MEASUREMENT/TECHNICAL REPORT

Company: General Sensors, Incorporated
FRN: 0006564041
Model
WIAR3
FCC ID: P72WIAR3

Description: This is a report to support a request for an original grant of equipment authorization.

Equipment Type: Low Power Communications Device Transmitter (DXX)

Report prepared for:

General Sensors, Incorporated
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Report prepared by:

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Introduction

This report is an application for Certification of a Transmitter operating pursuant to 47 CFR 15.231. The model number covered by this report is WIAS3. This report is designed to demonstrate the compliance of these devices with the requirements outlined in 47 CFR Part 15 using the methods outlined in 47 CFR Part 2.

EUT Configuration

Work Order:	C0157
Company:	General Sensors
Company Address:	20 Baldwin Drive Branford, CT 06405
Contact:	Don Hudson
Person(s) Present:	None

	MN	**SN**
EUT:	WIAR3	-
General sensor AC adaptor	P/N: CT-4805	
EUT Description:	Wireless water intrusion repeater. The model WIAR3 wireless repeater is a wireless device that operates by receiving a sensor's coded signal and then transmitting that signal to a receiver. It is intended for indoor use only.	
EUT Max Frequency:	418 MHz	
Tx output values used:	R13 = 0 ohm, R14 = 39.2 ohm, R15 = 110 ohm, R16 = 13 ohm	

Support Equipment:	**MN**	**SN**
None		

EUT Cables:	**Qty**	**Shielded?**	**Length**	**Ferrites**
DC power cable	1	No	1.5 m	None

Unpopulated EUT Ports:	**Qty**	**Reason**
None		

Statement of Conformity

The WIAR3 has been found to conform with the following parts of the 47 CFR as detailed below:

Applicable FCC part 15C section: **15.231 Periodic operation in the band 40.66 – 40.70 MHz and above 70 MHz.**

Part 2	Part 15	Comments
	15.15(b)	The product contains no user accessible controls that increase transmission power above allowable levels.
2.925	15.19	The label will be made from maylor and it will be attached with permanent adhesive. A sample label is shown in the label exhibit.
	15.21	Information to the user is shown in the instruction manual exhibit.
	15.27	No special accessories are required for compliance.
	15.31(e)	Readings were taken at the fundamental frequency with the supply voltage varied 15% below the lowest nominal rated voltage and 15% above the highest nominal rated voltage.
	15.207	See data table # 4supplied in this report.
	15.231 a(1)	See WIAR3 Operation Under Section 15.231
	15.231 a(2)	See WIAR3 Operation Under Section 15.231
	15.231 a(3)	See WIAR3 Operation Under Section 15.231
	15.231 a(4)	Not employed for radio controlled purposes. See WIAR3 Operation Under Section 15.231
	15.231 b(1)(2)(3)	See data tables #1 and # 2 supplied in this report.
	15. 231 c	See attached graph of the bandwidth
	15.231 d	NA. Transmitter operates at 418 MHz.
	15.231 e	Satisfies paragraph b through d.

Test Methodology

Radiated emission testing was performed according to the procedures in ANSI C63.4 (1992). The testing was performed at an antenna to EUT distance of 3 or 1 meter(s) below 30MHz and a distance of 10m above 30MHz. The actual test distance used is noted in the test data sheets. The device's performance was investigated to 5 GHz. Since the device is installed in one orientation, the emissions were maximized around the vertical axis and the maximum reading was recorded. The integrated antenna cannot be maximized separately.

All other performance tests were made in accordance with the procedures outlined in Part 15 of CFR 47. The applicable sections provided under Part 15 are provided in the measurement section of this report.

Test Facility

Curtis-Straus LLC
All testing for the range 9kHz–5000MHz was performed at Curtis-Straus (A2LA Certificate Number 1627-01). The open area test site used to collect the radiated data is located at 527 Great Road, Littleton, MA 01460. Site "T" was used.

Test Equipment Used

SPECTRUM ANALYZERS					
x	**Analyzer**	**Model No.**	**Company**	**Serial No.**	**Calibration Due**
x	**BLACK** 9kHz-12.8GHz	8596E	HP	3710A00944	29-JUN-2002
x	**BLUE** 9kHz-1.8GHz	8591E	HP	3223A00227	14-SEP-2002

OPEN AREA TEST SITES (OATS)					
x	**Site**	**FCC Code**	**IC Code**	**VCCI Code**	**Calibration Due**
x	**"A"** Alaska	93448	IC 2762-A	R-903/ C-480	23-JUN-2002

ANTENNAS					
x	**Antenna**	**Model No.**	**Company**	**Serial No.**	**Calibration Due**
x	**GREEN** Bilog: 30MHz-2GHz	CBL6112B	Chase	2742	26-JAN-2003
x	**BLACK** 9kHz-12.8GHz	8596E	HP	3710A00944	29-JUN-2002

PREAMPLIFIERS					
x	**Preamplifier**	**Model No.**	**Company**	**Serial No.**	**Calibration Due**
x	**BLUE** 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	18-MAY-2002
x	**YELLOW-BLACK** 1-20GHz	SMC-12A	MITEQ	535055	21-SEP-2002

LISNS					
x	**LISN**	**Model No.**	**Company**	**Serial No.**	**Calibration Due**
x	**RED** 10kHz-30MHz	8012-50-R-24-BNC	Solar	956348	19-APR-2002

Unless otherwise noted the calibration interval is one year. All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

WIAR3 Operation Under Section 15.231

- Manual operation of the unit occurs when the unit is initially installed and tested. Pushing the test button activates the transmission for 453ms and transmission is terminated automatically.
- Automatic transmission occurs every 9 hours when unit "checks-in" with its status. The duration of automatic transmissions is 453ms.
- Periodic Operation, the unit is part of a safety/security system and transmits supervisory signals to insure system integrity. Periodic rate of transmission does not exceed one second per hour for each transmissions.
- Transmissions during alarm conditions. The Tx time limits are waived as indicated in section 15.231. The duration of transmission is 1.4s and it is repeated once every 15 minutes until cleared.

Measurement Results

Operating Frequency

This device operates at 418MHz.

Electric Field Strength Radiation Measurements

Limit calculation at fundamental and spurious:

Limit at 418 MHz from table in 15.231 b = 80.1 dbuV/m
Averaging factor was calculated as:

Max numbers of bits in 100 ms	= 23
no of high in 100 ms	= 12
Averaging factor	= 20 log (23/12)
	= 5.6 db
Adjusted Limit at fundamental	= 5.6 + 80.1 = 85.7 dbuV/m
Limit used for harmonics	= 60.1 + 5.6 = 65.7 dbuV/m
Limit used for other spurious frequencies:	= 60.1 dbuV/m

Radiated Emissions Table

Curtis-Straus LLC

Date: 25-Mar-02 **Company:** General Sensors **Table** 1
Engineer: Mairaj Hussain **EUT Desc:** WIAR3 **Work Order:** C0157

Frequency Range: 30 - 2000 MHz **Measurement Distance:** 3 m
Notes: Fundamental, harmonics,and spurious **EUT Max Freq:** 418 MHz
pk = peak reading

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Ave. Factor (dB)	Adjusted Reading (dBµV/m)			FCC Part 15 Sec. 231 Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
Vpk	418.0	64.6	0.0	16.8	2.4	5.6	78.2			80.1	-1.9	Pass
Vpk	836.0	38.0	22.3	21.1	3.9	5.6	35.1			60.1	-25.0	Pass
Vpk	1254.0	39.0	21.5	23.0	5.1	5.6	40.0			60.1	-20.1	Pass
Vpk	1672.0	28.0	19.6	25.7	6.2	5.6	34.7			60.1	-25.4	Pass

Table Result: Pass by -1.9 dB ***Worst Freq:*** 418.0 MHz

Test Site: "A" **Pre-Amp:** Blue **Cable:** 65 ft RG8A/U **Analyzer:** Black **Antenna:** Green

Note: In receving mode, no emissions were observed

Radiated Emissions Table

Curtis-Straus LLC

Date: 25-Mar-02 **Company:** General Sensors **Table** 2
Engineer: Mairaj Hussain **EUT Desc:** WIAR3 **Work Order:** C0157

Frequency Range: 2 - 5 GHz **Measurement Distance:** 3 m
Notes: Harmonics and spurious **EUT Max Freq:** 418 MHz
pk = reading, NF = noise floor reading

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Ave. Factor (dB)	Adjusted Reading (dBµV/m)			FCC Part 15 Sec. 231 Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
Hpk	2090.0	41.1	20.2	29.4	1.3	5.6	46.0			60.1	-14.1	Pass
Hpk	2508.0	27.0	20.5	30.6	1.5	5.6	33.0			60.1	-27.1	Pass
NF	2926.0	25.0	20.8	31.5	1.6	5.6	31.7			60.1	-28.4	Pass
NF	3344.0	25.4	20.9	32.5	1.8	5.6	33.2			60.1	-26.9	Pass
Hpk	3761.0	40.3	20.9	33.6	2.1	5.6	49.5			60.1	-10.6	Pass
Hpk	4179.0	36.0	20.9	34.2	2.2	5.6	45.9			60.1	-14.2	Pass
Hpk	4598.0	34.1	21.0	34.2	2.2	5.6	43.9			60.1	-16.2	Pass

Table Result: Pass by -10.6 dB ***Worst Freq:*** 3761.0 MHz

Test Site: "A" **Pre-Amp:** Yel-Blk **Cable:** 3m Microflex **Analyzer:** Black **Antenna:** Black Horn

Voltage Variation Table

Curtis-Straus LLC

Date: 25-Mar-02 **Company:** General Sensors **Table** 3
Engineer: Mairaj Hussain **EUT Desc:** WIAR3 **Work Order:** C0157

Frequency Range: 418 MHz **Measurement Distance:** 3 m
Notes: pk = peak reading **EUT Max Freq:** 418 MHz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Avg Factor (db)	Adjusted Reading (dBµV/m)	Margin (dB)	Result (Pass/Fail)	FCC Part 15 Sec. 31(e) Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
Operation at nominal Voltage												
Vpk	418	64.6	0	16.8	2.4	5.6	78.2			80.1	-1.9	Pass
Operating at 85% of nominal input Voltage												
Vpk	418.0	63.2	0.0	16.8	2.4	5.6	76.8			80.1	-3.3	Pass
Operating at 115% of nominal input Voltage												
Vpk	418.0	62.8	0.0	16.8	2.4	5.6	76.4			80.1	-3.7	Pass

Table Result: Pass by -1.9 dB ***Worst Freq:*** 418.0 MHz

Test Site: "A" **Pre-Amp:** none **Cable:** 65 ft RG8A/U **Analyzer:** Black **Antenna:** Green

AC Mains Conducted Emissions

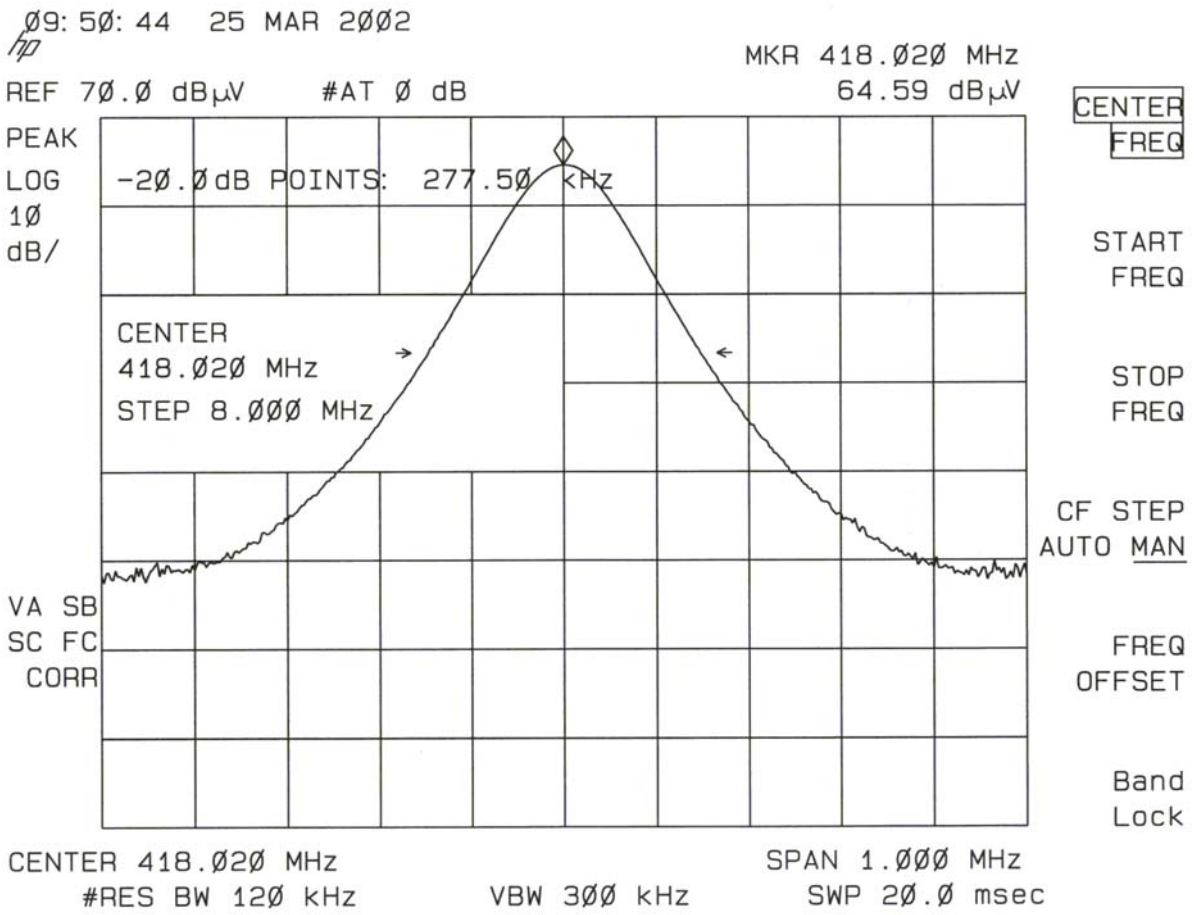
Curtis-Straus LLC

Date: 16-Apr-02 **Company** General Sensors **Table No:** 4
Engineer: Mairaj Hussain **EUT Des** WIAR3 **Work Order:** C0157
Notes:
Range: 0.45-30Mhz **LISN(s):** Red **Other Equipment:** --- **Spectrum Analyzer:** Blue

	Q.P. Readings		Ave. Readings		Impedance	FCC Part 15 Sec. 207		---		---		Overall
Frequency	QP1	QP2	AV1	AV2	Factor	Limit	Margin	qp Limit	qp Margin	AVE Limit	AVE Margin	Result
(MHz)	(dBµV)	(dBµV)	(dBµV)	(dBµV)	(dB)	(dBµV)	dB	(dBµV)	dB	(dBµV)	dB	(Pass/Fail)
0.45	18.8	14.8			20.0	47.9	-9.1					Pass
1.25	6.9	6.7			20.0	47.9	-21.0					Pass
6.25	2.0	2.0			20.0	47.9	-25.9					Pass
16.50	1.6	1.4			20.0	47.9	-26.3					Pass
22.50	1.5	3.4			20.0	47.9	-24.5					Pass
24.10	2.1	2.2			20.0	47.9	-25.7					Pass
25.90	2.2	1.5			20.0	47.9	-25.7					Pass

Table Result: Pass by -9.1 dB ***Worst Freq:*** 0.45 MHz

Emissions Plots



Fundamental

20db Bandwidth = 277.5 KHz
Limit = 418 MHz * 0.0025 = 1,045 KHz