

TEST RESULT SUMMARY

UNITED STATES STANDARD 47 CFR PART 15, SUBPART B

MANUFACTURER NAME	DIRECTED ELECTRONICS, INC.
NAME OF EQUIPMENT	449 Module*
MODEL NUMBER	449
MANUFACTURER ADDRESS	2560 Progress Street Vista, CA 92083
TEST REPORT NUMBER	S8331-06
TEST DATE	02 July 1998

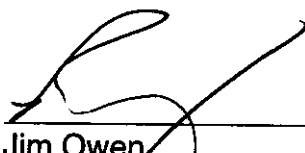
According to testing performed at TÜV Product Service, Inc., the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in United States Standard 47 CFR Part 15, Subpart B, Paragraphs 15.107(a) and 15.109(a).

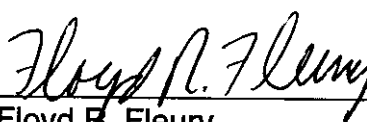
TÜV Product Service reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV Product Service, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service, Inc. issued reports.

As the responsible EMC Project/Division Managers, we hereby declare that the equipment tested at TÜV Product Service, Inc. as specified above conforms to the requirements of United States Standard 47 CFR Part 15, Radio Frequency Devices, Subpart B, Unintentional Radiators.

Date: 02 July 1998

Location: San Diego, California
USA


for Jim Owen
Responsible Engineer


Floyd R. Fleury
EMC Manager, EIC

(*) FCC ID: EZSDEI449

Not Transferable

EMC EMISSION - TEST REPORT

UNITED STATES STANDARD 47 CFR PART 15, SUBPART B

Test Report File No. : **S8331-06** Date of Issue: 02 July 1998

Model / Serial No. : 449 / Sample #2

Product Type : 449 Module*

Applicant : DIRECTED ELECTRONICS, INC.

Manufacturer : DIRECTED ELECTRONICS, INC.

License holder : DIRECTED ELECTRONICS, INC.

Address : 2560 Progress Street
: Vista, CA 92083

Test Result : ☒ **Positive** ☐ **Negative**

Test Project Number
Reference(s) : S201833101-06

Total pages - Test Report : 12

(*) FCC ID: EZSDEI449

TÜV Product Service, Inc. is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 25 and EN 45001.

TÜV Product Service reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV Product Service, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service, 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 without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP or any agency of the US government.

TÜV Product Service, Inc. and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NVLAP, and VCCI

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EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to the following regulations:

☐ - EN 50081-1 / 1991

☐ - EN 55011 / 1991

☐ - Group 1

☐ - Group 2

☐ - Class A

☐ - Class B

☐ - EN 55013 / 1990

☐ - EN 55014 / 1987

☐ - Household appliances and similar

☐ - Portable tools

☐ - Semiconductor devices

☐ - EN 55014 / A2:1990

☐ - EN 55014 / 1993

☐ - Household appliances and similar

☐ - Portable tools

☐ - Semiconductor devices

☐ - EN 55015 / 1987

☐ - EN 55015 / A1:1990

☐ - EN 55015 / 1993

☐ - EN 55022 / 1987

☐ - Class A

☐ - Class B

☐ - EN 55022 / 1994

☐ - Class A

☐ - Class B

☐ - BS

☐ - VCCI

☐ - Class A ITE

☐ - Class B ITE

■ - 47 CFR Part 15, Subpart B

☐ - 107(b)

■ - 107(a)

☐ - 107(e)

☐ - Class A

☐ - Class B

☐ - 109(b)

■ - 109(a)

☐ - 109(g)

☐ - Class A

☐ - Class B

☐ - AS/NZS 3548: 1995

☐ - Class A

☐ - Class B

☐ - CISPR 11 (1990)

☐ - Group 1

☐ - Group 2

☐ - Class A

☐ - Class B

☐ - CISPR 22 (1993)

☐ - Class A

☐ - Class B

Environmental Conditions In The Laboratory:

	<u>Actual</u>
Temperature:	: 23 °C
Relative Humidity:	: 50 %
Atmospheric Pressure:	: 100.0 kPa

Power Supply Utilized:

Power supply system : Battery

Symbol Definitions:

- - Applicable
- - Not Applicable

Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

The **CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE)** measurements were performed at the following test location:

■ - Test not performed - see remarks

- ☐ - SR-2, Shielded Room, 12' x 24' x 10', Metal Chamber
- ☐ - SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber
- ☐ - SR-4, Shielded Room, 10' x 17' x 8', Copper Screen Chamber
- ☐ - SR-5, Shielded Room, 16' x 28' x 15', Metal, Semi-Anechoic Chamber
- ☐ - CSR-1, Shielded Room, 10' x 7' x 7', Metal Chamber

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.
<input type="checkbox"/> - NM-7A, NM-17/27, NM-37/57, NM-67, CCA-7, & H/P 9836 HP-1B Computer	156, 162-166	Automated RFI Measurement System (ARMS), NO. 1	Eaton/Ailtech	(multiple)
<input type="checkbox"/> - NM-17/27, NM-37/57, CA-7, and H/P 9826 Computer	168, 170, 177, 178	Automated RFI Measurement System (ARMS), NO. 2	Eaton/Ailtech	(multiple)
<input type="checkbox"/> - H/P Spectrum Analyzer, Model 8568B; Display Section RF Analyzer Section; H/P 85650A, Quasi-Peak Adapter H/P Computer System, Model 310 with HP 85869A Software	187, 188	Automated RFI Measurement System (ARMS)	Various	(multiple)
<input type="checkbox"/> - LISN-3, 50 A	262-263	Power Mains Network (LISN), 50 μ H/250 μ H/50 Ω /0.25 μ F	Fischer Custom Communications, Inc.	3-4
<input type="checkbox"/> - LISN-3, 50 A	264, 265	Power Mains Network (LISN), 50 μ H/250 μ H/50 Ω /0.25 μ F	Fischer Custom Communications, Inc.	5-6
<input type="checkbox"/> - LISN-2, 25 A	413	Power Mains Network (LISN), 50 μ H/250 μ H/50 Ω /0.25 μ F	Fischer Custom Communications, Inc.	7
<input type="checkbox"/> - LISN-2, 25 A	--	Power Mains Network (LISN), 50 μ H/250 μ H/50 Ω /0.25 μ F	Fischer Custom Communications, Inc.	7
<input type="checkbox"/> - FCC-LISN-50-25-2	553	Power Mains Network (LISN), 50 μ H/250 μ H/50 Ω /0.25 μ F	Fischer Custom Communications, Inc.	112
<input type="checkbox"/> - FCC-LISN-50-25-2	552	Power Mains Network (LISN), 50 μ H/250 μ H/50 Ω /0.25 μ F	Fischer Custom Communications, Inc.	113
<input type="checkbox"/> - 8012-50-R-12-BNC	266	LISN, 50 μ H/50 Ω /0.1 μ F	Solar Electronics Co.	--
<input type="checkbox"/> - 9252-50-R-24-BNC	458	LISN, 50 μ H /250 μ H/50 Ω /0.25 μ F	Solar Electronics Co.	941719
<input type="checkbox"/> - 9252-50-R-24-BNC	457	LISN, 50 μ H /250 μ H/50 Ω /0.25 μ F	Solar Electronics Co.	941720
<input type="checkbox"/> - MDS-21	277	Absorbing Clamp	Rohde & Schwarz	821023
<input type="checkbox"/> - ESHS 20	428	EMI Test Receiver	Rohde & Schwarz	837055/001
<input type="checkbox"/> - ESHS 30	459	EMI Test Receiver	Rohde & Schwarz	832354/004
<input type="checkbox"/> - CAT-20	598	20 dB Attenuator	Mini-Circuits	--
<input type="checkbox"/> - CAT-20	615	20 dB Attenuator	Mini-Circuits	--

Remarks: EUT battery operated.

Emissions Test Conditions: RADIATED EMISSIONS (Magnetic Field)
The RADIATED EMISSIONS (MAGNETIC FIELD) measurements were performed at the following test location:
☒ - Test not applicable

- ☐ - SR-2, Shielded Room, 12' x 24' x 10', Metal Chamber
- ☐ - SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber
- ☐ - SR-4, Shielded Room, 10' x 17' x 8', Copper Screen Chamber
- ☐ - SR-5, Shielded Room, 16' x 28' x 15', Metal, Semi-Anechoic Chamber
- ☐ - TR-1, Shielded Room, 16.5' x 10' x 7.5', Copper Screen Chamber
- ☐ - CSR-1, Shielded Room, 10' x 7' x 7', Metal Chamber

Testing was performed at a test distance of :

- ☐ - 3 meters
- ☐ - 30 meters

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.
<input type="checkbox"/> - NM-7A, NM-17/27, NM-37/57, NM-57, CCA-7, and H/P 9836 HP-1B Computer	156, 62, 166	Automated RFI Measurement System (ARMS), NO. 1	Eaton/Ailtech	(multiple)
<input type="checkbox"/> - NM-17/27, NM-37/57, CA-7, & H/P 9836 Computer	168, 170, 177, 178	Automated RFI Measurement System (ARMS), NO. 2	Eaton/Ailtech	(multiple)
<input type="checkbox"/> - AT-205/URM-5	201	Loop Antenna	Eaton/Ailtech	64090
<input type="checkbox"/> - 94593-1	205	Loop Antenna	Eaton/Ailtech	0264

Remarks: _____

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The **RADIATED EMISSIONS (ELECTRIC FIELD)** measurements, in the frequency range of 30 MHz-1000 MHz, were tested in a horizontal and vertical polarization at the following test location :

☐ - Test not applicable

- ☐ - Roof (Small Open Area Test Site)
- ☐ - Canyon #1 (10- and 30-Meter Open Area Test Site), Carroll Canyon, San Diego
- ☒ - Canyon #2 (3- and 10-Meter Open Area Test Site), Carroll Canyon, San Diego

Testing was performed at a test distance of :

- ☒ - 3 meters
- ☐ - 10 meters
- ☐ - 30 meters

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.
<input type="checkbox"/> - NM-37/57A	420	OATS measurement set (Roof)	Eaton/Ailtech	0561-09261
CCA-7	373			0773-03117
<input type="checkbox"/> - NM-37/57	171	OATS measurement set (Canyon)	Eaton/Ailtech	0709-82078
CCA-7	172			0187-0322
<input type="checkbox"/> - HFH 2-Z2	208	Antenna, Loop	Rohde & Schwarz	880
<input type="checkbox"/> - 3104	235	Antenna, Biconical	EMCO	3031
<input type="checkbox"/> - 3110	451	Antenna, Biconical	EMCO	1378
<input type="checkbox"/> - 94455-1	231	Antenna, Biconical	Eaton/Ailtech	0811
<input checked="" type="checkbox"/> - 3110B	491	Antenna, Biconical	EMCO	9508-2
<input type="checkbox"/> - CBL6111	460	Antenna, Bilog	Chase	1013
<input type="checkbox"/> - CBL6111	461	Antenna, Bilog	Chase	1291
<input type="checkbox"/> - 3146	242	Antenna, Log Periodic Dipole	EMCO	1597
<input type="checkbox"/> - 3146	243	Antenna, Log Periodic Dipole	EMCO	106X
<input checked="" type="checkbox"/> - 3146	244	Antenna, Log Periodic Dipole	EMCO	1063
<input type="checkbox"/> - 7405	570	Loop Probes	EMCO	9104-1959
<input type="checkbox"/> - 8566B	404	Spectrum Analyzer	Hewlett Packard	2311A02209
<input type="checkbox"/> - 85662B	406	Spectrum Analyzer Display	Hewlett Packard	2309A04682
<input type="checkbox"/> - ESVS 30	427	EMI Test Receiver	Rohde & Schwarz	830350/006
<input checked="" type="checkbox"/> - ESVS 30	466	EMI Test Receiver	Rohde & Schwarz	833825/003

Remarks: _____

Emissions Test Conditions: INTERFERENCE POWER

The **INTERFERENCE POWER** measurements were performed by using the absorbing clamp on the mains and interface cables in the frequency range 30 MHz - 300 MHz at the following test location :

■ - Test not applicable

- ☐ - SR-2, Shielded Room, 12' x 24' x 10', Metal Chamber
- ☐ - SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber
- ☐ - SR-4, Shielded Room, 10' x 17' x 8', Copper Screen Chamber
- ☐ - SR-5, Shielded Room, 16' x 28' x 15', Metal, Semi-Anechoic Chamber
- ☐ - CSR-1, Shielded Room, 10' x 7' x 7', Metal Chamber

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.
<input type="checkbox"/> - MDS-21	277	Absorbing Clamp	Rohde & Schwarz	821023
<input type="checkbox"/> - NM-7A, NM-17/27, NM-37/57, NM-67, CCA-7, & H/P 9836 HP-1B Computer	158, 162-168	Automated RFI Measurement System (ARMS), NO. 1	Eaton/Ailtech	(multiple)
<input type="checkbox"/> - NM-17/27, NM-37/57, CA-7, & H/P 9825 Computer	168, 170, 177, 178	Automated RFI Measurement System (ARMS), NO. 2	Eaton/Ailtech	(multiple)
<input type="checkbox"/> - H/P Spectrum Analyzer, Model 8566B, Display Section RF Analyzer Section, H/P 85650A, Quasi-Peak Adapter H/P Computer System, Model 310 with HP 85869A Software	187, 188	Automated RFI Measurement System (ARMS)	Hewlett Packard	2304A04531 2304A02500 2811A01325
<input type="checkbox"/> - ESVS 30	427	EMI Test Receiver	Rohde & Schwarz	830350/006
<input type="checkbox"/> - ESVS 30	466	EMI Test Receiver	Rohde & Schwarz	830350/003

Remarks: _____

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range 1 GHz - 18 GHz were performed in a horizontal and vertical polarization at the following test location :

■ - Test not applicable

- ☐ - Roof (Small Open Area Test Site)
- ☐ - Canyon #1 (10- and 30-Meter Open Area Test Site), Carroll Canyon, San Diego
- ☐ - Canyon #2 (3- and 10-Meter Open Area Test Site), Carroll Canyon, San Diego

Testing was performed at a test distance of:

- ☐ - 1 meters
- ☐ - 3 meters
- ☐ - 10 meters

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.
<input type="checkbox"/> - 8566B	407	Spectrum Analyzer	Hewlett Packard	2311A02209
<input type="checkbox"/> - 85662B	406	Spectrum Analyzer Display	Hewlett Packard	2309A04682
<input type="checkbox"/> - 3115	453	Antenna, Double Ridge Guide	EMCO	9412-4363
<input type="checkbox"/> - 3115	251	Antenna, Double Ridge Guide	EMCO	2495
<input type="checkbox"/> - AFD3-0102-13-ST	366	Pre-Amplifier (38 dB gain), 1 to 2 GHz	Miteq, Inc.	16429
<input type="checkbox"/> - AFD3-0208-40-ST	367	Pre-Amplifier (30 dB gain), 2 to 8 GHz	Miteq, Inc.	155382
<input type="checkbox"/> - AFS4-08001800-70-10P-4	368	Pre-Amplifier (22 dB gain), 8 to 18 GHz	Miteq, Inc.	167
<input type="checkbox"/> - 91888-2	252	Horn Antenna (1 to 2 GHz)	Eaton	101
<input type="checkbox"/> - 91889-2	253	Horn Antenna (2 to 3.6 GHz)	Eaton	101
<input type="checkbox"/> - 91892-1	254	Reflector Antenna (3.6 to 18 GHz)	Eaton	--
<input type="checkbox"/> - 94613-1	255	Horn Antenna (3.6 to 7.6 GHz)	Eaton	--
<input type="checkbox"/> - 91891-2	256	Horn Antenna (7.3 to 12 GHz)	Eaton	--
<input type="checkbox"/> - 94614-1	257	Horn Antenna (12 to 18 GHz)	Eaton	--

Remarks: No emissions detected at 0.5 meter distance above 1 GHz.

Equipment Under Test (EUT) Test Operation Mode - Emissions Tests :

The equipment under test was operated under the following conditions during emissions testing:

- ☐ - Standby
- ☐ - Test Program (H - Pattern)
- ☐ - Test Program (Color Bar)
- ☐ - Test Program (Customer Specified)
- ☐ - Practice Operation
- ☐ - Normal Operating Mode
- ☒ - Normal with receive signal present

Configuration of the equipment under test:

- ☐ - See Constructional Data Form in Appendix B - Page B2
- ☒ - See Product Information Form(s) in Appendix B - Page B2

The following peripheral devices and interface cables were connected during the testing:

- | | |
|--|---|
| <input checked="" type="checkbox"/> - Power Supply | Type : Hewlett Packard, Model E3611A |
| <input checked="" type="checkbox"/> - Signal Generator | Type : Hewlett Packard, Model 8648C, ID 573 |
| <input type="checkbox"/> - _____ | Type : _____ |
| <input type="checkbox"/> - _____ | Type : _____ |
| <input type="checkbox"/> - _____ | Type : _____ |
| <input type="checkbox"/> - _____ | Type : _____ |
| <input type="checkbox"/> - _____ | Type : _____ |
| <input type="checkbox"/> - _____ | Type : _____ |
| <input checked="" type="checkbox"/> - unshielded power cable | |
| <input checked="" type="checkbox"/> - unshielded cables | |
| <input type="checkbox"/> - shielded cables | MPS.No.: _____ |
| <input type="checkbox"/> - customer specific cables | |
| <input type="checkbox"/> - _____ | |
| <input type="checkbox"/> - _____ | |

Emissions Test Results:**Conducted Emissions, 10/150/450 kHz - 30 MHz**☐ - PASS☐ - FAIL☒ - NOT APPLICABLE

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: EUT battery operated.**Radiated Emissions (Magnetic Field), 10 kHz - 30 MHz**☐ - PASS☐ - FAIL☒ - NOT APPLICABLE

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated Emissions (Electric Field), 30 MHz - 1000 MHz☒ - PASS☐ - FAIL☐ - NOT APPLICABLE

Minimum limit margin _____ 2.6 dB at _____ 433 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Interference Power at the Mains and Interface Cables, 30 MHz - 300 MHz☐ - PASS☐ - FAIL☒ - NOT APPLICABLE

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Equivalent Radiated Emissions, 1 GHz - 18 GHz☐ - PASS☐ - FAIL☒ - NOT APPLICABLE

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: No emissions detected at 0.5 meter distance above 1 GHz.

GENERAL REMARKS:

FCC ID: EZSDEI449

- (*) Conducted Emissions - EUT battery operated.
Radiated Emissions, Electric Field - No emissions detected at 0.5 meter distance above 1 GHz.

SUMMARY:

All tests according to the regulations cited on page 3 were

☐ - Performed

☒ - Not Performed*

The Equipment Under Test

☒ - **Fulfills** the general approval requirements cited on page 3.

☐ - **Does not** fulfill the general approval requirements cited on page 3.

Statement of Measurement Uncertainty

The data and results referenced in this document are true and accurate. There may be some degree or level of measurement uncertainty. As EN 45001 does not allow recommendations to be included in the test report, the reader is encouraged to request a copy of the TÜV policy concerning pass or fail judgment with respect to possible measurement uncertainties.

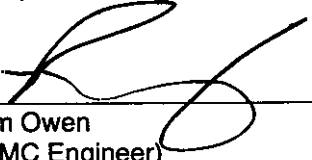
Equipment Received Date: 02 July 1998

Testing Start Date: 02 July 1998

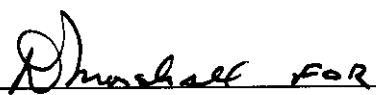
Testing End Date: 02 July 1998

- TÜV PRODUCT SERVICE, INC. -

Responsible Engineer:

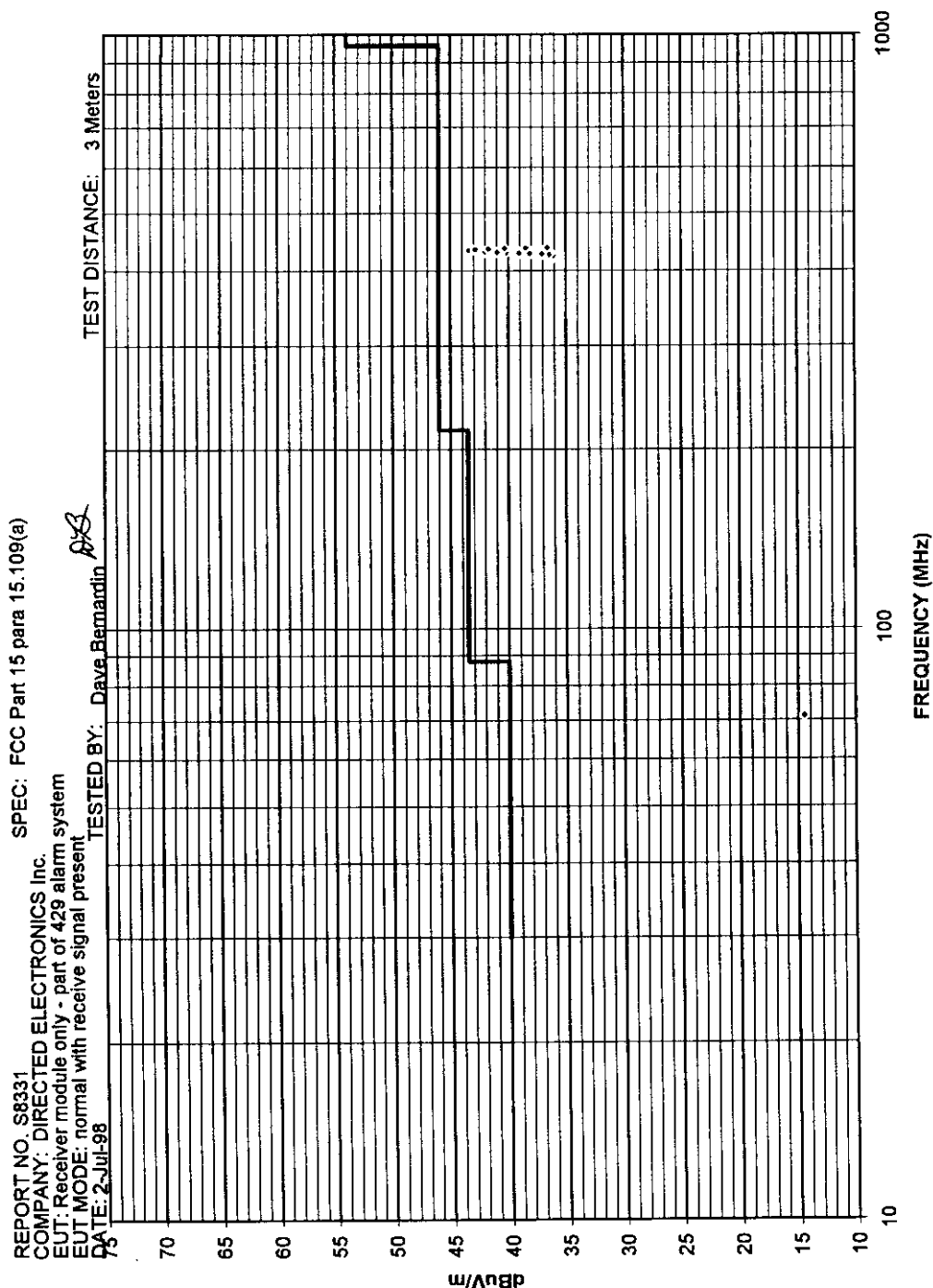

for Jim Owen
(EMC Engineer)

Responsible Test Engineer:


Dave Bernardin
(Senior EMC Engineer)

Technical Documentation

Test Data Sheets
and
Test Setup Drawing(s)



SPEC: FCC Part 15 para 15.109(a)

TEST DIST: 3 Meters

TEST SITE: 2

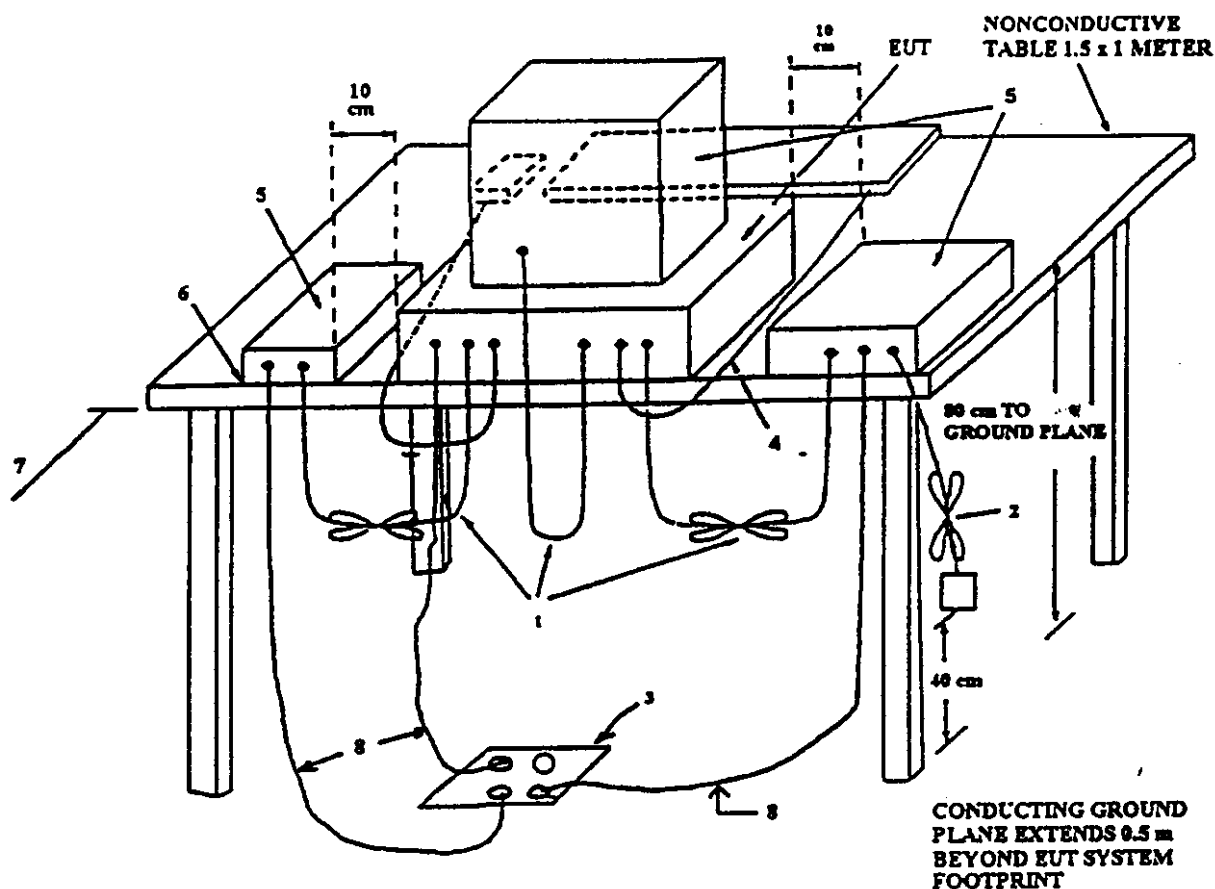
BICONICAL: 491

LOG PERIODIC: 244

RCVR:

TÜV PRODUCT SERVICE 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 619 546 3999 FAX 619 546 0364

Radiated Emission Test Setup, 30 to 1,000 MHz

**LEGEND:**

1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between ground plane and table.
2. I/O cables that are connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.
3. If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground plane with the receptacle flush with the ground plane.
4. Cables of hand-operated devices, such as keyboards, mouses, etc., have to be placed as close as possible to the controller.
5. Non-EUT components of EUT system being tested.
6. The rear of all components of the system under test shall be located flush with the rear of the table.
7. No vertical conducting wall used.
8. Power cords drape to the floor and are routed over to receptacle.