

# **MEASUREMENT/TECHNICAL REPORT**

**Company - Model: FitSense Technology  
FS-1 Heart Rate Monitor  
FCC ID: O9DHA  
June 1, 2001**

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: FitSense Technology  
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## Introduction

This report is an application for Certification of a Transmitter operating pursuant to Part 15.249 of the FCC Rules, Code of Federal Regulations 47. The model number covered by this report is FS-1 Heart Rate Monitor. This report is designed to demonstrate the compliance of this device with the requirements outlined in Part 15 of CFR 47 using the methods outlined in Part 2 of CFR 47.

The confidential information and descriptions included in this application are detailed descriptions of the products, block diagrams, component specifications, and schematic diagrams. We hereby respectfully request under the provision of section 0.457d of the code that the documents listed below be held confidential.

Technical Descriptions and Block Diagrams

Schematics

Bill of Materials

FitSense is requesting that the Technical Descriptions, Block Diagrams, Schematics and Bill of Materials be kept confidential in the FCC application because of the proprietary design developed by FitSense that is unique to the industry.

### Statement of Conformity

The FitSense FS-1 Heart Rate Monitor has been found to conform with the following parts of the 47 CFR as detailed below:

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 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.
	15.203	The antenna is built into the board and there is no external antenna connection.
	15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209.
	15.207	The unit is battery powered without the capability of being recharged or operated from the AC mains.
	15.249(a)	The unit complies with the field strength limits of the 15.249(a) table including the 20dB peak restriction of 15.35(b) and 15.249(d).
	15.249(c)	The unit complies with the field strength limits of the 15.209(a) table.

**Unit Tested**

Model Number: FS-1 Heart Rate Monitor

## Test Methodology

Radiated emission testing was performed according to the procedures in ANSI C63.4 (1992). Radiated testing was performed at an antenna to EUT distance of 3 meters below 1 GHz, and at a distance of 3 or 1 meter(s) above 1 GHz. The actual test distance used is noted in the test data sheets. The device's performance was investigated to 10GHz. The EUT was powered by a Maxell CR2032 3VDC battery for all tests. A fresh battery was used for all testing. Since the Heart Rate Monitor can be operated in any orientation, the emissions were maximized in each of the three orthogonal axes 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.

### *Discussion of CFR47 Part 15.249 Testing Procedure*

The FS-1 Heart Rate Monitor is part of a system involving four separate units. The Heart Rate Monitor transmits heart rate data to the FS-1 Watch (a separate part of the FS-1 system). The unit was continuously activated by stimulating the sensors with a simulated heart beat (low voltage repetitive pulse). During the transmission cycle, peak readings were taken.

### Test Facility

#### *Curtis-Straus LLC*

All testing for the range 30–10,000MHz 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

<b>Spectrum Analyzers</b>					
<b>x</b>	<b>Analyzer</b>	<b>Model No.</b>	<b>Company</b>	<b>Serial No.</b>	<b>Calibration Due</b>
<b>X</b>	<b>GREEN</b> 9kHz-26.5GHz	8593E	HP	3829A03618	05-OCT-2001
<b>X</b>	<b>ORANGE</b> 9kHz-26.5GHz	E4407B	HP	US39440975	05-MAY-2001

<b>OPEN AREA TEST SITES (OATS)</b>					
<b>x</b>	<b>Site</b>	<b>FCC Code</b>	<b>IC Code</b>	<b>VCCI Code</b>	<b>Calibration Due</b>
<b>X</b>	<b>"T"</b> Texas	93448	IC 2762-T	R-905/ C-480	09-AUG-2001

<b>ANTENNAS</b>					
<b>x</b>	<b>Antenna</b>	<b>Model No.</b>	<b>Company</b>	<b>Serial No.</b>	<b>Calibration Due</b>
<b>X</b>	<b>GREEN-WHITE</b> Bilog: 30MHz-2GHz	CBL6112B	Chase	2574	11-JUN-2001
<b>X</b>	<b>ORANGE</b> Horn: 1-18GHz	3115	EMCO	0004-6123	17-MAY-2001

<b>PREAMPLIFIERS</b>					
<b>x</b>	<b>Preamplifier</b>	<b>Model No.</b>	<b>Company</b>	<b>Serial No.</b>	<b>Calibration Due</b>
<b>X</b>	<b>GREEN</b> 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	24-MAR-2002
<b>X</b>	<b>ORANGE-BLACK</b> 1-20GHz	SMC-12A	MITEQ	690639	06-JUL-2001

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

## Measurement Results

### Operating Frequency

This device operates at 915.0 MHz.

### Electric Field Strength Radiation Measurements

Radiated Emissions Table							Curtis-Straus LLC		
Date: 09-Apr-01			Company: FitSense Technology				Table 1		
Engineer: Evan Gould			EUT Desc: Heart Strap Unit (FCC ID: O9DHA)				Work Order: B0408		
Frequency Range: 30-2000MHz					Measurement Distance: 3 m				
Notes: Fundamental, Band Edge, and Second Harmonic					EUT Max Freq: 915MHz				
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	FCC Class B		
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
BAND EDGE READINGS		---	---	---	---	---	---	---	---
H	902.0	29.7	21.5	20.6	4.1	32.9	46.0	-13.1	Pass
H	928.0	29.0	21.4	20.8	4.2	32.6	46.0	-13.4	Pass
FUNDAMENTAL		---	---	---	---	---	---	---	---
H	916.48	72.8	21.4	20.7	4.1	76.2	94.0	-17.8	Pass
SECOND HARMONIC		---	---	---	---	---	---	---	---
H (1m)	1830.0	36.6	17.3	26.5	6.5	52.3	63.5	-11.2	Pass
Table Result: Pass by -11.2 dB Worst Freq: 1830.0 MHz									
Test Site: "T"		Pre-Amp: Green		Cable: 65 ft RG8A/U		Analyzer: Orange		Antenna: Grn-Wht	

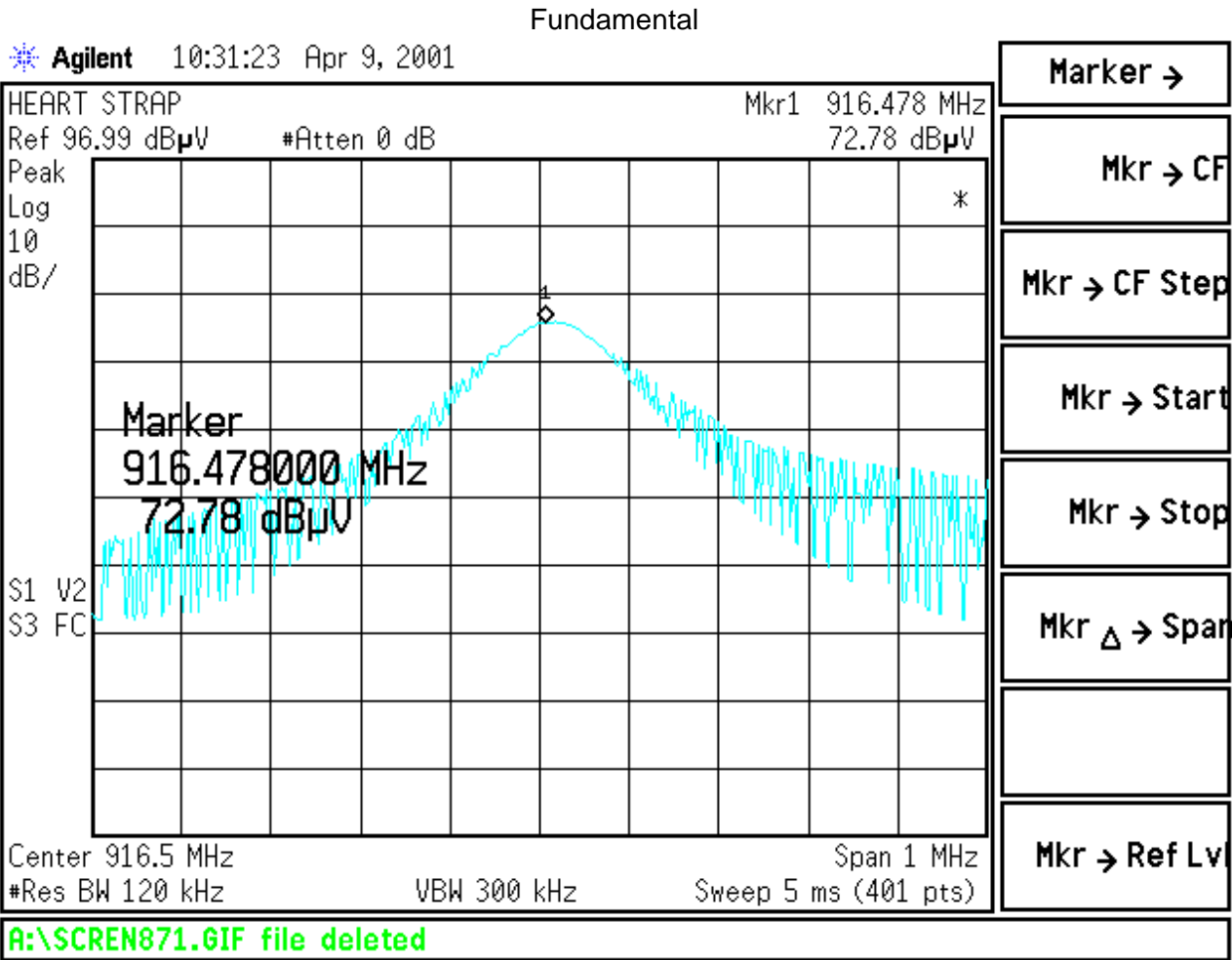
Radiated Emissions Table							Curtis-Straus LLC		
Date: 09-Apr-01			Company: FitSense Technology				Table 2		
Engineer: Evan Gould			EUT Desc: Heart Strap Unit (FCC ID: O9DHA)				Work Order: B0408		
Frequency Range: 2-10GHz					Measurement Distance: 3 m				
Notes: Harmonics (third through tenth) noise floor readings					EUT Max Freq: 915MHz				
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	FCC Class B		
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
V	2750.0	34.8	24.4	31.2	1.2	42.8	54.0	-11.2	Pass
V	3667.0	35.9	24.2	33.9	1.3	46.9	54.0	-7.1	Pass
V	4584.0	34.8	24.3	33.6	1.5	45.6	54.0	-8.4	Pass
V	5501.0	35.3	24.0	35.9	1.6	48.8	54.0	-5.2	Pass
V (1m)	6417.0	36.4	23.1	36.3	1.8	51.4	63.5	-12.1	Pass
V (1m)	7334.0	37.0	22.2	37.5	1.9	54.2	63.5	-9.3	Pass
V (1m)	8251.0	35.1	21.1	38.0	2.0	54.0	63.5	-9.5	Pass
V (1m)	9168.0	35.8	20.6	38.4	2.2	55.8	63.5	-7.7	Pass
Table Result: Pass by -5.2 dB Worst Freq: 5501.0 MHz									
Test Site: "T"		Pre-Amp: Or-Blk		Cable: 3m Sucoflex		Analyzer: Orange		Antenna: Orange Horn	



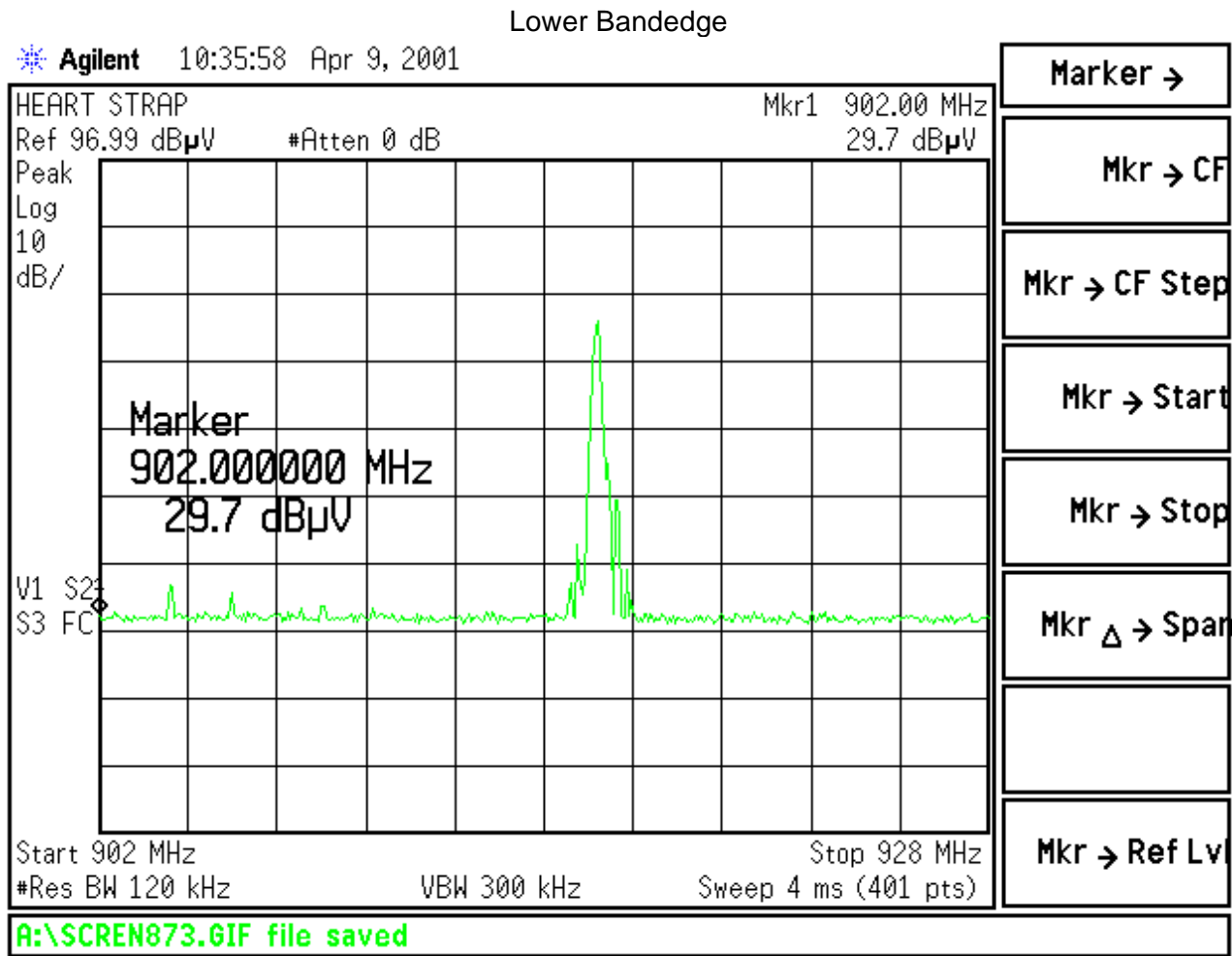
Radiated Emissions Table							Curtis -Straus LLC		
Date: 09-Apr-01			Company: FitSense Technology				Table 3		
Engineer: Evan Gould			EUT Desc: Heart Strap Unit (FCC ID: O9DHA)				Work Order: B0408		
Frequency Range: 30-10,000MHz					Measurement Distance: 3 m				
Notes: Spurious Emissions orange horn, orange analyzer, orange-black pre-amp, and sucoflex cable were used for 1-10GHz					EUT Max Freq: 915MHz				
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBuV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBuV/m)	FCC Class B		
							Limit (dBuV/m)	Margin (dB)	Result (Pass/Fail)
noise floor	532.7	16.5	21.5	17.8	2.9	15.7	46.0	-30.3	Pass
noise floor	611.2	16.2	21.3	18.8	3.2	16.9	46.0	-29.1	Pass
noise floor	753.6	16.4	21.2	19.6	3.7	18.5	46.0	-27.5	Pass
noise floor	808.2	16.1	21.3	20.0	3.9	18.7	46.0	-27.3	Pass
noise floor	848.4	15.8	21.4	20.3	4.0	18.7	46.0	-27.3	Pass
noise floor	943.2	16.1	21.3	20.9	4.2	19.9	46.0	-26.1	Pass
Table Result: Pass by -26.1 dB							Worst Freq: 943.2 MHz		
Test Site: "T"		Pre-Amp: Green		Cable: 65 ft RG8A/U		Analyzer: Green		Antenna: Grn-Wht	

NOTE: There wer no emissions from the product detected from 2-10GHz.

Emissions Plots

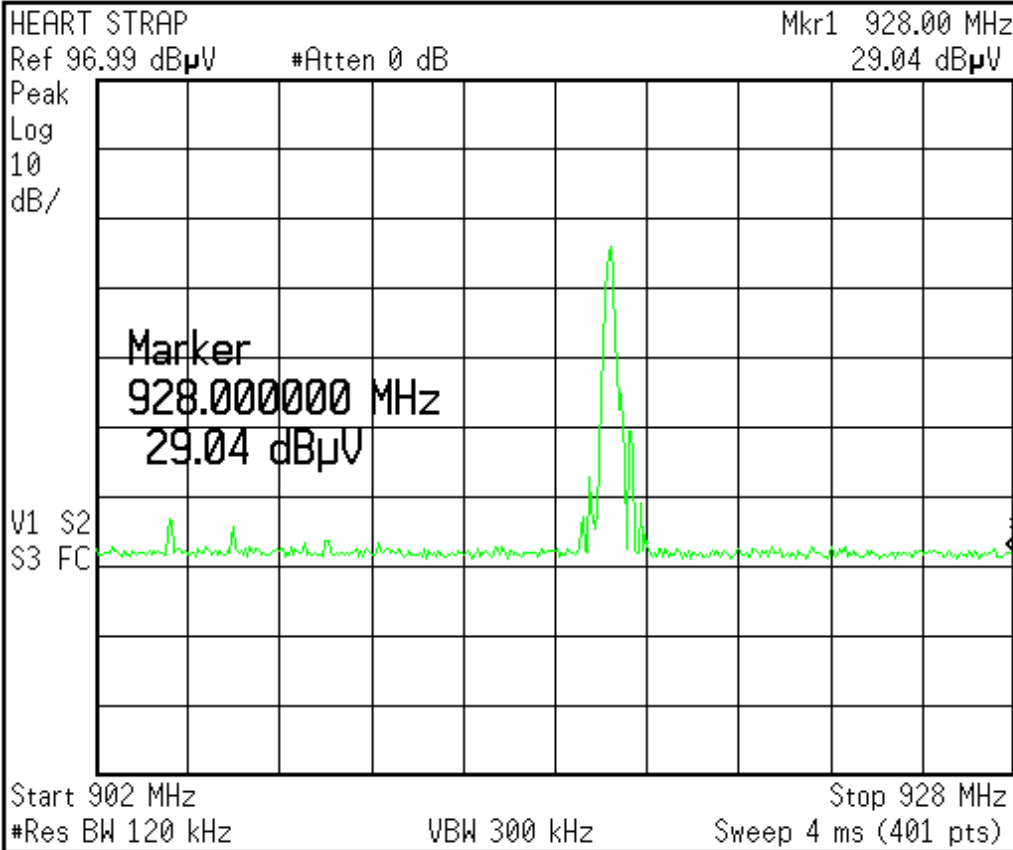


Band Edge Measurements



Upper Bandedge

Agilent 10:37:06 Apr 9, 2001



Marker →

Mkr → CF

Mkr → CF Step

Mkr → Start

Mkr → Stop

Mkr Δ → Span

Mkr → Ref Lvl

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