ACME TESTING
WORLDWIDE EMC & PRODUCT SAFETY SERVICES

20 August 2004

Ron Backlund
Daniels Electronic Ltd.
43 Erie Street,
Victoria, British Columbia
Canada V8V 1P8

Dear Mr. Backlund,

Enclosed is the 47 CFR Part 2 Subpart J Section 2.1053 (Radiated Spurious Emissions) Test Report for three Power Amplifiers (i.e., Models AMP-2/145-30-00, AMP-2/155-30-00, and AMP-2/170-30-00, and the CD-ROM containing this Test Report in PDF Format. Please check it thoroughly for discrepancies and please contact us immediately if you have any questions or if you identify any problems.

This is an official copy of your Test Report, complete with the original Acme Testing Co. staff signatures. You should retain this Test 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 Test Report on file for a three-year period, after which our copy of your Test Report will be destroyed.

Please note that the FCC Certification Procedure Rules require that this Test Report (and all other Exhibits that form the FCC Filing Package on your Power Amplifiers) must be retained by the Responsible Party for two years after the manufacturing of the product has been permanently discontinued [cf., 47 CFR Part 2 Section 2.938(c)].

Please note that Acme Testing Co. is accredited by the American Association for Laboratory Accreditation (A2LA), and that there is a current Mutual Recognition Agreement between the United States and Canada. Further, Acme Testing Co.'s Open Area Test Sites [OATS] are Registered with both Industry Canada and the FCC. This means that the data contained in your Test Report is acceptable to Industry Canada, which is the Radio Regulatory Authority of Canada.

Thank you for your business! We look forward to being of service to you in the future.

Yours sincerely,

Harry H. Hodes
Principal EMC Engineer
President & CEO

:sg
Enclosure

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ACCREDITED
CERTIFICATE # 0829-01 ACME, WA
CERTIFICATE # 0829-02 PLUMMER, ID
AN ISO 9000 REGISTERED CORPORATION
A VALIDATED CONFORMITY ASSESSMENT BODY

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TEST REPORT
47 CFR Part 2 Subpart J Section 2.1053
Measurements of Field Strength of Spurious Radiation
From:
Power Amplifier Family

DEVICES: THREE POWER AMPLIFIERS

MODELS: AMP-2/145-30-00,
AMP-2/155-30-00,
AMP-2/170-30-00.

MANUFACTURER: DANIELS ELECTRONICS LTD.

ADDRESS: 43 ERIE STREET,
VICTORIA, BRITISH COLUMBIA
CANADA V8V 1P8

WORK ORDER: 04-EMC-0623-0172

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1. General

1.1 Document History

REVISION	DATE	COMMENTS
-	20 August 2004	Initial Release, Harry H. Hodes

Note: Acme Testing Co. hereby makes the following statements:

- The Units described in this Test Report were received at Acme Testing Co.'s facilities on 28 June 2004. Testing was performed on the Units described in this Test Report on 29 and 30 June 2004 and 01 July 2004.
- 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.

This document is the property of Acme Testing, Co., and shall not be reproduced, except in full, without prior written approval of Acme Testing Co. However, all ownership rights are hereby returned unconditionally to Daniels Electronics Ltd., and approval is hereby granted to Daniels Electronics Ltd. and its employees and agents to reproduce all or part of this report for any legitimate business purpose without further reference to Acme Testing Co.

1.2 Purpose

Per Client Request, the purposes of this Test Report are:

- to document the results of Radiated Spurious Emissions measurements made on three Power Amplifiers (i.e., Daniels Electronics Ltd. Models AMP-2/145-30-00, AMP-2/155-30-00, and AMP-2/170-30-00) in accordance with 47CFR Part 2 Subpart J Section 2.1053 (i.e., the FCC Rules governing Radiated Spurious Emissions measurements).

- to document the compliance of the three Power Amplifiers (i.e., Daniels Electronics Ltd. Models AMP-2/145-30-00, AMP-2/155-30-00, and AMP-2/170-30-00) to the –20 dBm Limit applicable to Radiated Spurious Emissions for Power Amplifiers used in conjunction with VHF Transmitter Systems and VHF Repeater Systems operating under 47 CFR Parts 22, 80, and 90.

This Test Report references the applicable Electromagnetic Emissions requirements.

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

BRIAN WIKE
ASSOCIATE EMC ENGINEER

1.3 Manufacturer

Company Name:	Daniels Electronics Ltd.
Contact:	Ron Backlund
Street Address:	43 Erie Street,
City/Province/Postal Code:	Victoria, British Columbia, V8V 1P8
Country:	Canada
Telephone:	1-250-382-8268 Ext. 261
Fax:	1-250-382-6139
E-mail:	Ron_Backlund@danelec.com

1.4 Test Location

Laboratory:	Test Site # 1
Street Address:	2002 Valley Highway,
Mailing Address:	PO Box 3,
City/State/Zip:	Acme, WA 98220-0003
Telephone:	1-360-595-2785
Fax:	1-360-595-2722
E-mail:	acmetest@acmetesting.com
Web:	www.acmetesting.com

1.5 Accreditations and Listings

Acme Testing Co.'s Quality Management System is currently registered to ISO 9001:2000(E) by QMI under Certificate Numbers: CC1828-010083 (Acme, WA.) and CC1828-014276 (Plummer, ID.).

Acme Testing Co.'s test facilities are currently accredited by A2LA to ISO 17025:1999(E) for a specific Scope of Accreditation which includes the tests detailed herein, under Certificate Numbers: 0829-01 (Acme, WA), and 0829-02 (Plummer, ID).

Acme Testing Co.'s test facilities that are used to perform Radiated and Conducted Emissions Tests are currently registered with the Federal Communications Commission under Registration Numbers: 90420 (Acme, WA), and 96502 (Plummer, ID).

Acme Testing Co.'s test facilities that are used to perform Radiated and Conducted Emissions Tests are currently registered with the Industry Canada under Registration Numbers: IC3251 (Acme, WA), and IC3618 (Plummer, ID).

2. Test Results Summary

47 CFR Part 2 Subpart J Section 2.1053 Radiated Spurious Emissions Test Results for Daniels Electronics Ltd. Power Amplifiers (Models AMP-2/145-30-00, AMP-2/155-30-00, and AMP-2/170-30-00) used in conjunction with VHF Transmitter Systems and/or VHF Repeater Systems operating under 47 CFR Parts 22, 80, & 90

Summary of Test Results - Emissions

EUT	Test Description	Limit	Result and Worst-Case Margin (dB)
AMP-2/145-30-00	47 CFR Section 2.1053 Radiated Spurious Emissions	-20 dBm	Pass Margin = -6.5 dB
AMP-2/155-30-00	47 CFR Section 2.1053 Radiated Spurious Emissions	-20 dBm	Pass Margin = -7.1 dB
AMP-2/170-30-00	47 CFR Section 2.1053 Radiated Spurious Emissions	-20 dBm	Pass Margin = -3.5 dB

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 SUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, the effects of measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are 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 standards. 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

20 August 2004
Date of Issuance

3. Description of Equipment and Peripherals

3.1 Equipments Under Test (EUTs)

The EUTs comprise a "Power Amplifier Family" consisting of the following Devices:

Device:	Power Amplifier, VHF (136 – 150 MHz), 10 – 30 Watt *Note: Fixed Power Amplifier Gain; the RF Output Power depended on the RF Input Power. 4 Watt (nominal) RF Input Power yielded 30 Watt (nominal) RF Output Power from the Power Amplifier*
Model Number:	AMP-2/145-30-00,
Serial Number:	R&D 10001
Input Power:	13.8 VDC
Grounding:	*via* the Subrack Chassis [Note: The DC Return was tied (internally to the Subrack) to the Subrack Chassis Ground
Size of Device:	14.2 cm X 12.8 cm X 19.0 cm

Device:	Power Amplifier, VHF (150 – 162 MHz), 10 – 30 Watt *Note: Fixed Power Amplifier Gain; the RF Output Power depended on the RF Input Power. 4 Watt (nominal) RF Input Power yielded 30 Watt (nominal) RF Output Power from the Power Amplifier*
Model Number:	AMP-2/155-30-00,
Serial Number:	R&D 10002
Input Power:	13.8 VDC
Grounding:	*via* the Subrack Chassis [Note: The DC Return was tied (internally to the Subrack) to the Subrack Chassis Ground
Size of Device:	14.2 cm X 12.8 cm X 19.0 cm

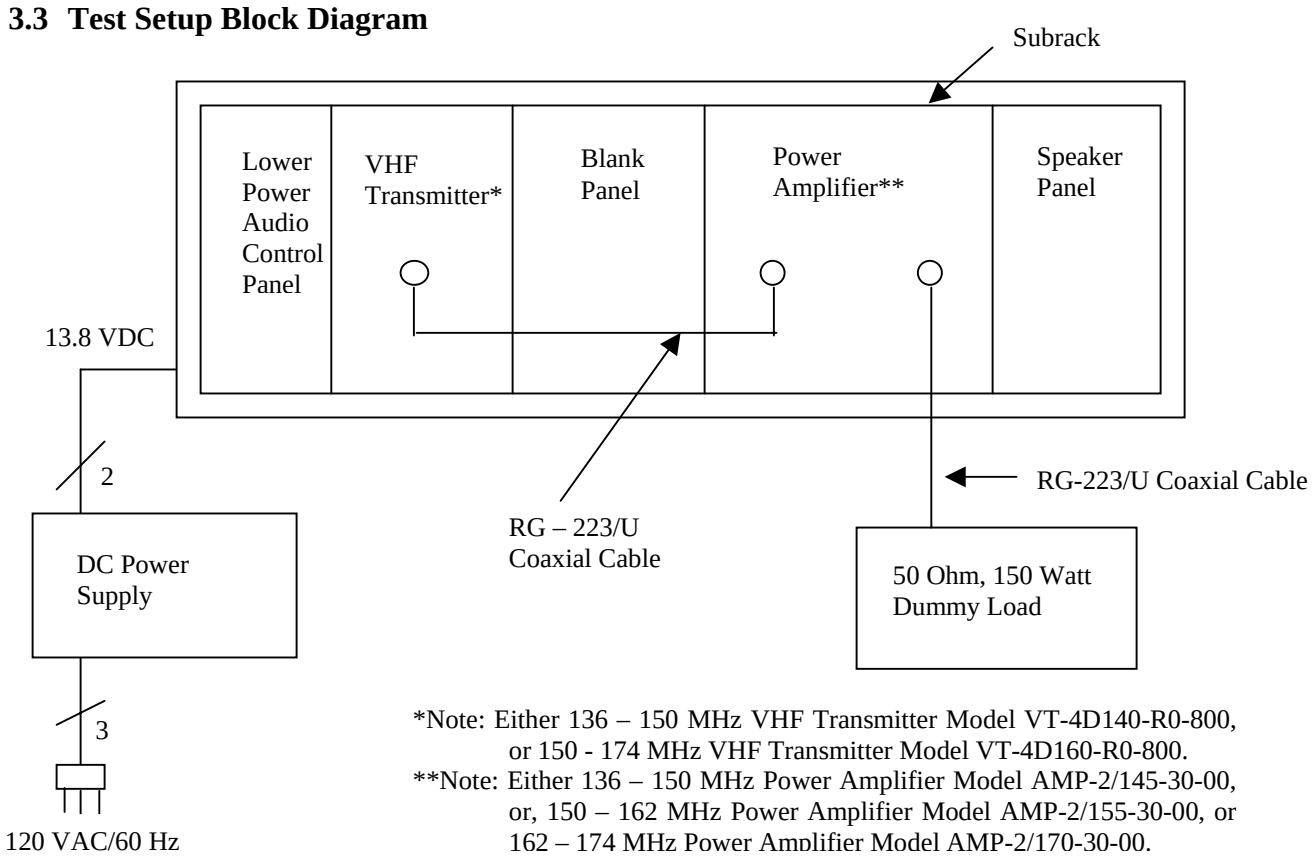
Device:	Power Amplifier, VHF (162 – 174 MHz), 10 – 30 Watt *Note: Fixed Power Amplifier Gain; the RF Output Power depended on the RF Input Power. 4 Watt (nominal) RF Input Power yielded 30 Watt (nominal) RF Output Power from the Power Amplifier*
Model Number:	AMP-2/170-30-00,
Serial Number:	11715
Input Power:	13.8 VDC
Grounding:	*via* the Subrack Chassis [Note: The DC Return was tied (internally to the Subrack) to the Subrack Chassis Ground
Size of Device:	14.2 cm X 12.8 cm X 19.0 cm

Note: the above-listed Power Amplifier devices are not capable of stand-alone operation. Any one of the above-listed Power Amplifiers must be used in conjunction with other devices (i.e., a Subrack/Motherboard + 96 PIN + I/O + Speaker Panel; an Low Power 96 PIN Audio Control Panel, and a VHF Transmitter or VHF Transceiver) to form either a single "VHF Transmitter System" or a single "VHF Repeater System". It should be noted that the VHF Transmitter (or VHF Transceiver) used must be matched to its corresponding Power Amplifier.

3.2 Support Equipment Used During Emissions Testing

Device	Manufacturer	Model Number	Serial Number
VHF Transmitter, 8 Watt, P25 (136 – 150 MHz)	Daniels Electronics	VT-4D140-R0-800	10353
VHF Transmitter, 8 Watt, P25 (150 – 174 MHz)	Daniels Electronics	VT-4D160-R0-800	10736
VHF Transmitter, 8 Watt, P25 (150 – 174 MHz)	Daniels Electronics	VT-4D160-R0-800	R&D 10004
Subrack/Motherboard, 96 PIN + I/O + Speaker Panel	Daniels Electronics	SR-39-2	15347
Audio Control, Low Power, 96 PIN	Daniels Electronics	AC-3L-96	R&D 10001
50 Ohm, 150 Watt Dummy Load	Bird	Unknown	DE572 (Daniels Asset #)
DC Power Supply	Hewlett-Packard	6268B	2309A05870

3.3 Test Setup Block Diagram



*Note: Either 136 – 150 MHz VHF Transmitter Model VT-4D140-R0-800, or 150 - 174 MHz VHF Transmitter Model VT-4D160-R0-800.
**Note: Either 136 – 150 MHz Power Amplifier Model AMP-2/145-30-00, or, 150 – 162 MHz Power Amplifier Model AMP-2/155-30-00, or 162 – 174 MHz Power Amplifier Model AMP-2/170-30-00.

3.4 Description of Interface Cables Used During Emissions Testing

VHF Transmitter [RF Out Port] / Power Amplifier [RF In Port] (RG-223/U Coaxial Cable, Type N Male Connectors at each end)

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	37 cm	No

Power Amplifier [RF Out Port] / 50 Ohm-150 Watt Dummy Load (RG-223/U Coaxial Cable, Type N Male Connectors at each end)

Shielded	Unshielded	Flat	Round	Length	Ferrite
Yes	No	No	Yes	37 cm	No

DC Power Supply [DC Output Port] / Subrack [DC Input Port]

Shielded	Unshielded	Flat	Round	Length	Ferrite
No	Yes	No	Yes	2.0 m	No

DC Power Supply [AC Input Port] / AC Mains Input Power (60 Hz /120 VAC)

Shielded	Unshielded	Flat	Round	Length	Ferrite
No	Yes	No	Yes	2.8 m	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).

3.5 Mode of Operation During Emissions Testing

3.5.1 Mode of Operation During Emissions Testing of Power Amplifier Model AMP-2/145-30-00

A 136 – 150 MHz VHF Transmitter System was first assembled as follows:

The 136 - 150 MHz Band Power Amplifier, (i.e., the Model AMP-2/145-30-00), and its corresponding VHF Transmitter, (i.e., the Model VT-4D140-R0-800), and, the Low Power Audio Control Panel were inserted into the Subrack Assembly. (The Subrack Assembly included the Motherboard, 96 PIN Connector, I/Os, and the Speaker Panel). An RG-223/U Coaxial Cable was used to connect the VHF Transmitter RF Output to the Power Amplifier RF Input. An RG-223/U Coaxial Cable was used to connect the Power Amplifier RF Output to the 50 Ohm – 150 Watt Dummy Load.

Next, the Subrack was then fed 13.8 VDC from the HP 6268B Linear DC Power Supply.

Finally, the 136 – 150 MHz VHF Transmitter System was then turned “on”, all three channels were set to a frequency of 136 MHz, the VHF Transmitter was set to deliver 4 Watts (nominal) to the Power Amplifier (which caused the Power Amplifier to deliver its maximum RF output [i.e. 30 watts nominal]) into the 50 Ohm – 150 watt Dummy Load. (It should be noted that the Power Amplifier was amplifying an un-modulated carrier signal output from the VHF Transmitter).

3.5.2 Mode of Operation During Emissions Testing of Power Amplifier Model AMP-2/155-30-00

A 150 – 162 MHz VHF Transmitter System was first assembled as follows:

The 150 - 162 MHz Band Power Amplifier, (i.e., the Model AMP-2/155-30-00), and its corresponding VHF Transmitter, (i.e., the Model VT-4D160-R0-800), and, the Low Power Audio Control Panel were inserted into the Subrack Assembly. (The Subrack Assembly included the Motherboard, 96 PIN Connector, I/Os, and the Speaker Panel). An RG-223/U Coaxial Cable was used to connect the VHF Transmitter RF Output to the Power Amplifier RF Input. An RG-223/U Coaxial Cable was used to connect the Power Amplifier RF Output to the 50 Ohm – 150 Watt Dummy Load.

Next, the Subrack was then fed 13.8 VDC from the HP 6268B Linear DC Power Supply.

Finally, the 150 – 162 MHz VHF Transmitter System was then turned "on", all three channels were set to a frequency of 156 MHz, the VHF Transmitter was set to deliver 4 Watts (nominal) to the Power Amplifier (which caused the Power Amplifier to deliver its maximum RF output [i.e. 30 watts nominal]) into the 50 Ohm – 150 watt Dummy Load. (It should be noted that the Power Amplifier was amplifying an un-modulated carrier signal output from the VHF Transmitter).

3.5.3 Mode of Operation During Emissions Testing of Power Amplifier Model AMP-2/170-30-00

A 162 – 174 MHz VHF Transmitter System was first assembled as follows:

The 162 - 174 MHz Band Power Amplifier, (i.e., the Model AMP-2/170-30-00), and its corresponding VHF Transmitter, (i.e., the Model VT-4D160-R0-800), and, the Low Power Audio Control Panel were inserted into the Subrack Assembly. (The Subrack Assembly included the Motherboard, 96 PIN Connector, I/Os, and the Speaker Panel). An RG-223/U Coaxial Cable was used to connect the VHF Transmitter RF Output to the Power Amplifier RF Input. An RG-223/U Coaxial Cable was used to connect the Power Amplifier RF Output to the 50 Ohm – 150 Watt Dummy Load.

Next, the Subrack was then fed 13.8 VDC from the HP 6268B Linear DC Power Supply.

Finally, the 162 – 174 MHz VHF Transmitter System was then turned "on", all three channels were set to a frequency of 174 MHz, the VHF Transmitter was set to deliver 4 Watts (nominal) to the Power Amplifier (which caused the Power Amplifier to deliver its maximum RF output [i.e. 30 watts nominal]) into the 50 Ohm – 150 watt Dummy Load. (It should be noted that the Power Amplifier was amplifying an un-modulated carrier signal output from the VHF Transmitter).

3.6 Modifications Required for Compliance

None.

4. Radiated Spurious Emissions Tests

Test Requirement: FCC Rules: 47CFR Part 2 Subpart J Section 2.1053

Test Procedure: EIA/TIA 603-1993 Section 2.2.12

Date of Test: 29 and 30 June 2004 and 1 July 2004

Laboratory: Test Site #2 (Acme, WA)

4.1 Test Equipment

⇒ Spectrum Analyzer (blue): Hewlett-Packard 8566B, Serial Number 2410A00168, Calibrated: 30 June 2003, Calibration Due Date: 15 July 2004

⇒ RF Preselector (blue): Hewlett-Packard 85685A, Serial Number 2648A00519, Calibrated: 30 June 2003, Calibration Due Date: 15 July 2004

⇒ Quasi Peak Adapter (blue): Hewlett-Packard 85650A, Serial Number 2043A00327, Calibrated: 30 June 2003, Calibration Due Date: 15 July 2004

⇒ Synthesized RF Signal Generator: Gigatronics 6062A, Serial Number 5140235, Calibrated 11 December 2003, Calibration Due Date: 11 December 2004

⇒ Biconical Antenna (black): EMCO 3110B, Serial Number 9707-2961, Calibrated: 21 November 2003, Calibration Due Date: 21 November 2004

⇒ Log Periodic Antenna (red) (200 MHz to 1000 MHz): EMCO 3146, Serial Number 9008-2853, Calibrated: 16 October 2003, Calibration Due Date: 16 October 2004

⇒ Double Ridge Guide Horn Antenna (Blue): (1 GHz to 18 GHz): EMCO 3115, Serial Number 9807-5534, Calibrated: 04 December 2003, Calibration Due Date: 04 December 2004

⇒ Double Ridge Guide Horn Antenna (Red) (1 GHz to 18 GHz): EMCO 3115, Serial Number 2551, Calibrated 28 July 2003, Calibration Due Date: 28 July 2004

⇒ Precision Attenuator: Weinschel AS-18/1 dB, Serial Number 665, Calibrated 16 October 2001, Calibration Due Date: 16 October 2004

⇒ Precision Attenuator: Weinschel AS-18/3 dB, Serial Number 665, Calibrated 16 October 2001, Calibration Due Date: 16 October 2004

(Continued on the Next Page)

(Test Equipment – Continued for the Previous Page)

⇒ Roberts Dipole Set Dipole 2 (65 MHz – 185 MHz): Compliance Design, Serial Number 17267, Calibrated 13 February 2003, 13 February 2006

⇒ Roberts Dipole Set Dipole 3 (180 MHz – 400 MHz): Compliance Design, Serial Number 17267, Calibrated 13 February 2003, 13 February 2006

⇒ Roberts Dipole Set Dipole 4 (400 MHz – 1000 MHz): Compliance Design, Serial Number 17267, Calibrated 13 February 2003, 13 February 2006

⇒ Tripod, EMCO Model TR-1, No Calibration Required

⇒ Wood Table, Plastic Stand, and Wood Stand (1.5 metre high): Acme Testing Co., No Calibration Required

⇒ Turntable Controller: Hy-Gain 300, Custom, No Calibration Required

⇒ Antenna Mast and Controller: Acme Testing Co., No Calibration Required

⇒ Turntable: Acme Testing Co., Custom, No Calibration Required

⇒ Open Area Test Site: Acme Testing Co., Test Site Number 1, Normalized Site Attenuation [NSA] Calibrated: 22 July 2003, Calibration Due Date: 22 July 2004

4.2 Purpose

The purposes of this Test were:

- to measure the Radiated Spurious Emissions resulting from the operation of each of the three members of the Power Amplifier Family (i.e., Daniels Electronics Ltd. Models AMP-2/145-30-00, AMP-2/155-30-00, and AMP-2/170-30-00) in accordance with 47CFR Part 2 Subpart J Section 2.1053 (i.e., the FCC Rules governing Radiated Spurious Emissions measurements), and,

- to determine the compliance of each of the three members of the Power Amplifier Family (i.e., Daniels Electronics Ltd. Models AMP-2/145-30-00, AMP-2/155-30-00, and AMP-2/170-30-00) to the –20 dBm Limit applicable to Radiated Spurious Emissions for Power Amplifiers used in conjunction with VHF Transmitter Systems and VHF Repeater Systems operating under 47 CFR Parts 22, 80, and 90.

4.3 Test Procedures

4.3.1 Procedures Applicable to Testing of the Power Amplifier Model AMP-2/145-30-00

The 136 – 150 MHz VHF Transmitter System containing the EUT (i.e., the Model AMP-2/145-30-00 Power Amplifier) was placed on a 1 metre long by 1.5 metres wide by 0.8 metre high nonconductive (wood) table that was also fitted with a plastic stand and a wood stand (that were stacked on top of the wood table to yield a 1.5 metre height). The entire assembly (i.e. wood table and two stands) was placed directly onto a flush mounted turntable.

The 136 – 150 MHz VHF Transmitter System containing the EUT was set-up to operate in the "worst-case" (i.e. highest RF Output Power) mode, whilst set to transmit at f_0 = 136 MHz. Emissions from the 136 – 150 MHz VHF Transmitter System containing the EUT were maximized by manipulating the cables, by adjusting the height of the receive antenna (from 1 metre to 4 metres), and by rotating the turntable. Measurements were made at both Horizontal and Vertical Polarization, noting in each case the "maximized" antenna height and azimuth, and the received signal level.

The 136 – 150 MHz VHF Transmitter System containing the EUT was then removed from the Turntable. A calibrated RF Signal Generator, a calibrated Coaxial Cable, calibrated Precision Attenuators, and a (dielectric tripod-mounted) calibrated Substitution Antenna were then used to make Substitution Measurements to determine the Effective Radiated Power of the Spurious Emissions over the frequency range from 136 MHz to 1,360 MHz. The resulting measurements were then compared to the –20 dBm Limit applicable to Radiated Spurious Emissions for Power Amplifiers used in conjunction with VHF Transmitter Systems and VHF Repeater Systems operating under 47 CFR Parts 22, 80, and 90.

4.3.2 Procedures Applicable to Testing of the Power Amplifier Model AMP-2/155-30-00

The 150 - 162 MHz VHF Transmitter System containing the EUT (i.e., the Model AMP-2/155-30-00 Power Amplifier) was placed on a 1 metre long by 1.5 metres wide by 0.8 metre high nonconductive (wood) table that was also fitted with a plastic stand and a wood stand (that were stacked on top of the wood table to yield a 1.5 metre height). The entire assembly (i.e. wood table and two stands) was placed directly onto a flush mounted turntable.

The 150 – 162 MHz VHF Transmitter System containing the EUT was set-up to operate in the "worst-case" (i.e. highest RF Output Power) mode, whilst set to transmit at f_0 = 156 MHz. Emissions from the 136 – 150 MHz VHF Transmitter System containing the EUT were maximized by manipulating the cables, by adjusting the height of the receive antenna (from 1 metre to 4 metres), and by rotating the turntable. Measurements were made at both Horizontal and Vertical Polarization, noting in each case the "maximized" antenna height and azimuth, and the received signal level.

The 150 – 162 MHz VHF Transmitter System containing the EUT was then removed from the Turntable. A calibrated RF Signal Generator, a calibrated Coaxial Cable, calibrated Precision Attenuators, and a (dielectric tripod-mounted) calibrated Substitution Antenna were then used to make Substitution Measurements to determine the Effective Radiated Power of the Spurious Emissions over the frequency range from 156 MHz to 1,560 MHz. The resulting measurements were then compared to the –20 dBm Limit applicable to Radiated Spurious Emissions for Power Amplifiers used in conjunction with VHF Transmitter Systems and VHF Repeater Systems operating under 47 CFR Parts 22, 80, and 90.

4.3.3 Procedures Applicable to Testing of the Power Amplifier Model AMP-2/170-30-00

The 162 – 174 MHz VHF Transmitter System containing the EUT (i.e., the Model AMP-2/170-30-00 Power Amplifier) was placed on a 1 metre long by 1.5 metres wide by 0.8 metre high nonconductive (wood) table that was also fitted with a plastic stand and a wood stand (that were stacked on top of the wood table to yield a 1.5 metre height). The entire assembly (i.e. wood table and two stands) was placed directly onto a flush mounted turntable.

The 162 – 174 MHz VHF Transmitter System containing the EUT was set-up to operate in the "worst-case" (i.e. highest RF Output Power) mode, whilst set to transmit at f_0 = 174 MHz. Emissions from the 162 – 174 MHz VHF Transmitter System containing the EUT were maximized by manipulating the cables, by adjusting the height of the receive antenna (from 1 metre to 4 metres), and by rotating the turntable. Measurements were made at both Horizontal and Vertical Polarization, noting in each case the "maximized" antenna height and azimuth, and the received signal level.

The 162 – 174 MHz VHF Transmitter System containing the EUT was then removed from the Turntable. A calibrated RF Signal Generator, a calibrated Coaxial Cable, calibrated Precision Attenuators, and a (dielectric tripod-mounted) calibrated Substitution Antenna were then used to make Substitution Measurements to determine the Effective Radiated Power of the Spurious Emissions over the frequency range from 174 MHz to 1,740 MHz. The resulting measurements were then compared to the –20 dBm Limit applicable to Radiated Spurious Emissions for Power Amplifiers used in conjunction with VHF Transmitter Systems and VHF Repeater Systems operating under 47 CFR Parts 22, 80, and 90.

4.3.4 Rationale for Testing the Power Amplifier Family at Three Frequencies

The three Power Amplifiers comprising the Power Amplifier Family span the operating frequency range 136 MHz to 174 MHz. It was therefore decided to measure the Radiated Spurious Emissions from the Power Amplifiers that comprise the Power Amplifier Family at three spot frequencies, so as to cover the operating frequency range 136 MHz to 174 MHz. Specifically, these were the lowest frequency generated and/or used (136 MHz), the highest frequency generated and/or used (174 MHz), and the middle frequency generated and/or used (156 MHz).

4.3.5 Radiated Spurious Emissions Test Characteristics

Test Characteristics	Test Criteria
Frequency range	136 MHz – 1,740 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	30 kHz
Receive antenna scan height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal

4.4 Test Results

4.4.1 Test Results for Power Amplifier Model AMP-2/145-30-00

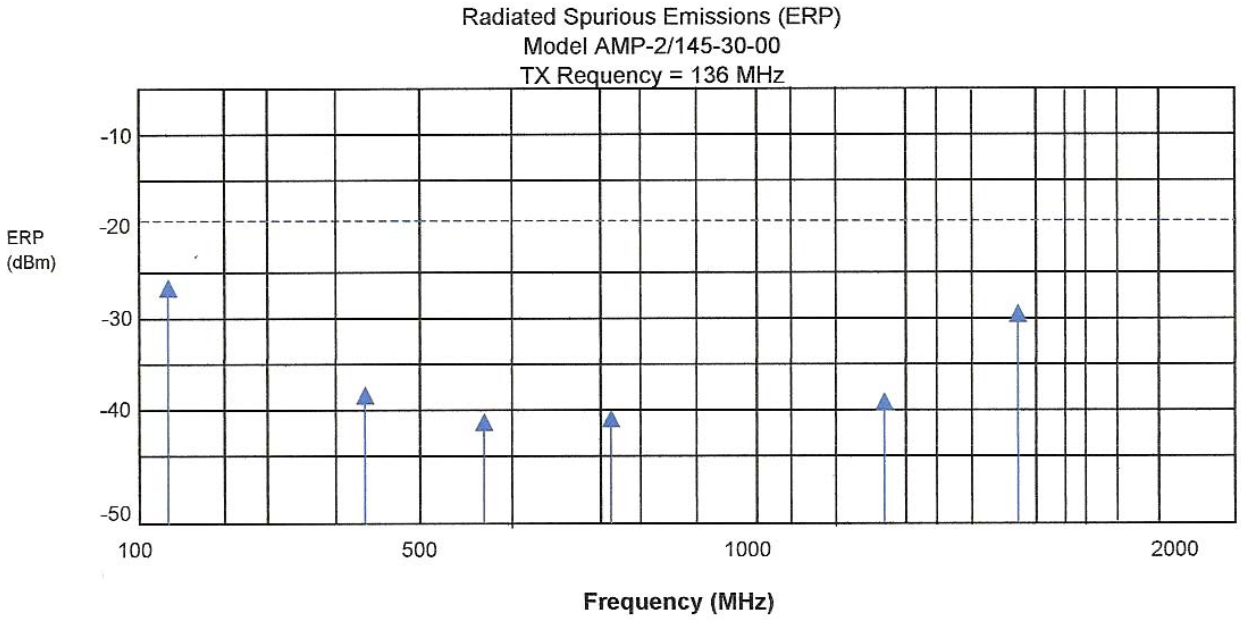
Radiated Spurious Emissions (ERP)

Model: AMP-2/145-30-00

Tx Frequency = 136 MHz **Note: Limit = -20 dBm**

Frequency (MHz)	Polarization (H or V)	Height (cm)	Azimuth (degrees)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power (dBm)	Margin (dB)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h) = (e)-(f)+(g)	(i) = (h)-(Limit)
142.976	H	140	0	-24.0	4.1	1.6	-26.5	-6.5
428.967	H	172	111	-35.0	4.1	1.7	-37.4	-17.4
571.969	H	130	171	-38.0	4.5	1.0	-41.5	-21.5
714.968	H	190	20	-37.0	4.6	1.3	-40.3	-20.3
1287.020	V	100	172	-39.0	6.5	7.4	-38.1	-18.1
1572.940	H	110	294	-33.0	5.5	8.6	-29.9	-9.9

Note: All other Radiated Spurious Emissions were more than 25 dB below the -20 dBm Limit.



4.4.2 Test Results for Power Amplifier Model AMP-2/155-30-00

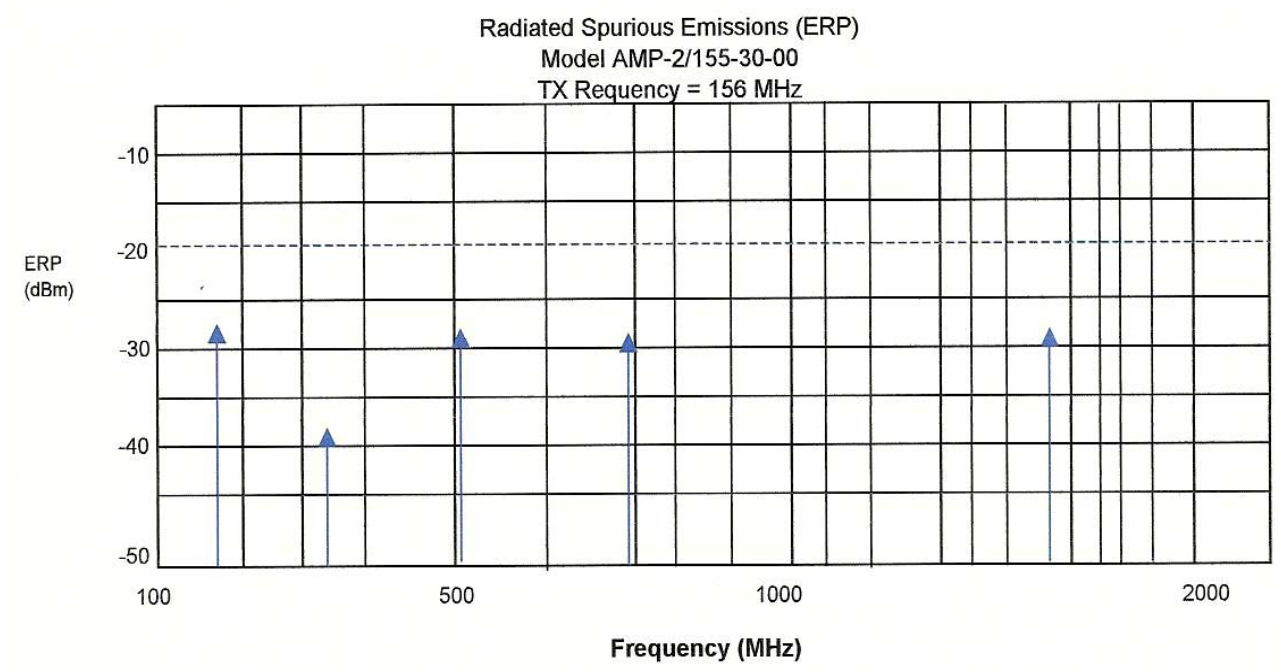
Radiated Spurious Emissions (ERP)

Model: AMP-2/155-30-00

Tx Frequency = 156 MHz **Note: Limit = -20 dBm**

Frequency (MHz)	Polarization (H or V)	Height (cm)	Azimuth (degrees)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power (dBm)	Margin (dB)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h) = (e)-(f)+(g)	(i) = (h)-(Limit)
173.972	V	170	0	-25.0	4.5	2.2	-27.3	-7.3
347.971	H	140	222	-36.0	4.3	1.5	-38.8	-18.8
521.967	H	180	242	-24.0	4.2	1.0	-27.2	-7.2
695.964	H	199	200	-25.0	4.0	1.4	-27.6	-7.6
1565.930	H	110	91	-30.0	5.7	8.6	-27.1	-7.1

Note: All other Radiated Spurious Emissions were more than 25 dB below the -20 dBm Limit.



4.4.3 Test Results for Power Amplifier Model AMP-2/170-30-00

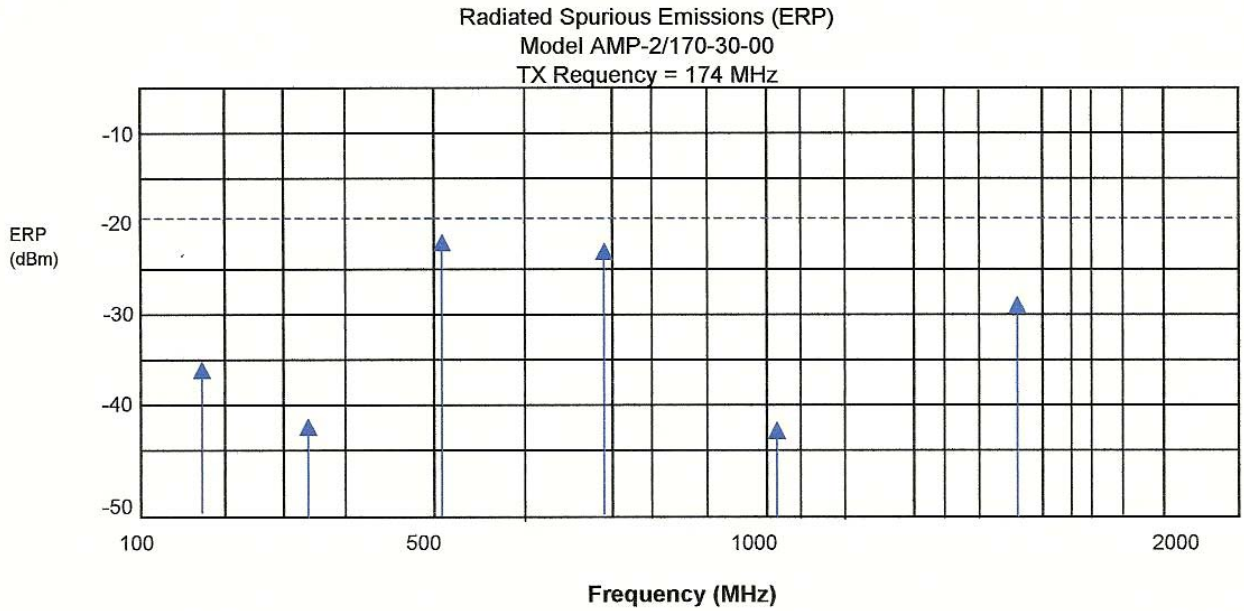
Radiated Spurious Emissions (ERP)

Model: AMP-2/170-30-00

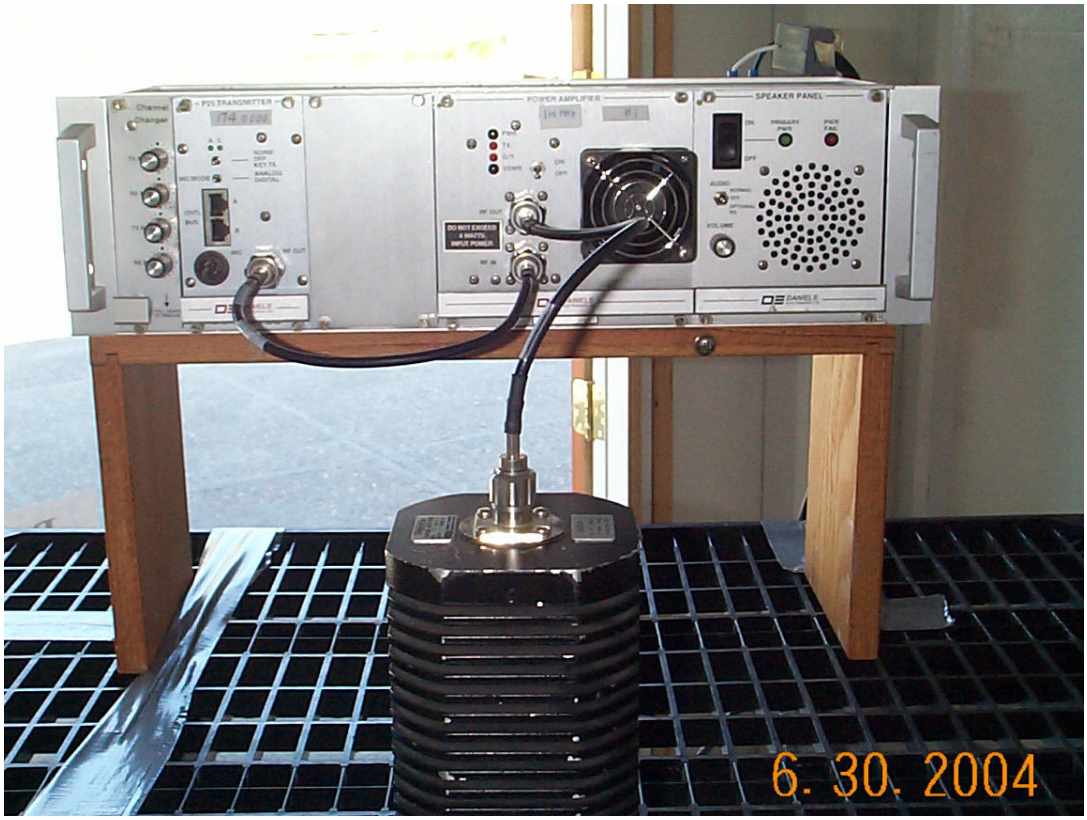
Tx Frequency = 174 MHz **Note: Limit = -20 dBm**

Frequency (MHz)	Polarization (H or V)	Height (cm)	Azimuth (degrees)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power (dBm)	Margin (dB)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h) = (e)-(f)+(g)	(i) = (h)-(Limit)
173.920	H	110	60	-31.5	5.8	2.2	-35.1	-15.1
347.949	H	150	30	-38.0	5.5	1.5	-42.0	-22.0
521.973	V	190	72	-19.0	5.5	1.0	-23.5	-3.5
695.974	V	100	120	-20.0	5.2	1.4	-23.8	-3.8
1043.890	H	155	72	-42.3	6.5	6.2	-42.6	-22.6
1565.960	V	120	177	-31.0	5.6	8.6	-28.0	-8.0

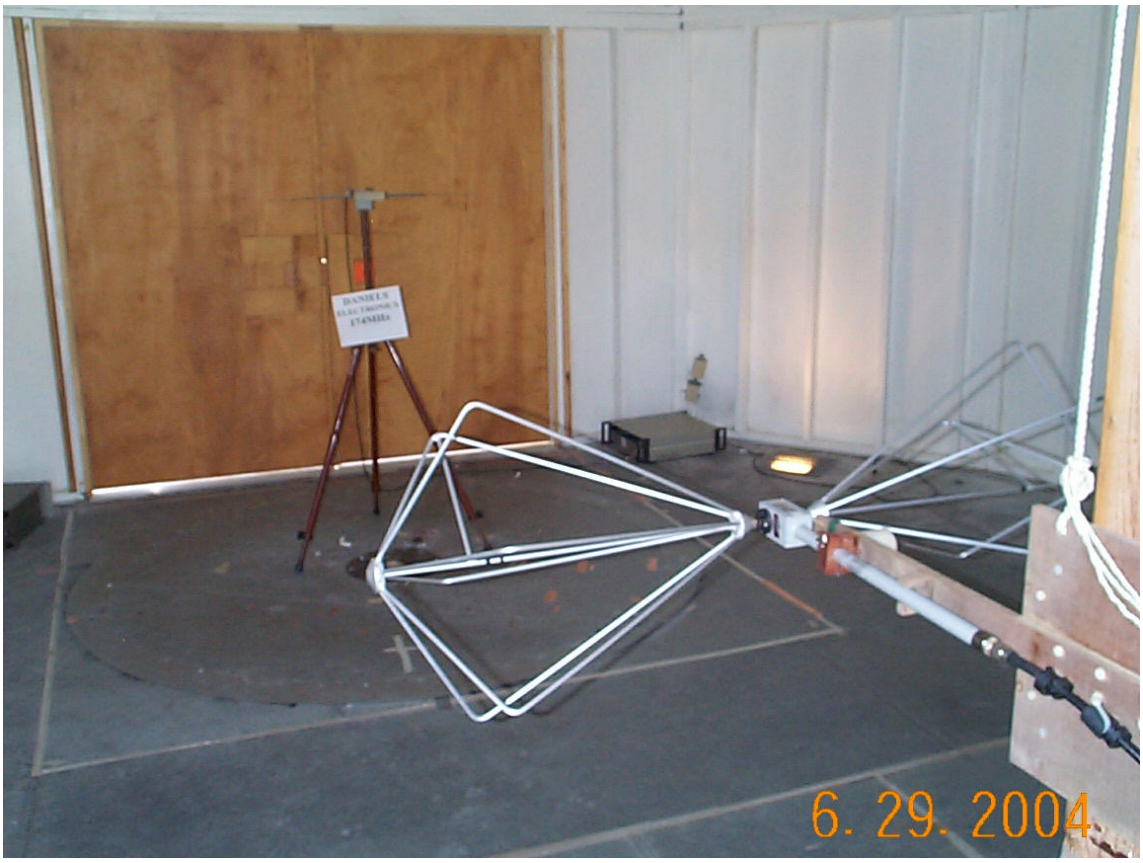
Note: All other Radiated Spurious Emissions were more than 25 dB below the -20 dBm Limit.



4.5 Test Setup Photographs

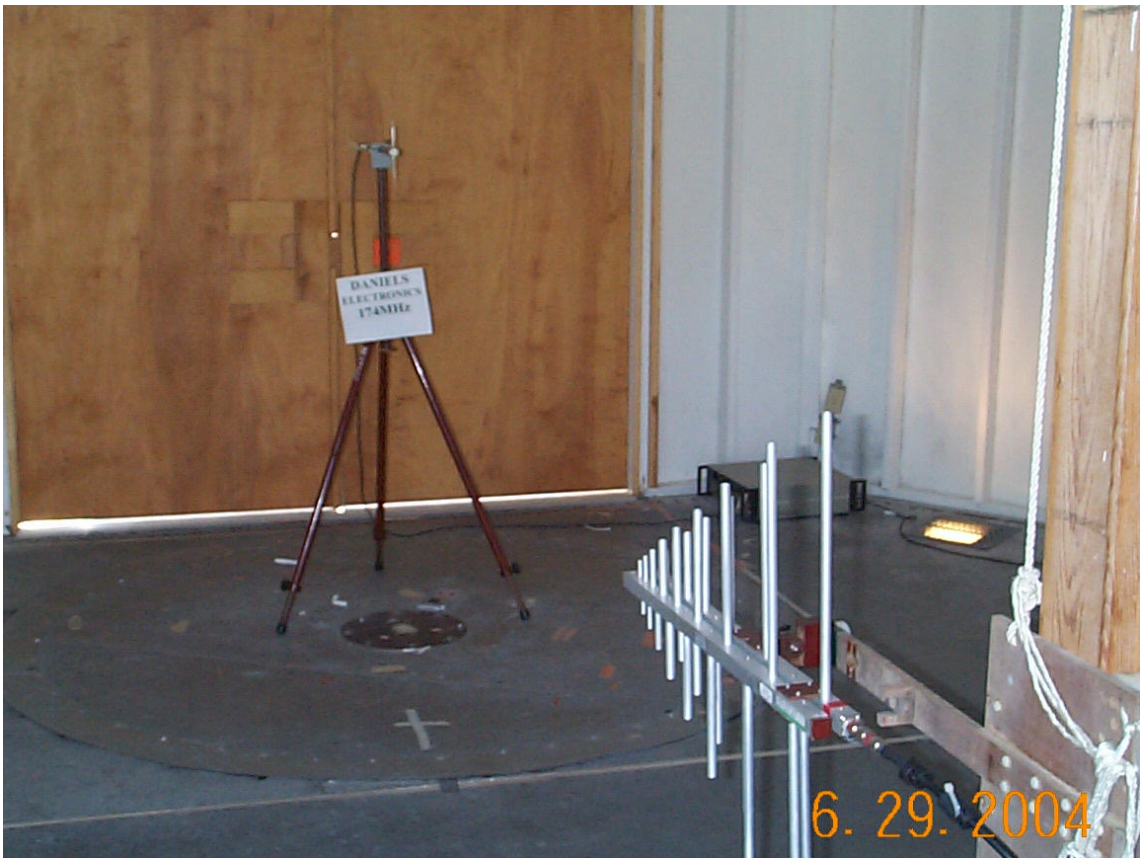


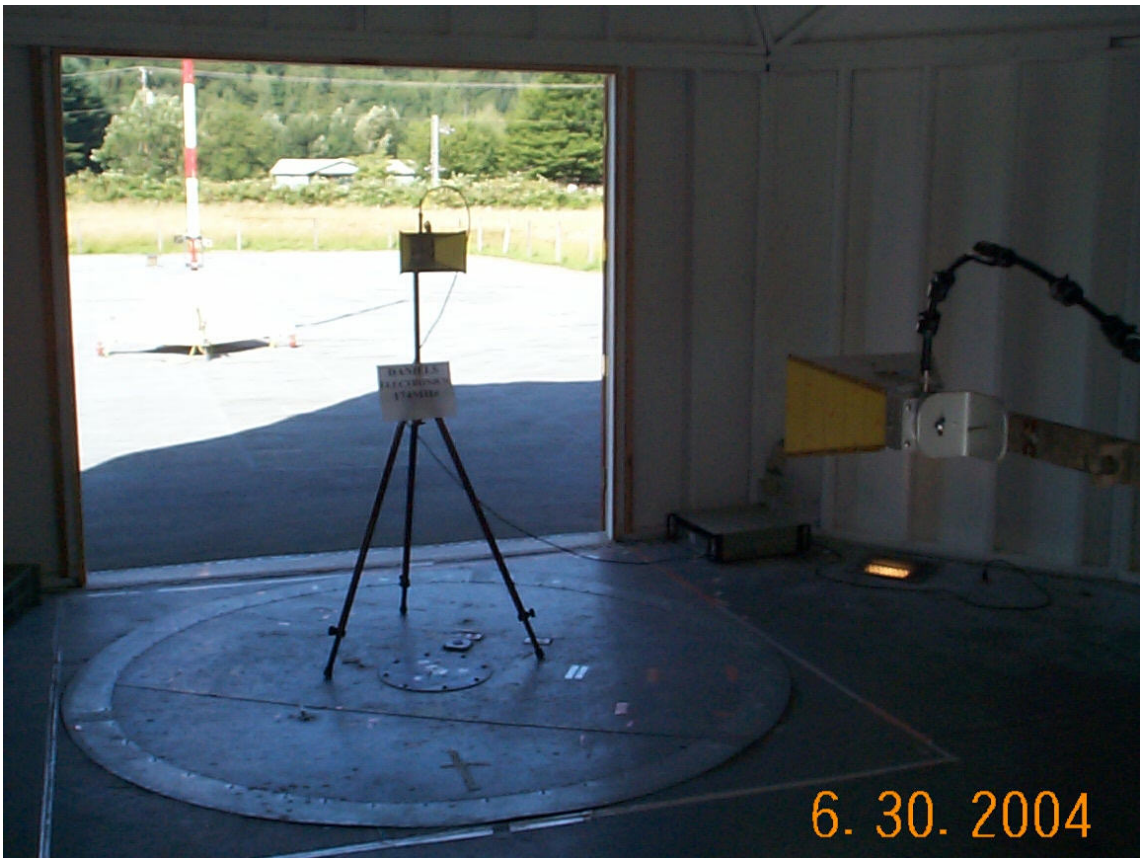
6. 30. 2004


6. 29. 2004

DANIELS
ELECTRONICS
174MHz
6. 29. 2004

DANIELS
ELECTRONICS
174MHz
6. 29. 2004


DANIELS
ELECTRONICS
174MHz
6. 29. 2004


6. 30. 2004

6. 30. 2004

5. Miscellaneous Comments and Notes

None.

6. Annex A: Non-Normative Information

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.

Presented this 13th day of April 2004.

American Association For Laboratory Accreditation
Corporate SEAL 1978 District of Columbia
A2LA

President
For the Accreditation Council
Certificate Number 829-01
Valid to November 30, 2005

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of 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: 1-360-595-2785

ELECTRICAL (EMC)

Valid to: November 30, 2005 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:

Test Technology	Test Method(s)
Basic Test Method Standards (Emissions):	
Conducted & Radiated:	ANSI C63.4-1992 & ANSI C63.4-2001; EIA/TIA-603:1993 & TIA/EIA-603:2001; FCC OST MP-5:1986; CISPR 11:1990 & EN 55011:1991; CISPR 11:1997 + A1:1999 + A2:2002; CISPR 11:1998; CISPR 11:2003 (*excluding measurements above 1 GHz*); & EN 55011:1998 + A1:1999 + A2:2002 CISPR 13:1996 + A1:1998; CISPR 13:2001 & EN 55013:2001 + Corrigendum 1 & 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 + A1:2000; 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 + A2:2002 & EN 55022:1998 + A1:2000 ; + A2:2003
Harmonic Current:	IEC 61000-3-2:1995+A1:1997+A2:1998; IEC 61000-3-2:2000; IEC 61000-3-2:2001 & 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
Basic Test Method Standards (Immunity):	
Audio Frequency Common Mode	IEC 61000-2-1:1990; IEC 61000-2-2:2002
Electrostatic Discharge (ESD):	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; IEC 61000-4-3:2002; EN 61000-4-3:1996 + A1:1998; EN 61000-4-3:2002; & ENV 50204:1995;

Test Technology	Test Method(s)
Electrical Fast Transient/Burst:	IEC 801-4:1998; IEC 1000-4-4:1995; IEC 61000-4-4:1995; EN 61000-4-4:1995 + A1:2000 + A2:2001;
Surge:	IEC 801-5(D):1992 (*excluding 10/700 surge testing*); ENV 50142:1994 (*excluding 10/700 surge testing*); IEC 1000-4-5:1995 (*excluding 10/700 surge testing*); IEC 61000-4-5:1995 (*excluding 10/700 surge testing*); EN 61000-4-5:1995 +A1:2001 (*excluding 10/700 surge testing*); IEC 61000-4-5:2001 (*excluding 10/700 surge testing*);
RF Common Mode (Conducted):	ENV 50141:1994; IEC 1000-4-6:1996; IEC 61000-4-6:1996; IEC 61000-4-6:2003; & EN 61000-4-6:1996;
Power Frequency Magnetic Fields:	IEC 1000-4-8:1993; IEC 61000-4-8:1993; EN 61000-4-8:1993; IEC 61000-4-8:1993 + A1:2000; EN 61000-4-8:1993 + A1:2001;
Voltage Dips, Short Interruptions, & Variations:	IEC 1000-4-11:1994; IEC 61000-4-11:1994 + A1:2000, EN 61000-4-11:1994 +A1:2001;

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 C63.4-2001); &
Part 18 (using FCC OST 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, 9.10.5, & 9.10.6 Only*);
Telcordia [Bellcore] GR-1089-CORE Issue 3:2002
(*Sections 2, 3, 4.6.7[1st Level Surge Pulse 4 only], 4.6.8, 4.6.9, 4.7, 9.12.5, & 9.12.6 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 12015:1998; EN 12016:1998

EN 50081-1:1992; EN 50081-2:1993; EN 50082-1:1997; EN 50082-2:1995;
IEC 61000-6-1:1997 & EN 61000-6-1:2000 & 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 50083-2:2001; EN 50091-2:1995;
EN 50130-4:1995 + A1:1998, EN 50199:1995; EN 50270:1999;
EN 50293:2000;

CISPR 11:1990 & EN 55011:1991;
CISPR 11:1997 + A1:1998 + A2:2002 & EN 55011:1998 + A1:1999 + A2:2002;
CISPR 11:2003 (*excluding measurements above 1GHz*)

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phone:888 226-3837 fax: 360 595-2722

Test Technology	Test Method(s)
Generic & Product Family Standards:	
	CISPR 13:1996 + A1:1998
	& EN 55013:1990 + A12:1994 + A13:1996 + A14:1999
	CISPR 13:2001 & EN 55013:2001 + Corrigendum 1;
	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;
	& EN 55014-2:1997 + A1:2001
	CISPR 14-2:1997 + A11:1998
	CISPR 22:1993 + A1:1995 + A2:1996
	& EN 55022:1994 + A1:1995 + A2:1997;
	CISPR 22:1997 + A1:2000 + A2:2002 & EN 55022:1998 + A1:2000 + A2:2003;
	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 & IEC 60687:1992;
	IEC 60870-2-1:1995 & EN 60870-2-1:1996
	IEC 945:1996 (*Clauses 9, 10, 11.2, 12.2, & 12.3 Only*),
	& EN 60945:1997 (*Clauses 9, 10, 11.2, 12.2, & 12.3 Only*);
	IEC 60945:2002 (*Clauses 9, 10, 11.2, 12.2, & 12.3 Only*),
	IEC 61000-3-2:1995+A1:1997+A2:1998; IEC 61000-3-2:2000;
	IEC 61000-3-2:2001; & 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/EN 300 386:1997
	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)

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Radio Test Standards:

47 U.S. Code of Federal Regulations (47 CFR) FCC Methods, as follows:
Part 15 (using ANSI C63.4-1992 & ANSI C63.4-2001)
Part 90 (using ANSI C63.4-1992 & ANSI C63.4-2001, & 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 300 328 V1.4.1 (2003)
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.

(A2LA Cert. No. 829-01) 04/13/04 Page 4 of 4

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

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

Industry Canada Industrie Canada
http://strategis.ic.gc.ca

June 6, 2002

Our File: 46405- 3251
Submission: 42375

Mr. Harry H. Hodes
AcmeTesting
P.O. Box 3
2002 Valley Highway
Acme, Washington 98220-0003

Dear Mr. Hodes:

The Bureau has received your test report for the Open Area Test Site located at Acme, Washington, dated April 3, 2002. I have reviewed the report and find it complies with RSS 212, Issue 1 (Provisional).

The site is acceptable to Industry Canada for the performance of radiated measurements.

Please reference the file number " IC 3251" in the body of all test reports containing measurements made on this site.

This reference number is the indication to the Industry Canada Certification Officers that the site meets the requirements of RSS 212, Issue 1 (Provisional). Your company has been added to our published list of filed sites on the Bureau's web page. Please keep the contact information current by notifying us if it changes or is in error.

Keep informed of the latest Industry Canada regulations by visiting the Bureau's site on the World Wide Web: **http://spectrum.ic.gc.ca/deblab/english/debintre.html**

Whenever major construction or repairs to the site are completed, a re-submission of the site attenuation characteristics will be required, or every three years.

Yours sincerely,

Stéphane Picard
on behalf of Head, EMC and Standards
Certification and Engineering Bureau
3701 Carling Ave., Building 94
P.O. Box 11490, Station "H"
Ottawa, Ontario
K2H 8S2
Tel. No. (613) 990-5318
Fax. No. (613) 990-4752

Canada

A DIVISION OF CSA GROUP

QMI
90 Burnhamthorpe Road West, Suite 300
Mississauga, Ontario, Canada L5B 3C3
Telephone: (905) 272-3920
Facsimile: (905) 272-3942

CERTIFICATE OF REGISTRATION

QMI issues this certificate to:

ACME TESTING CO.

P.O. Box 3
2002 Valley Highway
Acme, Washington
98220-0003 USA

P.O. Box 157
Highway 5 & Little Plummer Creek
Plummer, Idaho
83851-0157 USA

which has demonstrated that its Quality Management System is in compliance with:

ISO 9001:2000

The following scope of registration applies:

Provider of Electromagnetic Compatibility (EMC) Testing and Product Safety Testing services for manufacturers of electronic equipment [per Authorized Scope(s) of Accreditation and Facility/Site Registrations], and, Conformity Assessment Body (CAB) Third-Party Product Certification Services for manufacturers of electronic equipment [per Validation Letters].

- *Further clarification regarding the scope of this certificate and the applicability of ISO 9001:2000 requirements may be obtained by consulting this organization*

Certificate Numbers:	**CC1828-010083**	**CC1828-014276**
SIC Number:	**8734**	**8734**
Date of Original Registration:	**January 26, 2000**	**November 18, 2002**
Date of Current Registration:	**November 18, 2002**	**November 18, 2002**
Date Registration Expires:	**November 18, 2005**	**November 18, 2005**

Standards Council of Canada Accredited Registrar
Conseil canadien des normes Registrars accrédités

ANSI-RAB QMS ACCREDITED

ISO 9001:2000 QMI REGISTERED QUALITY MANAGEMENT SYSTEM

Wendy J. Tilford
President