

TEST REPORT #120799

STANDARD: FCC PART 15

**SUBPART C--INTENTIONAL RADIATORS
SECTION 15.231 PERIODIC OPERATION IN
THE BAND 40.66-40.70 MHZ AND ABOVE 70 MHZ.**

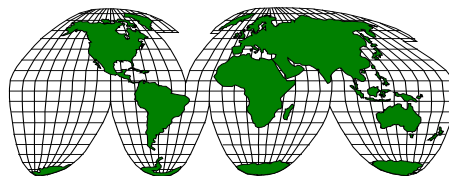
EQUIPMENT TESTED:

LACROSSE TECHNOLOGY, LTD.

MODEL: HFS 300-S

TEST DATE: 12 JULY 1999

1100 Falcon Avenue
Glencoe, MN 55336



INTERNATIONAL
CERTIFICATION SERVICES, INC.

Tele: 320-864-4444
Fax: 320-864-6611

Prepared for:

LaCrosse Technology, Ltd.
1116 South Oak Street
LaCrescent, MN 55447

Test agent:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336
Tele: 320-864-4444
Fax: 320-864-6611

Test location:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336
Tele: 320-864-4444
Fax: 320-864-6611

Prepared by:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336

International Certification Services represents to the client that testing is done in accordance with standard procedures applicable and that reported test results are accurate within generally accepted commercial ranges of accuracy.

This report only applies to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. International Certification Services shall have no liability for any deductions, inferences or generalizations drawn by the client or others from this report.

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.

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1.0 TEST SUMMARY

TEST REPORT: #120799	
COMPANY:	LaCrosse Technology, Ltd.
AGENT:	International Certification Services, Inc.
PHONE:	320-864-4444
TEST DATE:	12 July, 1999
EQUIPMENT UNDER TEST:	433.92 Mhz Hand Held battery powered Intentional Radiator.
GENERAL TEST SUMMARY: The testing was performed at International Certification Services, Inc. at 1100 Falcon Ave, Glencoe, MN 55336	
VERIFICATION / CERTIFICATION STATUS:	The 433.92 Mhz Transmitter was found to be in compliance with the FCC Part 15 Subpart C, Section 15.231 requirements.
MODIFICATIONS NECESSARY:	None

TESTED BY

Gerald Heinen

WRITTEN BY

Duane R. Bagdons

2.0 Applicable Standards

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47 CFR Ch.1 (10-1-98 Edition)

FCC Part 15 Radio Frequency Devices

Subpart C Intentional Radiators

Section 15.231 Periodic operation in the band 40.66-40.70 Mhz
and above 70 Mhz.

2.1 Referenced Standards

ANSI C63.4-1992 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 Ghz.

2.2 Equipment Units Tested

The equipment tested was a 433.92 Mhz pulse modulated hand held battery powered transmitter. This device is a hand held unit with no attached cables or protruding antenna. The antenna is a permanent component and is part of the internal PC board assembly. The unit is programmed to transmit a pulse modulated signal of 93 mS every 171 seconds once turned on.

This standard PC board 433.92 Mhz transmitter is a subassembly in various products.

2.3 Equipment and Cable Configuration

See photos of the EUT pc board and schematic and test configuration setup in Attachment A

2.4 List of Test Equipment

<u>Test Equipment</u>	<u>Model</u>	<u>S/N</u>	<u>Calibration Date</u>
Spectrum Analyzer	Hewlett-Packard 8566B	2421A00458	3/10/99
Preamp	MiniCircuits ZKL-2R7	N/A	6/1/99
Biconical Antenna	AH Systems Model SAS-200/540	328	6/16/99
Log Periodic Antenna (200-1000 MHz)	EMCO 3146	9111-3280	6/16/99
Horn Antenna (1-18 Ghz)	EMCO 3115	5697	3/5/99

Measurement cable losses, and antenna correction factors are included in the data sheets. Average detection methods were used in the measurements. The Resolution BW was set at 1 Mhz and the Video BW was set at 1 Hz with a Span of 0 Hz to perform the correct average detected measurements.

2.5 Units of Measurement.

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All measurements were taken in dBuV/m with the antenna located at 3 meters distance from the EUT. Frequency measurements are recorded in Mhz. Input power to the intentional radiator was not recorded---only the radiated emissions with the internal transmitting antenna were recorded.

2.6 Location of Test Site

The open area test site (OATS) measurement facility used to collect the data was International Certification Services, Inc. at 1100 Falcon Ave in Glencoe, MN 55336. This site has been certified to be in spec of the normalized site attenuation per ANSI C63.4-1992. See letter of compliance from FCC dated July 23, 1998. (FCC 31040/SIT 1300F2)

2.7 Measurement Procedures

The antenna was placed at a distance of 3 meters from the EUT. The EUT was set on an insulating table in the OATS site and rotated through 360 degrees to determine the worst case EUT orientation. The antenna was then positioned vertical and horizontal to determine which antenna polarity orientation was worst case. Then certification data was recorded at all the transmitter frequencies from the fundamental to the 10th harmonic at an antenna height variation of from 1-4 meters.

2.8 Reporting Measurement Data

See data sheets and plots in Attachment B.

2.9 Radiated Emissions Data

The frequency and amplitude of the tuned frequency of the EUT along with the frequencies and amplitudes of the harmonics up to the 7th harmonic are reported in the data sheets in Attachment B. This information is plotted against the limit of section 15.231 of FCC Part 15 subpart C. The polarization of the antenna for each measurement is also recorded.

The Final Level, expressed in dBuV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBuV) and adding the antenna correction factor and cable loss factor (Factor dB) and subtracting the preamp gain. This result then has the FCC limit subtracted from it to provide the margin which gives the tabular data as shown in the data sheets in Attachment B.

Example:

<u>Frequency</u> <u>(MHz)</u>	<u>Level</u> <u>(dBuV)</u>	+	<u>Factor</u> <u>(dB)</u>	=	<u>Corr Data</u> <u>(dBuV/m)</u>	-	<u>FCC Limit</u> <u>(dBuV/m)</u>	=	<u>Margin</u> <u>(dB)</u>
100.0	20.6	+	11.0	=	31.6	-	43.5	=	-11.9

2.10 Operating Frequency Data for Intentional Radiators

All operating frequencies and harmonic frequencies and ambient temperature at which all data was taken at is recorded in the data sheets in Attachment B.

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2.11 Occupied Bandwidth Data for Intentional Radiators

The occupied BW data for the EUT is listed in the data sheets in Attachment B.

2.12 Summary of Results

The EUT passed the requirements of FCC Part 15 Subpart C, Section 15.231 with a minimum passing margin of -22.13974 dBuV/m at the fundamental frequency of 433.95541 Mhz. No modifications were necessary to accomplish this compliance.

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ATTACHMENT A

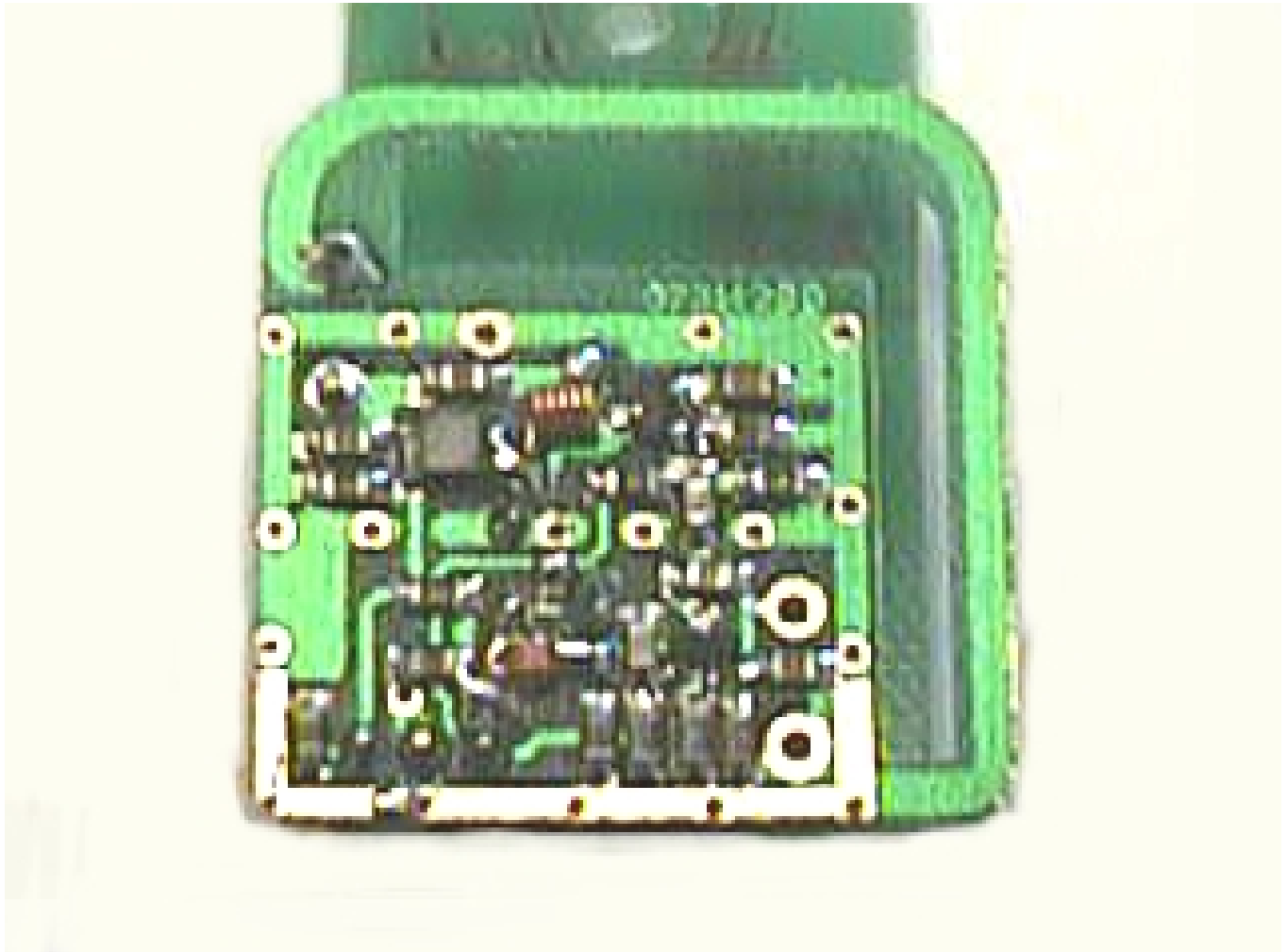
RADIATED MEASUREMENT SCHEMATIC AND PHOTOS

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HFS 300-S (433.92 Mhz) Transmitter PC Board



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ATTACHMENT B

DETAILED TEST DATA SHEETS

Each radiated emissions plot indicates the receiving antenna measurement distance in meters and the emission amplitudes with respect to their applicable limits. The associated tabulation for each radiated plot lists the emission frequency, the final emission level, and the margin from the limit.

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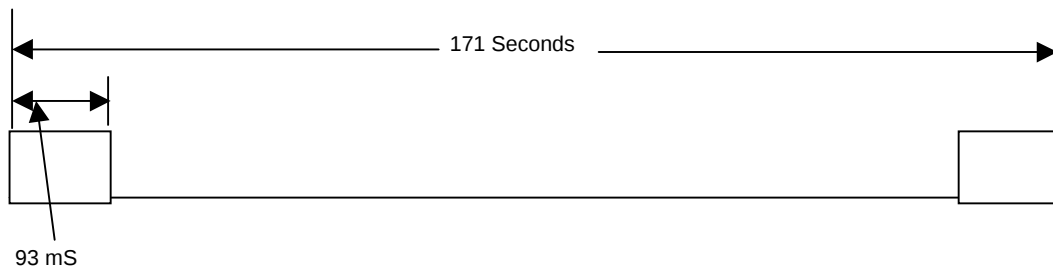


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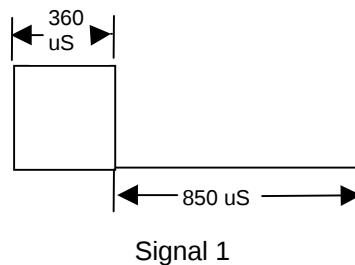
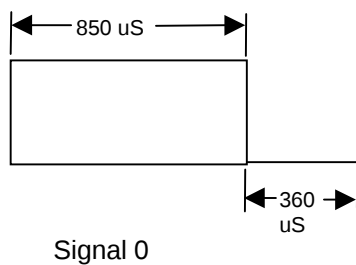
LaCrosse Technology, Ltd.
Model: HFS 300-S 433.92 Mhz Transmitter
Temperature: 64 Deg F.
Humidity: 61 % R.H.

Test Technician: Gerald Heinen

Center Frequency: 433.9616 Mhz



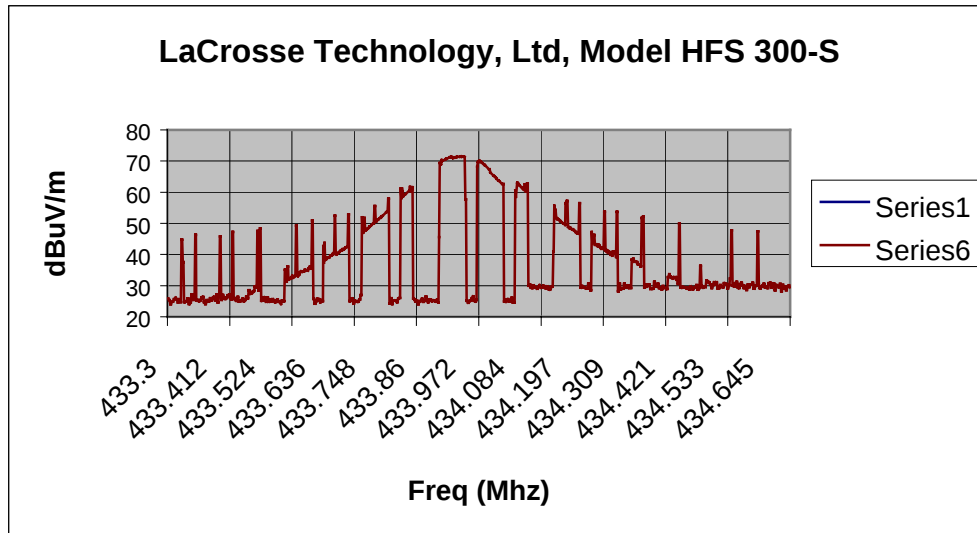
Transmit Burst Sequence Timing



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Transmit Output Spectrum Waveform

Preliminary tests:

EUT Orientation (Deg)	Ant. Polarity (Vertical)	Ant Polarity (Horizontal)
	dBuV/m	dBuV/m
0	52.2	53.6
90	57.5	51.1
180	51.1	52.2
270	56.4	51.7

This indicates the worst case orientation of the EUT and antenna polarity is 90 degrees EUT and vertical antenna polarity.

Testing was performed at this test configuration.

Transmit signal BW = 381 Khz. This is measured from ground floor to ground floor.

Transmit signal BW = 345 Khz at 80% down from peak carrier amplitude

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Initial testing was performed in the anechoic shield room to determine if there were any other spurious emissions other than the fundamental and its harmonics. No other emissions were found.

Certification testing was performed at the OATS site with an antenna distance of 3 meters and the EUT at 90 Degrees to the antenna.

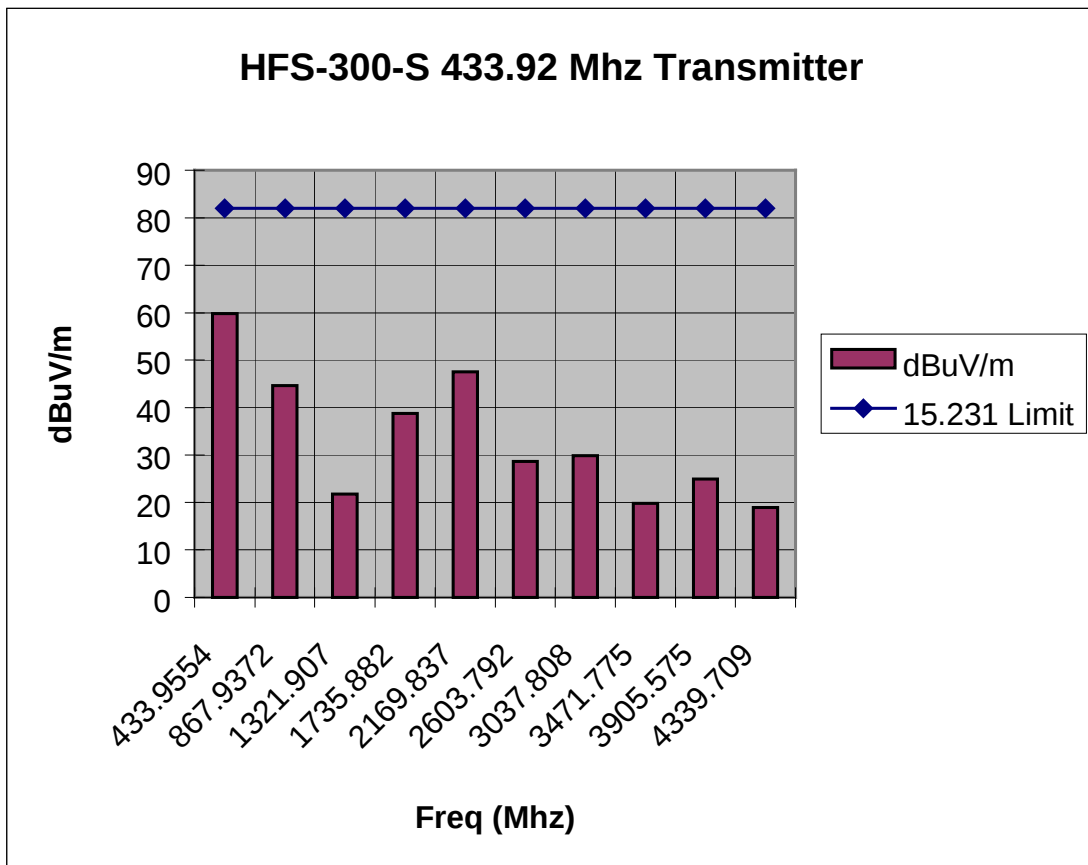
The limit for section 15.231 is 12,500 uV/m with an Average Detector. This converted to dBuV is 81.938 dBuV/m which is the limit shown in the next table.

Freq (Mhz)	Peak det	Avg Det	Preamp gain	Cable loss	Ant Corr Fac	Corr Data	FCC Limit (15.231)	Margin
	dBuV	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB
433.955407	89.4	76.30	33	0.2	16.3	59.80	81.938	-22.14
867.937224	68.4	54.4	33	0.5	22.7	44.60	81.938	-37.33
1321.907	39.1	29.46	33	0.59	24.7	21.75	81.938	-60.19
1735.882	59.8	45.11	33	0.6	26.07	38.78	81.938	-43.16
2169.837	66.2	52.87	33	0.65	27	47.52	81.938	-34.42
2603.792	47.4	31.69	33	0.68	29.3	28.67	81.938	-53.27
3037.808	45.4	30.88	33	0.7	31.3	29.88	81.938	-52.06
3471.775	33.3	19.59	33	0.72	32.5	19.81	81.938	-62.13
3905.5754	38.5	25.01	33	0.77	32.2	24.98	81.938	-56.96
4339.709	32.4	19.99	33	0.79	32.2	18.98	81.938	-62.96

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Transmitter Harmonic output levels at 3 meters

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ATTACHMENT C

**PRODUCT DATA SHEET OR PRODUCT INFORMATION FORM AS
SUPPLIED BY THE CUSTOMER**

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COMPANY NAME: LaCrosse Technology, Ltd.

CUSTOMER REPRESENTATIVE: International Certification Services, Inc.

EQUIPMENT DESCRIPTION: 433.92 Mhz hand held pulse modulated Transmitter

MODEL NUMBER: HFS 300-S

SERIAL NUMBER: Engineering Unit

TYPE OF TEST: ☐ Development
☐ Initial Design Verification
☐ Design Change (Please describe exact changes below)
☒ Production Sample (Audit Test)

Changes made: NONE

OSCILLATOR FREQUENCIES:

433.92 Mhz

PRODUCT SHIELDING PROVISION:

Plastic enclosure

SOFTWARE AND / OR OPERATING MODES:

The unit tested automatically transmitted a burst of pulses for 93 mS every 171 Seconds.

I/O CABLES: NONE

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