

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: Mairaj Hussain
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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 WIAR3. 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
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Limit used for harmonics	= $60.1 + 5.6 = 65.7$ dbuV/m
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Limit used for other spurious frequencies:	= 60.1 dbuV/m
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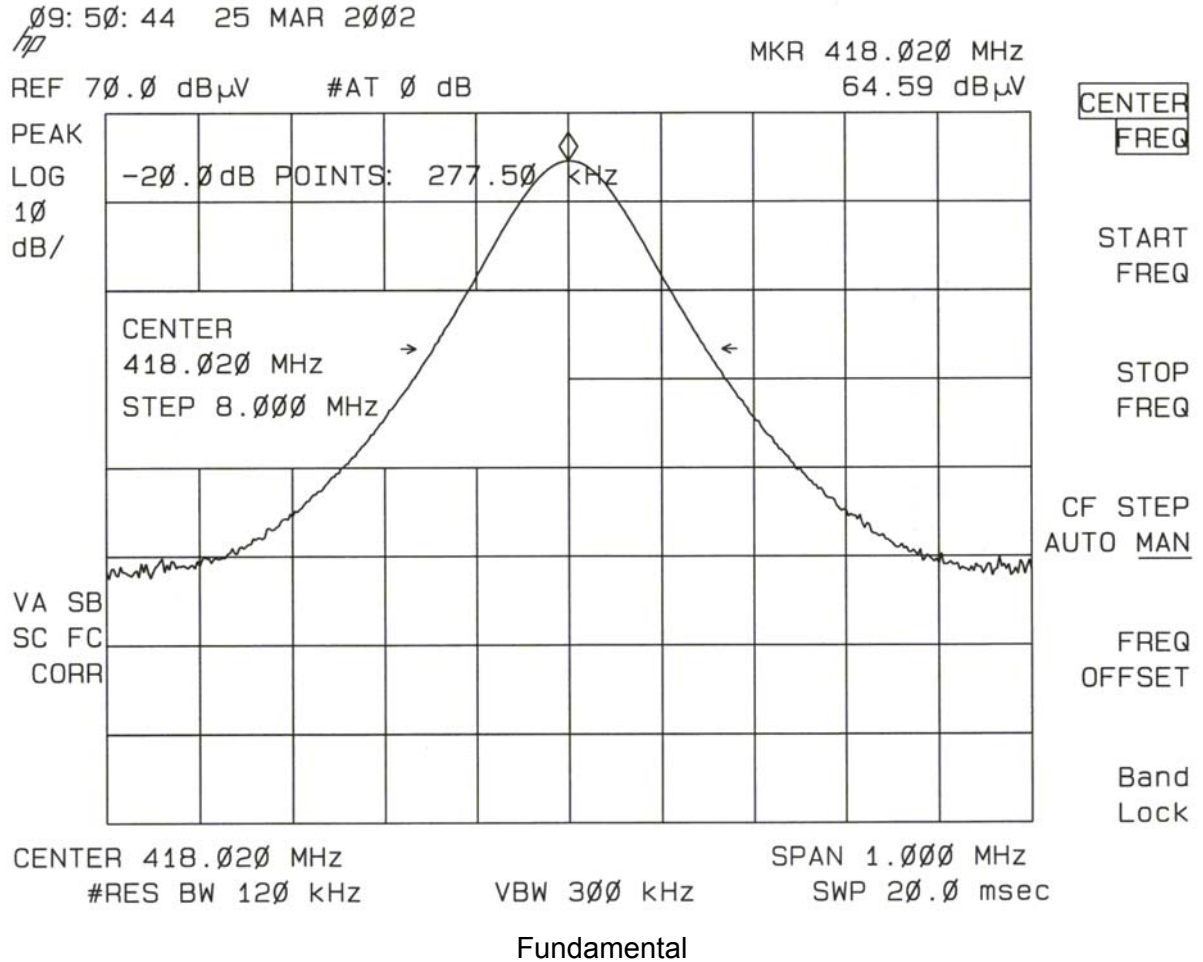
Radiated Emissions Table										Curtis-Straus LLC		
Date: 25-Mar-02			Company: General Sensors					Table 1				
Engineer: Mairaj Hussain			EUT Desc: WIAR3					Work Order: C0157				
Frequency Range: 30 - 2000 MHz							Measurement Distance: 3 m					
Notes: Fundamental, harmonics, and spurious pk = peak reading							EUT Max Freq: 418 MHz					
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	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 receiving 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 pk = reading, NF = noise floor reading							EUT Max Freq: 418 MHz					
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Ave. Factor (dB)	Adjusted			FCC Part 15 Sec. 231		
							Reading (dBµV/m)			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)			FCC Part 15 Sec. 31(e)		
								Margin (dB)	Result (Pass/Fail)	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 Desc: WIAR3					Work Order: C0157		
Notes:												
Range: 0.45-30Mhz					LISN(s): Red		Other Equipment: ---			Spectrum Analyzer: Blue		
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	FCC Part 15 Sec. 207		---		---		Overall Result (Pass/Fail)
	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)		Limit (dBµV)	Margin dB	qp Limit (dBµV)	qp Margin dB	AVE Limit (dBµV)	AVE Margin dB	
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



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