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FCC PT 90 AMPLIFIER TEST REPORT

APPLICANT	CODAN RADIO COMMUNICATIONS
ADDRESS	43 ERIE STREET VICTORIA BC V8V 1P8 CANADA
FCC ID	H4JAMP-4-470
IC LABEL	142A-AMP4470
MODEL NUMBER	AMP-4-470-30-00
PRODUCT DESCRIPTION	UHF 30W POWER AMPLIFIER
DATE SAMPLE RECEIVED	11/27/2012
DATE TESTED	11/28/2012
TESTED BY	NAM NGUYEN
APPROVED BY	MARIO R. DE ARANZETA
TIMCO REPORT NO.	3041AUT12TestReport.doc
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01



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ATTESTATION STATEMENT

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.



Test Certificate #0955-01

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

Authorized by:



Signature:

Function: Test Lab Supervisor / Engineer

Date: 12/11/2012

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REPORT SUMMARY

Disclaimer	The test results relate only to the items tested.
Purpose of Test	To show the DUT in compliance with FCC CFR 47, Part 90 and IC RSS-131 requirements for amplifiers
Test Procedures	ANSI/TIA 603-C: 2004 FCC CFR 47 Part 90 ANSI C63.4: 2003
Related Approval	N/A

TEST ENVIRONMENT AND TEST SETUP

Test Facility	All tests were conducted by Timco Engineering Inc. located at 849 NW State Road 45, Newberry, FL 32669 USA
Laboratory Test Condition	Temperature: 26°C Relative humidity: 50%.
Deviation from the standards	No deviation
Modification to the DUT	No modification was made.
Test Exercise (software etc.)	The DUT was placed in continuous transmitting mode of operation.
System Setup	Stand alone device.

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DUT DESCRIPTION

Manufactured by	CODAN RADIO COMMUNICATIONS
Product Description	UHF 30W POWER AMPLIFIER
FCC ID	H4JAMP-4-470
IC Label	142A-AMP4470
M/N	AMP-4-470-30-00
Operating Freq	(470 – 512) MHz
Modulation	N/A Amplifier
Power Source	13.8 VDC
Test Item	Preproduction
Type of DUT	Fixed/Mobile Amplifier

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TEST EQUIPMENT

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 12/31/11	12/31/13
AC Voltmeter	HP	400FL	2213A14499	CAL 6/12/11	6/12/13
Antenna: Active Loop	ETS-Lindgren	3117	00041534	CAL 10/5/12	10/5/14
Frequency Counter	HP	5385A	2730A03025	CAL 8/17/11	8/17/13
Hygro-Thermometer	Extech	445703	0602	CAL 6/15/11	6/15/13
Modulation Analyzer	HP	8901A	3435A06868	CAL 7/18/11	7/18/13
Digital Multimeter	Fluke	FLUKE-77	35053830	CAL 9/9/11	9/9/13
Power Meter	Boonton Electronics	4531	11793	CAL 11/12/2011	11/12/2013
EMI Receiver	Rohde & Schwarz	ESIB40	100274	CAL 3/16/2012	3/16/2014
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 10/28/11	10/28/13
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 10/28/11	10/28/13
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 10/28/11	10/28/13
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 10/28/11	10/28/13
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 2/22/12	2/22/13
Antenna	ETS	3117	35923	12/7/2011	12/7/2013
Antenna	Electro metrics	LPA-25	1122	5/04/2011	5/04/2013
Antenna	Electro metrics	BIA-25	1096	5/04/2011	5/04/2013

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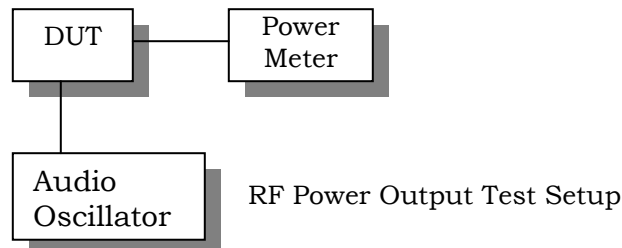
TEST PROCEDURES

Power Line Conducted Interference

The procedure used was ANSI 63.4-2003 using a 50uH LISN. Both lines were observed with the DUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

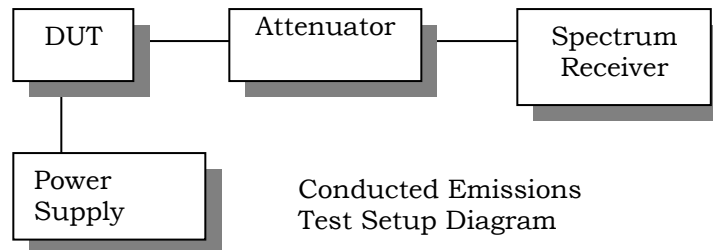
RF Power Output

The RF power output was measured at the antenna feed point using a peak power meter. A 50-ohm, resistive wattmeter was connected to the RF output connector. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:



Spurious Emissions At Antenna Terminals (Conducted)

The carrier was modulated 100%. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz. The measurements were made in accordance with standard ANSI/TIA-603-C: 2004



Radiation Interference

The test procedure used was ANSI/TIA-603-C: 2004 and ANSI C63.4-2003 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

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Modulation Characteristic

Audio frequency response

The audio frequency response was measured in accordance with ANSI/TIA 603-C: 2004.

Audio Low Pass Filter

The audio low pass filter for voice-modulated equipment was measured in accordance with ANSI/TIA 603-C: 2004.

Audio Input versus modulation

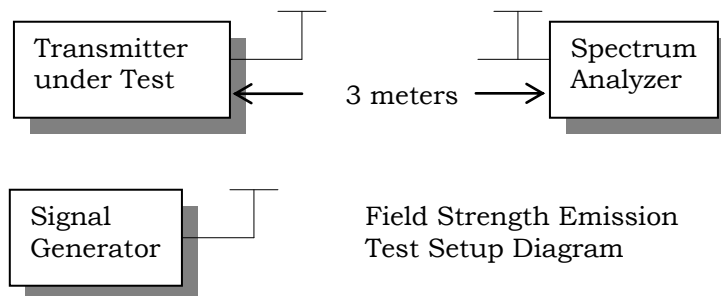
The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C: 2004. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz.

Frequency Stability

The frequency stability was measured per ANSI/TIA 603-C: 2004.

Field Strength of Spurious Emissions

The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per ANSI/TIA 603-C: 2004 using the substitution method.



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TEST RESULTS

RF POWER OUTPUT

Rule Part No.: Pt 2.1046(a), Pt 90, Pt 90.210, RSS-131

Requirements: Pt 2.1046(a), Pt 90, Pt 90.210, RSS-131

Test Data: Power = 96.6W

DC Power Consumption

Vdc = 13.8V

Ic = 7.0A

Test Frquency (MHz)	Input (dBm)	Output (dBm)	Output (W)
470.125	38.28	45.13	32.6
491.000	38.16	45.12	32.5
511.975	38.13	45.24	33.4

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OCCUPIED BANDWIDTH PLOTS

Rule Parts No: Pt 2.1049, Pt 90.210(b), RSS-119

Part 90.210(d) 12.5 kHz channel BW equipment.

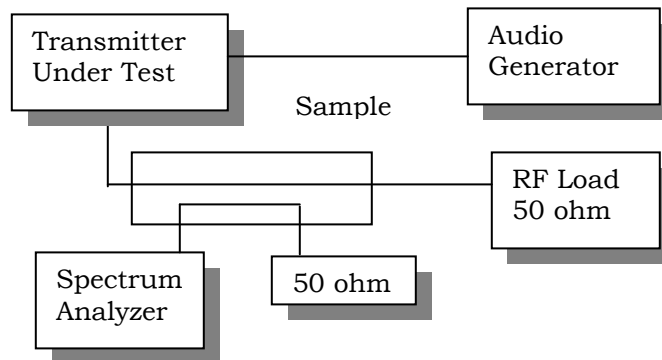
For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- (1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27 (f_d - 2.88 \text{ kHz})$ dB.
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10\log(P)$ dB or 70 dB, whichever is the lesser attenuation.

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Method of Measurement: ANSI/TIA 603-C: 2004

Test Setup Diagram:



Test Data: See the plots below

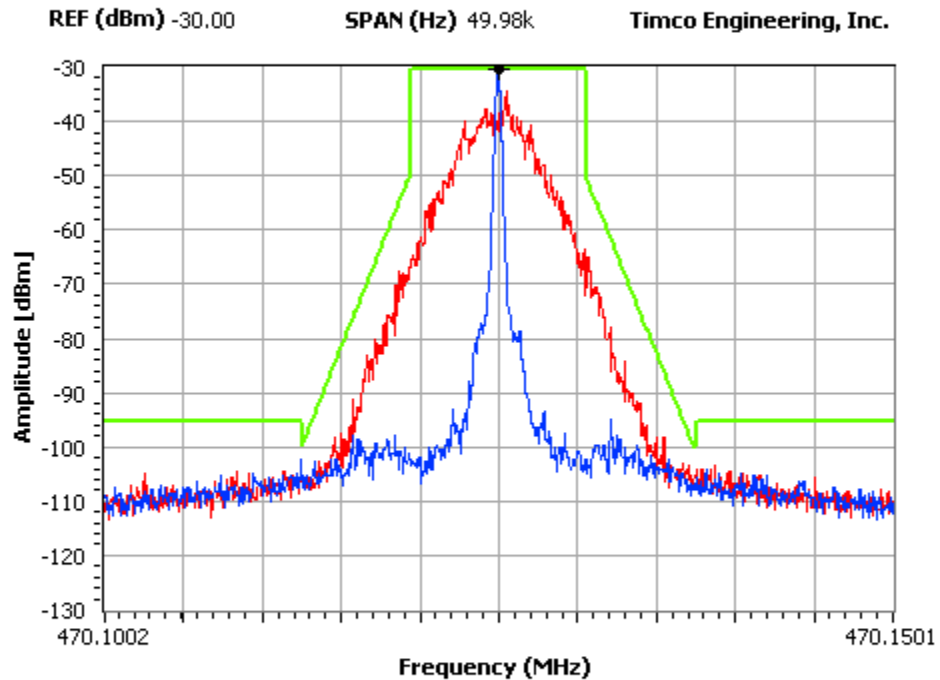
Applicant: CODAN RADIO COMMUNICATIONS
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Part 90.210(d) Emission Mask D - 12.5 kHz channel
Digital:

NOTES:

DANIELS ELECTRONICS LTD. - UHF 30W POWER AMPLIFIER
 OCCUPIED BANDWIDTH PLOT - DIGITAL

FCC 90.210 Mask D



RBW	VBW	ST (sec)	Peak	470.125	-30.40	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
100 Hz	100 kHz	15	MKR2	0.000	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			MKR3	0.000	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			HWMK	23.076	6.27	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Center Frequency (Hz) 470.125M

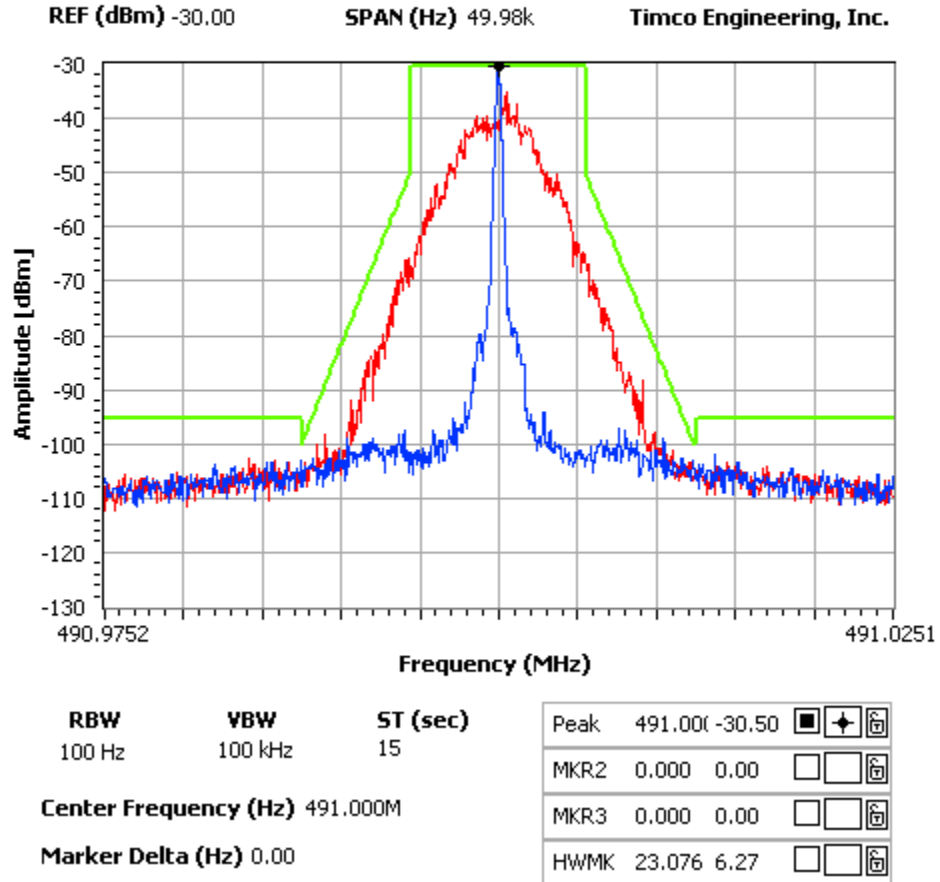
Marker Delta (Hz) 0.00

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NOTES:

DANIELS ELECTRONICS LTD. - UHF 30W POWER AMPLIFIER
OCCUPIED BANDWIDTH PLOT - DIGITAL

FCC 90.210 Mask D

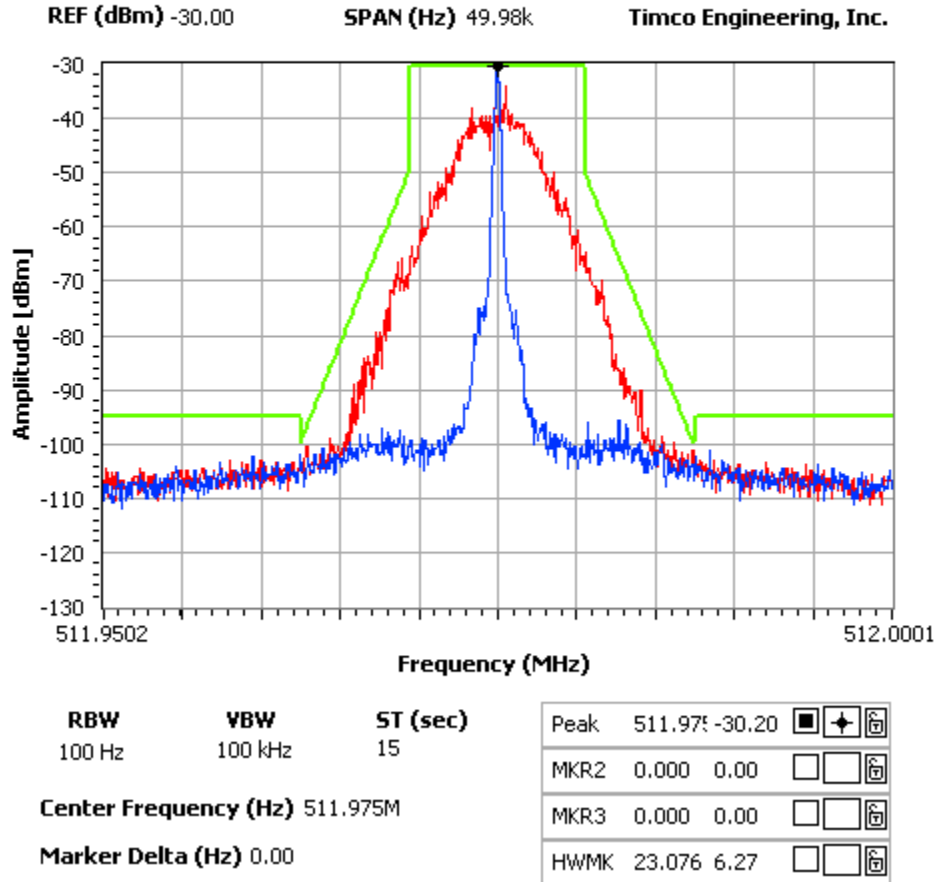


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NOTES:

DANIELS ELECTRONICS LTD. - UHF 30W POWER AMPLIFIER
OCCUPIED BANDWIDTH PLOT - DIGITAL

FCC 90.210 Mask D



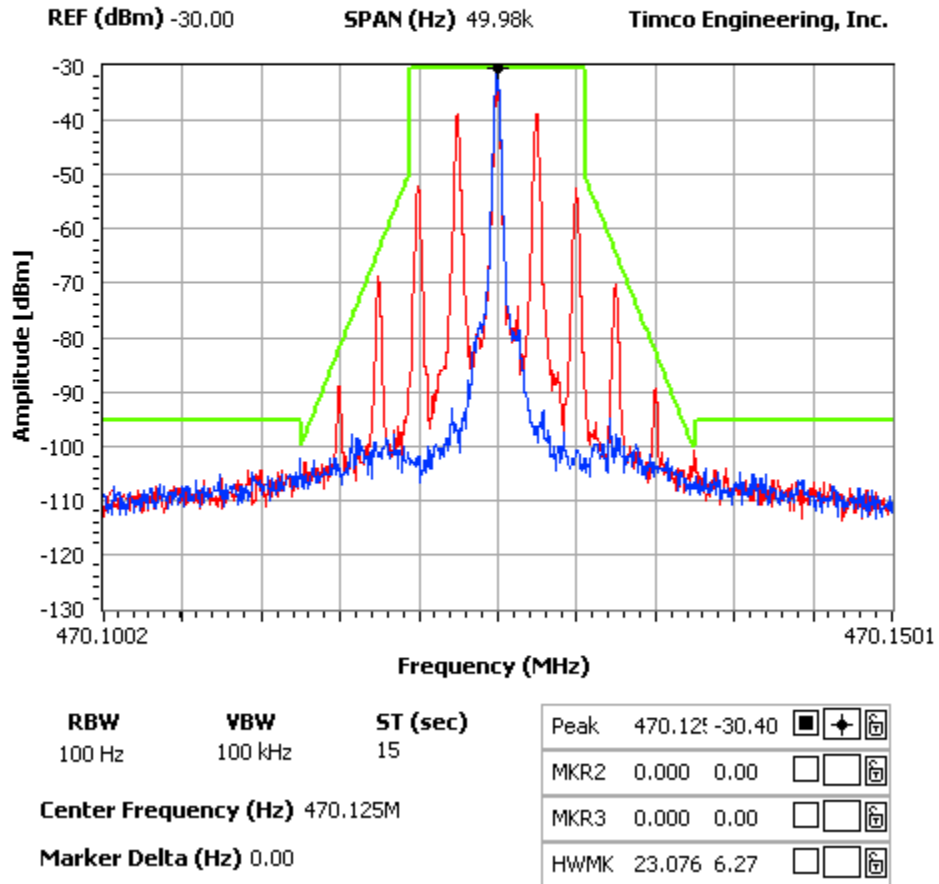
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Analog:

NOTES:

DANIELS ELECTRONICS LTD. - UHF 30W POWER AMPLIFIER
OCCUPIED BANDWIDTH PLOT - ANALOG

FCC 90.210 Mask D

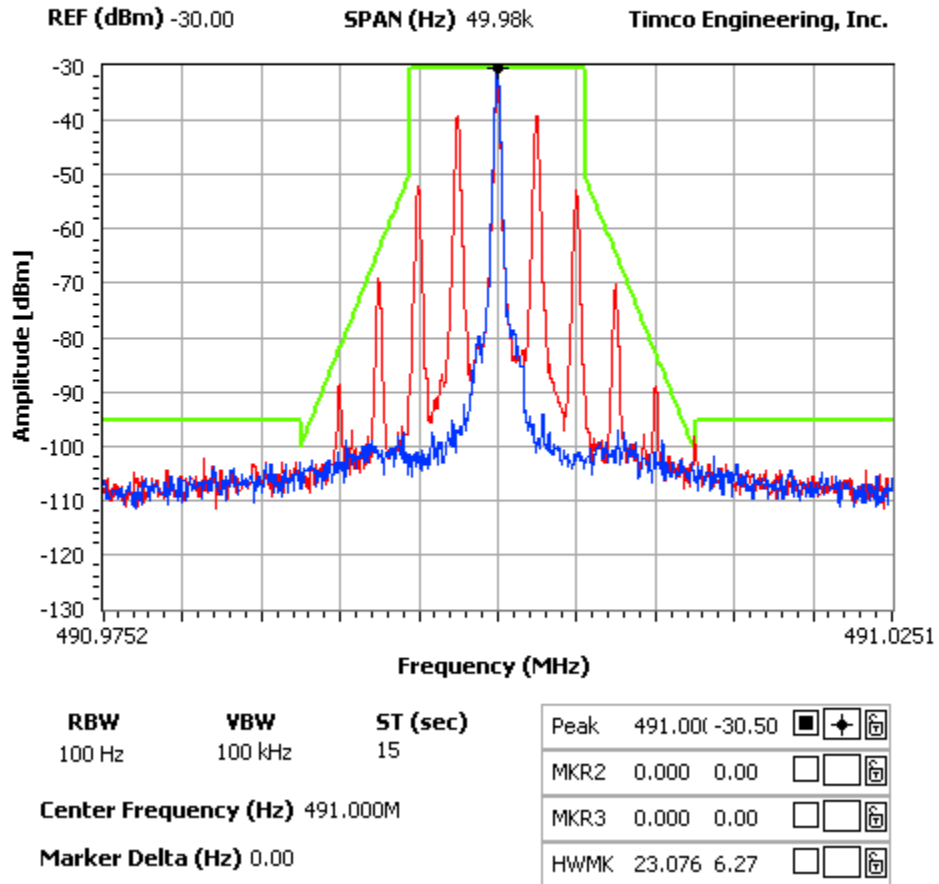


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NOTES:

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OCCUPIED BANDWIDTH PLOT - ANALOG

FCC 90.210 Mask D

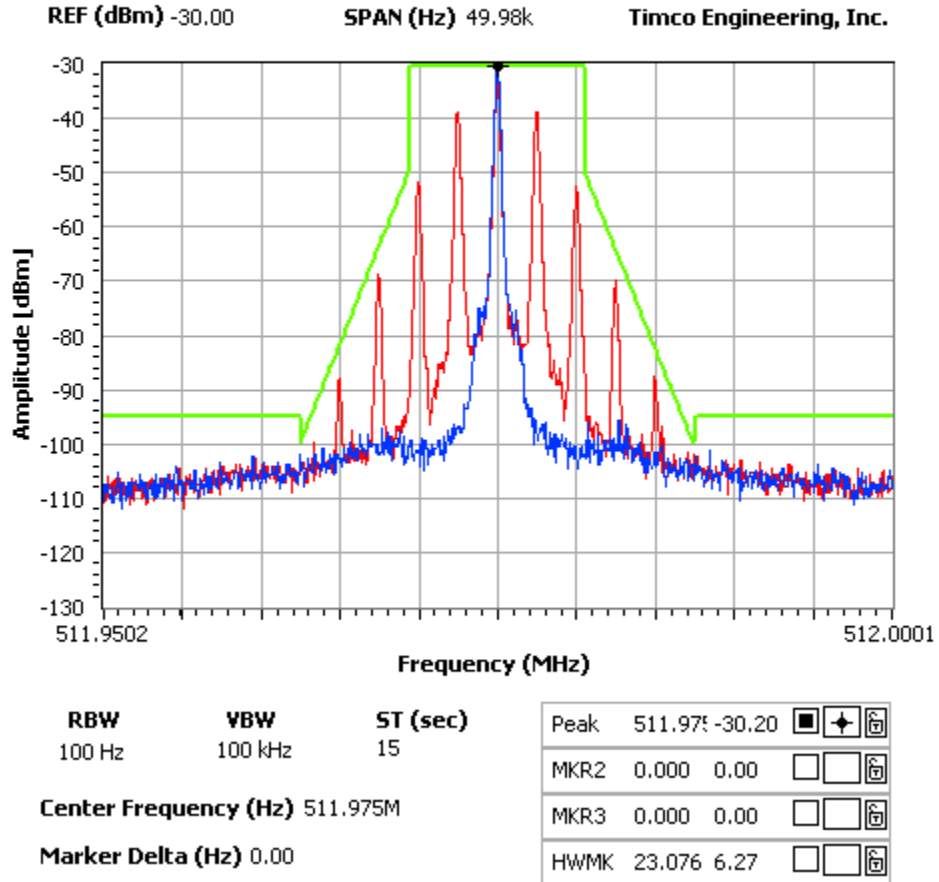


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NOTES:

DANIELS ELECTRONICS LTD. - UHF 30W POWER AMPLIFIER
OCCUPIED BANDWIDTH PLOT - ANALOG

FCC 90.210 Mask D



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SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: FCC Pt 2.1051(a), IC RSS-119

Requirements: $50+10\log(P_o)=43+10\log(35.5)= 65.50$ dB

Test Data:

Emission MHz	dBc
470.13	
940.25	102.8
1410.38	90.5
1880.50	91.8
2350.63	87.5
2820.75	99.6
3290.88	98.3
3761.00	98.7
4231.13	98.9
4701.25	99.4

Emission MHz	dBc
491.00	
982.00	100
1473.00	85.1
1964.00	93.8
2455.00	95.9
2946.00	97.8
3437.00	98.7
3928.00	98.7
4419.00	97.2
4910.00	97

Emission MHz	dBc
511.98	
1023.95	93
1535.93	92.6
2047.90	95.1
2559.88	96.9
3071.85	99.6
3583.83	100.5
4095.80	99.1
4607.78	97.3
5119.75	101.2

* Emissions are in the noise level and not reported.

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FIELD STRENGTH OF SPURIOUS EMISSIONS (RADIATED)

Rule Parts. No.: FCC Pt 2.1053, IC RSS-119

Requirements: Same as conducted emissions

Test Data:

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
470.13	0	0
940.25	V	100.3
1410.38	V	100.2
1880.50	V	95.5
2350.63	V	103.0
2820.75	V	99.4
3290.88	V	90.0
3761.00	H	92.6
4231.13	V	98.8
4701.25	V	97.5

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
491.00	0	0
982.00	V	98.1
1473.00	H	99.9
1964.00	V	93.3
2455.00	V	97.6
2946.00	V	84.1
3437.00	V	80.1
3928.00	H	82.0
4419.00	V	93.5
4910.00	V	96.1

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
511.98	0	0
1023.95	V	99.3
1535.93	V	101.7
2047.90	V	93.9
2559.88	V	97.3
3071.85	V	88.5
3583.83	V	85.5
4095.80	V	97.8
4607.78	V	94.0
5119.75	V	95.1

* Emissions are in the noise level and not reported.

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POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: FCC Pt 15.207, IC RSS-GEN

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBμV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56 *	56 – 46 *
0.5 – 5.0	56	46
5.0 – 30	60	50
* Decreases with logarithm of frequency		

Test Data: Not applicable DUT is battery operated exclusively.

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