairs are carried out either by the Nemko EESI, Inc.-approved independent (third party) metrology laboratories, or by the manufacturer of the equipment.

Nemko EESI, Inc. typically determines the Antenna Factors in its test antennas using qualified vendors. Antennas used for CISPR 11, CISPR 22, and FCC Part 15 and Part 18 Radiated Emissions testing (and for testing to the European Norms) are calibrated against NIST-traceable, FCC-approved Roberts™ Dipoles, using the methods specified in both Annex G.5 of CISPR 16-1 (1993) and ANSI C63.5 (1991), including the "Three-Antenna Method." Certain other antennas (e.g., log-conic spirals) are calibrated using the procedures specified in SAE ARP-958A. In accordance with FCC regulations, Nemko EESI, Inc. recalibrates its suite of antennas used for FCC tests on an annual basis. These calibrations are performed as a precursor to the FCC-required annual revalidation of the Normalized Site Attenuation properties of Nemko EESI, Inc.'s Open Area Test Site[1]. In those instances where antennas are acquired directly from the manufacturer, Nemko EESI, Inc. will purchase an Antenna Factor Calibration Data Package. Finally, Nemko EESI, Inc. may send antennas out to NIST-traceable/military-approved independent antenna range laboratories, or to the original equipment manufacturer.

[1] Nemko EESI, Inc. uses the procedures contained in both Subclause 16.6 and Annex G.2 of CISPR 16-1 (1993), and ANSI C63.4 (1992) when performing Normalized Site Attenuation measurement for calibration of Nemko EESI, Inc.'s Open Area Test Site.

FEDERAL COMMUNICATIONS COMMISSION

7435 Oakland Mills Road
Columbia, MD 21046
Telephone: 301-362-3044
Facsimile: 301-344-2050

November 20, 1998

IN REPLY REFER TO
31040/SIT
1300F2

Nemko EESI, Inc.
11696 Sorrento Valley Road, Suite F
San Diego, CA 92121

Attention: Harry H. Hodes

Re: Change of company name

Dear Mr. Hodes:

This is to acknowledge your letter of November 18, 1998, informing us of the change of the name of your company from Electromagnetic Engineering Services, Inc. to Nemko EESI, Inc. Our records have been revised to show Nemko EESI, Inc. as listed with the Commission to perform certification testing under Parts 15 and 18 and Declaration of Conformity testing according to the terms of accreditation by NVLAP.

Sincerely yours,

Thomas W. Phillips
Electronics Engineer
Customer Service Branch

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ISO/IEC GUIDE 25:1990
ISO 9002:1987

Certificate of Accreditation

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

NEMKO EESI, INC.
SAN DIEGO, CA

is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q9002-1987) as suppliers of calibration or test results. Accreditation is awarded for specific services, listed on the Scope of Accreditation for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS
FCC

December 31, 1999

Effective through

For the National Institute of Standards and Technology

NVLAP Lab Code: 200116-0

NVLAP-01C (11-95)

Nemko EESI, Inc.
11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121
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Revision	Date	Document Name	Document #	FCC ID#	Page #
A	1/19/99	Sweeney Enterprises RC10T FCC 'C' Certification Report	99-021	OC2RC10T	B-2

National Institute of Standards and Technology — NVLAP® — National Voluntary Laboratory Accreditation Program

ISO/IEC GUIDE 25:1990
ISO 9002:1987

Scope of Accreditation

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 200116-0

NEMKO EESI, INC.
11696 Sorrento Valley Road, Suite F
San Diego, CA 92121
Mr. Harry H. Hodes
Phone: 619-259-4952 Fax: 619-259-7170

NVLAP Code	*Designation / Description*
International Special Committee on Radio Interference (CISPR) Methods	
12/CIS22	IEC/CISPR 22:1993: Limits and methods of measurement of radio disturbance characteristics of information technology equipment
Federal Communications Commission (FCC) Methods	
12/F01	FCC Method - 47 CFR Part 15 - Digital Devices
12/F01a	Conducted Emissions, Power Lines, 450 KHz to 30 MHz
12/F01b	Radiated Emissions
Australian Standards referred to by clauses in AUSTEL Technical Standards	
12/T51	AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment

December 31, 1999
Effective through

For the National Institute of Standards and Technology

NVLAP-01S (11-95)