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## FCC TEST REPORT

### PART 15.231(e)

APPLICANT	CHARBROIL, LLC
ADDRESS	1442 BELFAST AVENUE COLUMBUS GA 31902
FCC ID	UOI3496931
MODEL NUMBER	3496931
PRODUCT DESCRIPTION	SMART THERMOMETER
DATE SAMPLE RECEIVED	12/11/2006
DATE TESTED	12/12/06
TESTED BY	RICHARD BLOCK
APPROVED BY	MARIO DE ARANZETA
TIMCO REPORT NO.	C:\CHARBROIL_UOI\3361AUT6\3361AUT6TestReport.doc
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL
TOTAL PAGES	13

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

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**GENERAL INFORMATION**

**EUT Specification**

The test results relate only to the items tested.		
<b>FCC ID</b>	UOI3496931	
<b>Model Number</b>	3496931	
<b>Product Description</b>	SMART THERMOMETER	
<b>Operating Frequency</b>	433.96Mhz	
<b>EUT Power</b>	<i>Primary Power</i>	3VDC
	<i>Secondary Power</i>	N/A
<b>Test Item</b>	<input type="checkbox"/> Prototype	
	<input type="checkbox"/> Pre-Production	
	<input checked="" type="checkbox"/> Production	
<b>Type of Equipment</b>	<input type="checkbox"/> Fixed	
	<input type="checkbox"/> Mobile	
	<input checked="" type="checkbox"/> Portable	
<b>Test Standards</b>	FCC Part 15, Subpart C and ANSI C63.4-2003	
<b>Modifications to DUT</b>	None	
<b>Test Exercise</b>	The EUT was set in continuous transmit	

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**COMPLIANCE WITH PART 15.231(a)**

Part 15.231(a):

- Continuous operation: Yes  No
- Control signal only: Yes  No
- Data transmission with a control signal Yes  No  N/A

Description of control signal: \_\_\_\_\_ (notes: indicate whether such info is included in supporting exhibit such as operation description page xx)

Part 15.231(a)(1):

- Manually operated device: Yes  No
- Does it meet the 5s deactivation requirement after the switch is being released: Yes  No

Description: \_\_\_\_\_ (notes: a plot showing the pulse train does not necessarily constitute an objective evidence of compliance with the deactivation requirement. A plot should be accompanied by an explanation and/or statement of compliance, if not otherwise clearly stated in supporting documentation e.g. operation description page xx)

Part 15.231(a)(2):

- Automatically operated device: Yes  No
- Does it meet the 5s deactivation requirement after being activated: Yes  No

Description: \_\_\_\_\_ (notes: a plot showing the pulse train does not necessarily constitute an objective evidence of compliance with the deactivation requirement. A plot should be accompanied by an explanation and/or statement of compliance, if not otherwise clearly stated in supporting documentation e.g. operation description page xx)

Part 15.231(a)(3):

- Periodic transmission at regular predetermined intervals: Yes  No  N/A

Description: \_\_\_\_\_

- Polling or supervision transmissions, including data, to check system integrity check requires a total transmission time not exceeding 2s per hour: Yes  No  N/A

Part 15.231(a)(4):

Operation involving fire, security, or safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

**Does the transmitter meet the condition? Yes  No  N/A**

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**EMC EQUIPMENT LIST**

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/27/04	3/26/07
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/05	12/7/07
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/05	12/7/07
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/05	12/8/07
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/05	12/8/07
Analyzer Blue Tower Spectrum Analyzer	HP	8568B	2928A04729 2848A18049	CAL 4/13/05	4/13/07
Analyzer Blue Tower RF Preselector	HP	85685A	2926A00983	CAL 9/5/05	9/5/07
Analyzer Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 4/13/05	4/13/07
Analyzer Silver Tower Spectrum Analyzer	HP	8566B Opt 462	3552A22064 3638A08608	CAL 10/30/06	10/30/08
Analyzer Silver Tower RF Preselector	HP	85685A	2620A00294	CAL 10/30/06	10/30/08
Analyzer Silver Tower Quasi-Peak Adapter	HP	85650A	3303A01844	CAL 10/30/06	10/30/08
Analyzer Open-Frame Tower Preamplifier	HP	8449B	3008A01075	CAL 8/8/05	8/8/07
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Antenna: Biconnical	Eaton	94455-1	1096	CAL 10/11/06	10/11/08
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/05	12/12/07

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## **TEST PROCEDURE**

**RADIATION INTERFERENCE:** The test procedure used was ANSI Standard C63.4-2003 using a spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz. The ambient temperature of the UUT was 78.3°F with a humidity of 40%.

**FORMULA OF CONVERSION FACTORS:** The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

**Example:**

Freq (MHz) METER READING + CL + ACF = FS  
33 20 dBuV + 1.02 + 10.36 dB = 31.38 dBuV/m @ 3m

**ANSI STANDARD C63.4-2003 10.1.7 MEASUREMENT PROCEDURES:** The UUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The UUT was placed in the center of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes and the highest readings were converted to average readings based on the duration of "ON" time.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

Measurements were made by TIMCO ENGINEERING INC. located at 849 N.W. State Road 45, Newberry, FL 32669.

**RADIATION INTERFERENCE**

RULES PART NO.: 15.231(e)

**REQUIREMENTS:**

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBµV)	Field Strength of Harmonics and Spurious Emissions (dBµV/m @ 3m)
40.66 to 40.70	60	40
70 to 130	54	34
130 to 174	54 to 63.5	34 to 43.5
174 to 260	63.5	43.5
260 to 470	63.5 to 74	43.5 to 54
470 and above	74	54

The limit for average field strength dBµV/m for the fundamental frequency = 73.0 dBµV/m. No fundamental is allowed in the restricted bands.

The limit for average field strength dBµV/m for the harmonics and spurious frequencies = 53.0 dBµV/m. Spurious in the restricted bands must be less than 54 dBµV/m or 15.209.

**TEST DATA:**

Tuned Frequency MHz	Emission Frequency MHz	*	Meter Reading dBµV	Ant. Polarity	Coax Loss dB	Correction Factor dB	Duty Cycle Factor dB	Field Strength dBµV/m	Margin dB
433.9	433.92		45.7	V	1.23	16.18	4.10	59.02	13.98
433.9	433.92		58.0	H	1.23	16.62	4.10	71.75	1.25
433.9	867.80		5.7	V	1.93	22.40	4.10	25.94	27.06
433.9	867.80		9.2	H	1.93	22.96	4.10	30.00	23.00
433.9	1,301.70	**	13.6	H	2.34	27.84	4.10	39.69	14.31
433.9	1,301.70	**	13.9	V	2.34	27.84	4.10	39.99	14.01
433.9	1,735.60		13.9	V	2.69	29.61	4.10	42.10	10.90
433.9	1,735.60		15.2	H	2.69	29.61	4.10	43.40	9.60
433.9	2,169.60		7.7	H	3.02	31.67	4.10	38.29	14.71
433.9	2,169.60		8.3	V	3.02	31.67	4.10	38.89	14.11
433.9	2,603.50		9.2	V	3.32	32.72	4.10	41.15	11.85
433.9	2,603.50		9.4	H	3.32	32.72	4.10	41.35	11.65
433.9	3,037.40		8.1	V	3.63	33.21	4.10	40.85	12.15
433.9	3,037.40		8.6	H	3.63	33.21	4.10	41.35	11.65
433.9	3,471.30		7.7	H	4.02	33.29	4.10	40.92	12.08
433.9	3,471.30		8.2	V	4.02	33.29	4.10	41.42	11.58
433.9	3,905.20	**	8.3	H	4.41	33.62	4.10	42.24	11.76
433.9	3,905.20	**	8.3	V	4.41	33.62	4.10	42.24	11.76
433.9	4,339.20	**	8.0	H	4.67	33.97	4.10	42.54	11.46
433.9	4,339.20	**	8.8	V	4.67	33.97	4.10	43.34	10.66

\*\* -DENOTES RESTRICTED BANDS.

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

- 1) for the band 130-174 MHz, uV/m at 3 meters =  $22.72727(F) - 2454.545$ ;
- 2) for the band 260-470 MHz, uV/m at 3 meters =  $16.6667(F) - 2833.333$ .

Emissions attenuated more than 20 dB below the permissible value are not reported.

Sample Calculation of Limit @ 433.9 MHz:

$$16.6667 (433.9) - 2833.3333 = 4398.34813 \text{ uV/m}$$
$$20\log(4398.34813) = 72.86 \text{ dBuV/m limit @ 433.9 MHz}$$



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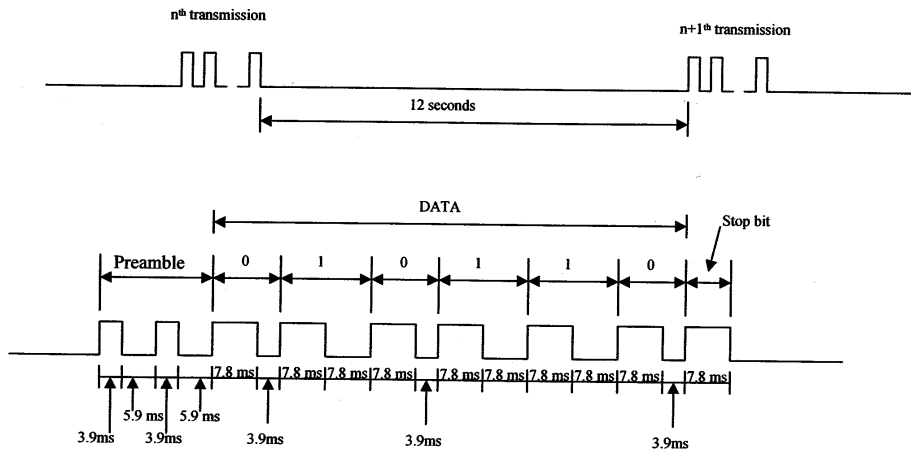
## **CALCULATION OF DUTY CYCLE**

The period of the pulse train is determined by observing it on an oscilloscope or a spectrum analyzer with zero (0) frequency span. A plot is then made of the pulse train with a sweep time of 100 milliseconds. This sweep determines the duration of the pulse train. This sweep allows the determination of the number of and type of pulses, i.e. long & short. Plots are then made showing the duration of each type of pulse and its duration. From the 100 millisecond Plot, the number of a given type of pulse is then multiplied by the duration of that type pulse. This allows the calculation of the amount of time the UUT is on within 100 ms. If the pulse train is longer than 100 ms then this number is multiplied by 100 to determine the percentage ON TIME. If the pulse train is less than 100 ms the total on time is divided by the length of the pulse train and then multiplied by 100 to determine the percentage ON TIME. In this case there were 2 short pulses 3.9 mS long and 7 long pulses 7.8 ms long for a total of 62.4 ms ON TIME within a 121 ms pulse train. The average field strength is determined by multiplying the peak field strength by the percent on time.

dB = 20\*log(ON TIME)/PERIOD  
dB = 20\*log(62.4/100)  
dB = 20\*log(0.624)  
dB = -4.096

DUTY CYCLE PLOT

Smart Thermometer Transmission Data Timing Diagram



Preamble = 19.6 ms  
 Data = 70.2 ms (all 0's) ~ 93.6 ms (all 1's)  
 Stop bit = 7.8 ms  
 Total transmission time = 97.6 ms ~ 121 ms

Average power factor =  $20 \log(62.4 \text{ ms} / 100 \text{ ms}) = 20 \log(0.624) = -4.1 \text{ dB}$

## OCCUPIED BANDWIDTH

**Rules Part No.:** 15.231(C)

**Requirements:** The bandwidth of the emission shall be no wider than .25% of the center frequency for devices operating between 70 and 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

**Method Of Measurement:** A small sample of the transmitter output was fed into the spectrum analyzer and the following plot was generated. The vertical scale is set to 10 dB per division.

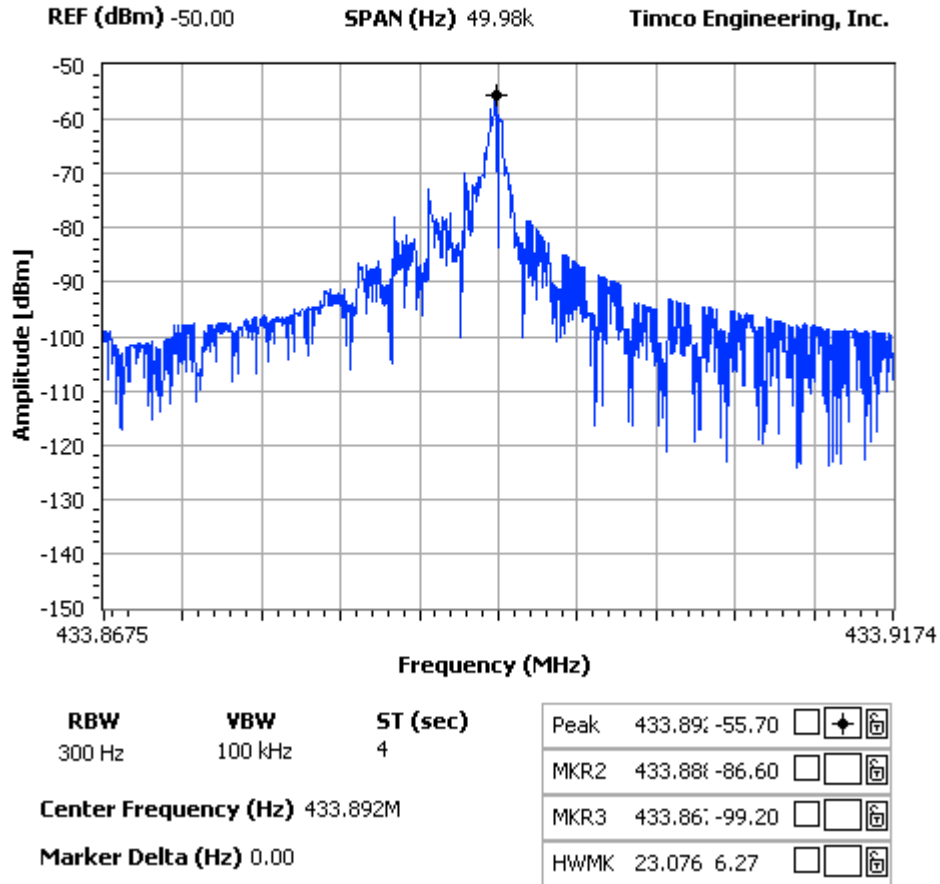
**Test Data:** The following plot represents the emissions taken for the device.

$$\begin{aligned} 433.90 \text{ MHz} * .0025 &= 1.08475 \text{ MHz} \\ 1.08475 \text{ MHz}/2 &= +/- 542.375 \text{ kHz} \end{aligned}$$

OCCUPIED BANDWIDTH PLOT

**NOTES:**

OCCUPIED BANDWIDTH  
 CHARBROIL, LLC -- FCC ID: UOI 3496931



**TEST SET UP PHOTO**

