

## TEST REPORT

Report Number: 100112160ATL-001

July 14, 2010

**Product Designation: TS-03**

Standard: 47 CFR Part 15, Subpart C (15.231 - Periodic operation in the band 40.66-40.70 MHz and above 70 MHz)  
RSS-210, Issue 7, 2007

**Tested by:**

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Duluth, GA 30096

**Client:**

Schawbel Corp (The)  
26 Crosby Drive  
Bedford, MA 01730  
Contact: Yigal Offir  
Phone: 866.753.3837

**Tests performed by:**

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Troy J. Ihle  
EMC Project Engineer

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## 1.0 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

## 2.0 Test Summary

Section	Test Full Name	Test Date	Result
4.0	System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)		
5.0	Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)		
6.0	Restrictions (FCC 15C - 15.231(a))	06/02/2010	PASS
7.0	Duty Cycle Determination (FCC 15A - 15.35(c))	05/21/2010	
8.0	Radiated Emissions (FCC 15C - 15.231(b))	07/07/2010	PASS
9.0	Bandwidth Requirements (FCC 15C - 15.231(c))	05/21/2010	PASS
NA	Conducted emissions on AC power lines (Conducted Emissions) was waived due to the EUT is battery-operated.		
NA	Conducted Emissions for Intentional Radiators (FCC 15C - 15.207) was waived due to the EUT is battery-operated.		

### 3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
ThermaCell FootWarmer Remote	The Schawbel Corporation	TS-03	Not Labeled

EUT receive date:	May 21 and July 7, 2010
EUT receive condition:	Good

Description of EUT provided by Client:

The TS-03 Transmitter is used to wirelessly control an in-sole heater placed in the user's shoe.

Description of EUT exercising:

During testing, the device was configured to transmit continuously.

#### 4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

**Method:**

Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

**Data:**

EUT Cabling						
ID	Description	Length	Shielding	Ferrites	Connection	
					From	To
No Cables Present						

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
No support equipment required			

**5.0 Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)****Method:**

Complete the overview spreadsheet.

Related Submittal(s) Grants: This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.

**Data:**

Applicant	The Schawbel Corporation
	26 Crobsy Drive
	Bedford, MA 01730
Trade Name & Model No.	Foot Warmer Remote & TS-03
FCC Identifier	YGU-TS03
IC Identifier	9030A-TS03
Frequency Range (MHz)	434
Antenna Type (15.203)	Integral
Manufacturer name & address	The Schawbel Corporation
	26 Crobsy Drive
	Bedford, MA 01730

Related Submittals and Grants:	This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.
Additions, deviations and exclusions from standards	

## 6.0 Restrictions (FCC 15C - 15.231(a))

### Method:

15.231(a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

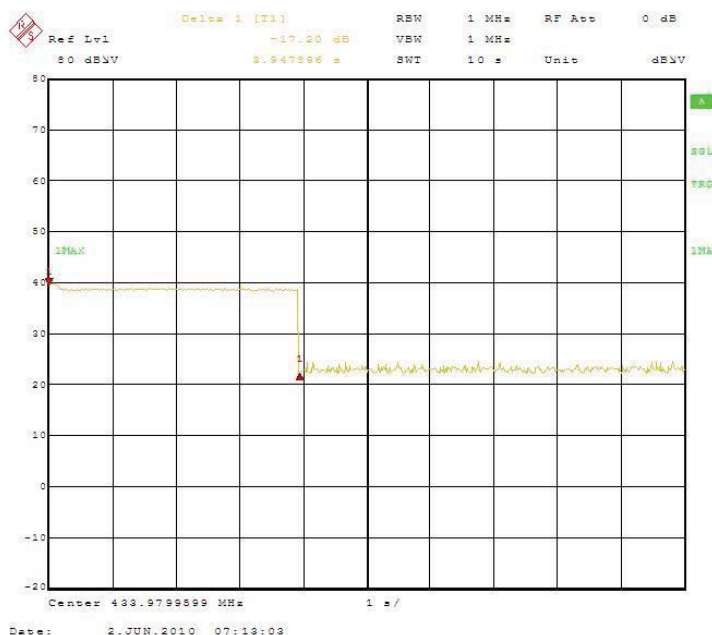
(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

### Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/19/2009	10/19/2010

**Results: The sample tested was found to Comply.**

### Plot:



10 Second Timing Plot

**6.0 Restrictions (FCC 15C - 15.231(a))****Data:**

15.231(a)	Response	Requirement
Frequency Range (Mhz, max)	434	40.66-40.70 MHz and > 70MHz
Frequency Range (MHz, min)	433.965	40.66-40.70 MHz and > 70MHz
Transmit only control signal?	Yes	Only control signal allowed
Continuous transmission?	No	No
Voice transmission?	No	No
Video transmission?	No	No
Radio control of toy?	No	No

15.231(a)(1)		
Manually operated?	Yes	
Deactivates within 5 seconds?	Yes	Yes
Show plot (30 second sweep)	Present	

15.231(a)(2)		
Automatically operated?	N/A	
Deactivates within 5 seconds?	N/A	
Show plot (10 second sweep)	N/A	

15.231(a)(3)		
Periodically transmits at predetermined intervals?	N/A	Allowed, with restrictions
Polling signals?	N/A	Allowed, with restrictions
Polling rate and timing	N/A	< 2 seconds per hour

15.231(a)(4)		
For Emergency Use?	No	Allowed

15.231(a)(5)		
Exceed 15.231(a)(1) or (a)(2) requirements?	N/A	Allowed for professional install

## 7.0 Duty Cycle Determination (FCC 15A - 15.35(c))

### Method:

(c) Unless otherwise specified, e.g. §15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Determine the period of the pulse train, T, in mSec and record the results. T is defined as the time from the beginning of one pulse train to the beginning of the next pulse train.

Count the number of different types of pulses, N and record the results.

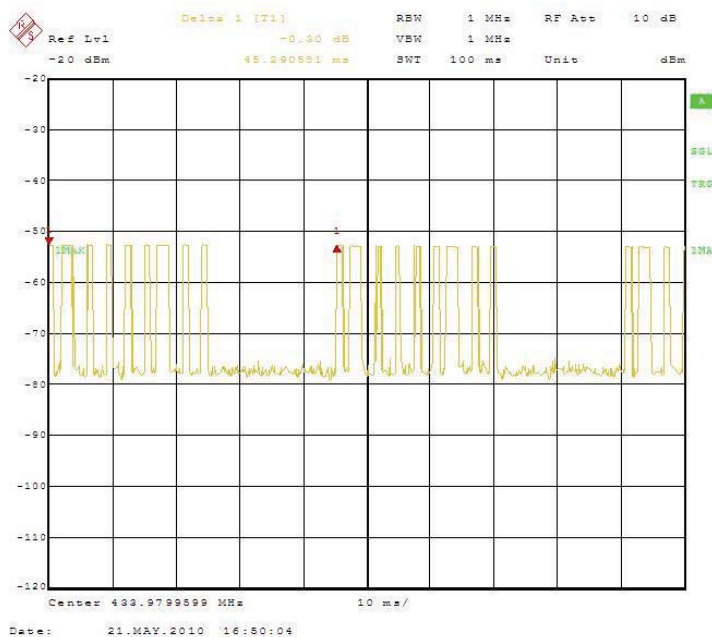
For each of the different types of pulses, count the number of occurrences within one pulse train.

Use the Duty Cycle Correction Factor, DCCF, from the results table and use it to adjust the field strength measurements recorded for radiated emissions.

### Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/19/2009	10/19/2010

### Plot:

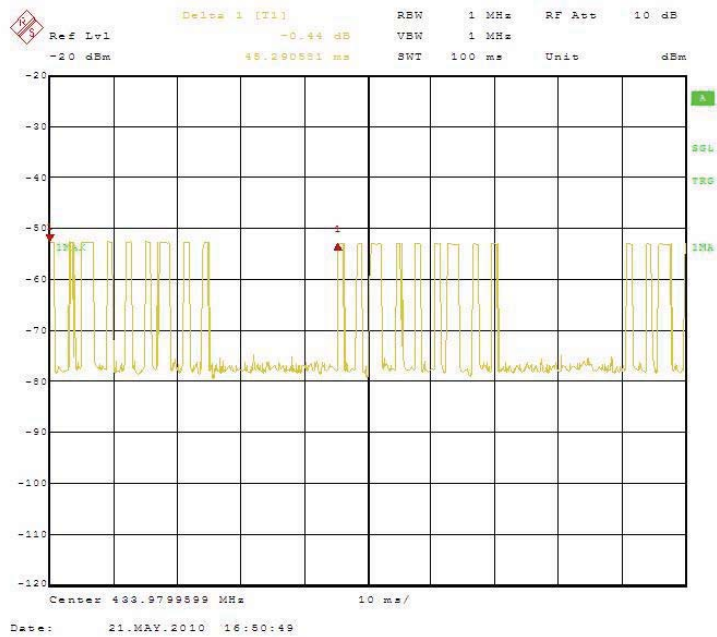


Pulse Train Plot, 100 ms, Button/Level #1



## 7.0 Duty Cycle Determination (FCC 15A - 15.35(c))

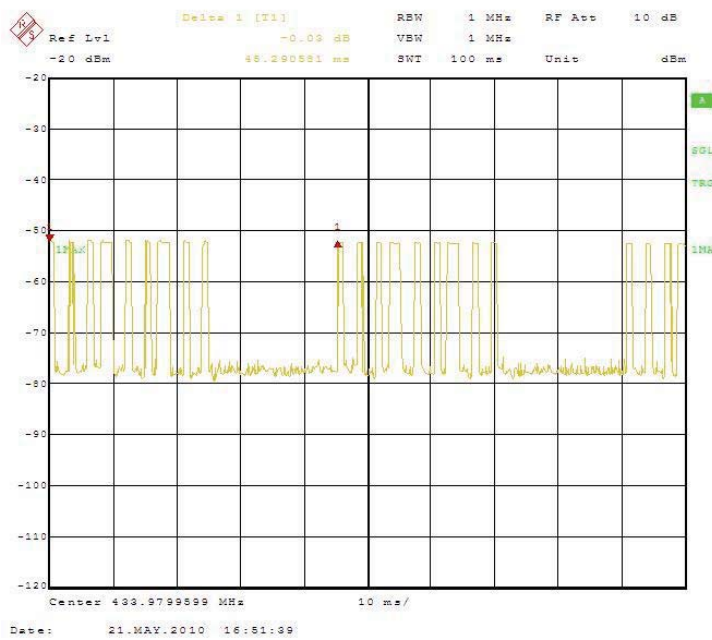
Plot:



Pulse Train Plot, 100 ms, Button/Level #2

## 7.0 Duty Cycle Determination (FCC 15A - 15.35(c))

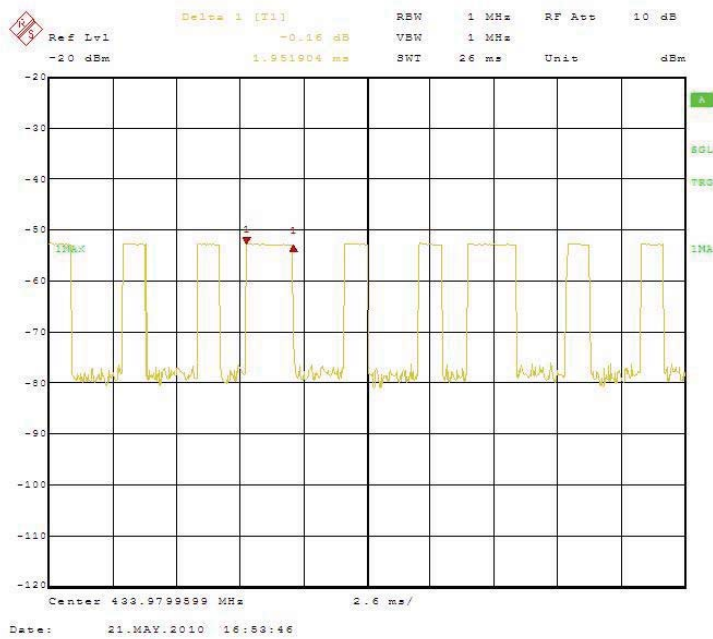
Plot:



Pulse Train Plot, 100 ms, Button/Level #3

## 7.0 Duty Cycle Determination (FCC 15A - 15.35(c))

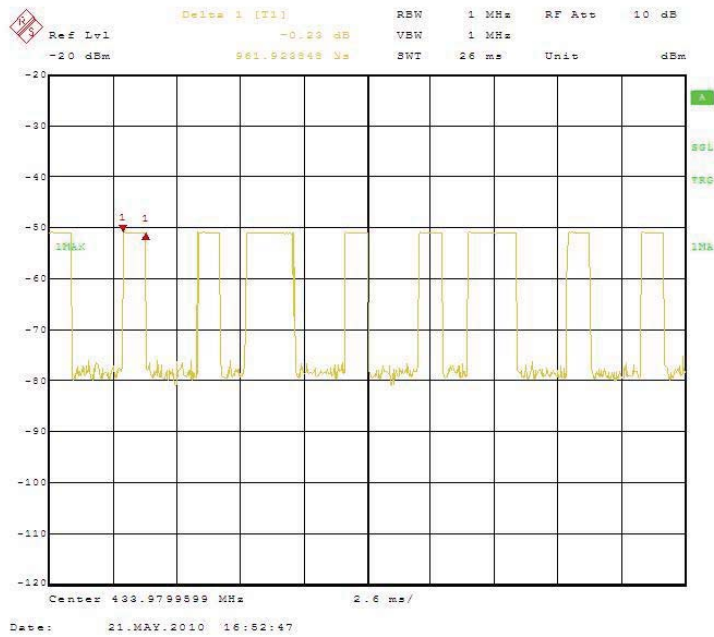
Plot:



On portion of pulse train, long pulse width

## 7.0 Duty Cycle Determination (FCC 15A - 15.35(c))

Plot:



On portion of pulse train, short pulse width

## 7.0 Duty Cycle Determination (FCC 15A - 15.35(c))

### Data:

Duration of Pulse Train, T (mSec):	45.29
Averaging Interval, $A_I$ (mSec):	45.29
Number of different Pulses, N:	2

	Number (#P <sub>x</sub> )	Pulse Width, mSec (PW <sub>x</sub> )	Product (#P <sub>x</sub> )*(PW <sub>x</sub> )
Pulse Width 1	7	0.9619	6.7333
Pulse Width 2	2	1.9519	3.9038
Pulse Width 3			
Pulse Width 4			
Pulse Width 5			
Pulse Width 6			
Pulse Width 7			
Pulse Width 8			
Pulse Width 9			
Pulse Width 10			

Duty Cycle:	0.234866416
Duty Cycle Correction Factor, dB:	-12.6

$$T_{on} = (PW_1 * \#P_1) + (PW_2 * \#P_2) + \dots + (PW_n * \#P_n)$$

$$DutyCycle = T_{on} \div A_I$$

$$DCCF = 20 * \log_{10}(DutyCycle)$$

## 8.0 Radiated Emissions (FCC 15C - 15.231(b))

### Method:

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the limits specified in FCC Part 15.231(b).

Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

For radiated emission measurements, the EUT is attached to a styro-foam block and placed on a non-conductive table whose top is 80cm above the ground plane. If the EUT is handheld, the signal shall be aximized through rotation and placement in the three orthogonal axes.

During the test the EUT is rotated and the antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at 3 meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent 3-meter reading using inverse scaling with distance.

Radiated emission measurements were performed from 30 MHz to 10 times the highest frequency generated in the EUT. When provided, emissions plots are taken with a peak detector unless otherwise indicated.

Analyzer resolution is:

- ☐ 100 kHz or greater for frequencies 1000 MHz and below,
- ☐ 1 MHz for frequencies above 1000 MHz.

Equipment setup for radiated disturbance tests shall follow the guidelines of ANSI C63.4:2003.

The Peak value of the Field Strength was measured. The Average value was obtained from the Peak by subtracting the Duty Cycle Correction Factor or by using an average detector.

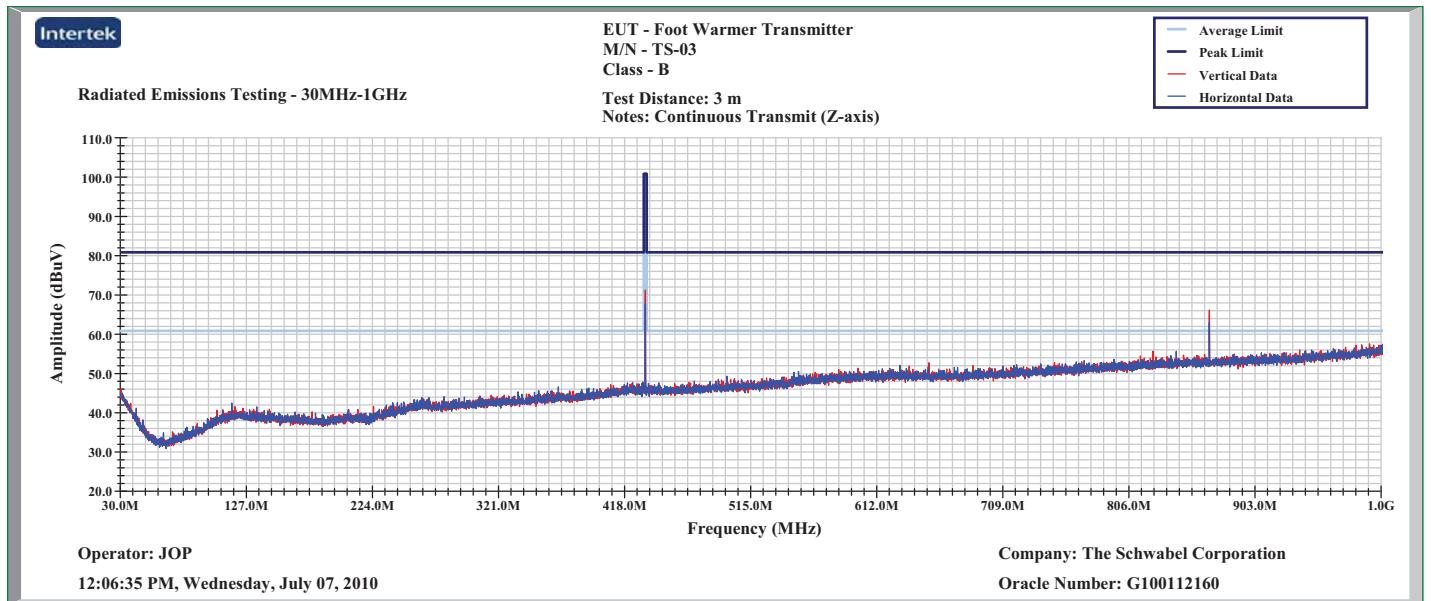
### Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, BiLog, 20-2000MHz	Chase	CBL6112B	211386	10/02/2009	10/02/2010
Antenna, Horn, <18 GHz	EMCO	3115	213061	05/07/2010	05/07/2011
Cable MP3, 18 GHz, N, 10m	Megaphase	G919-NKNK-394	MP3	05/04/2010	05/04/2011
Cable, 7 meters, 1-18GHz	Storm Products Co.	PR90-241-7MTR	ST-2	08/18/2009	08/18/2010
Cable, 7 meters, 1-18GHz	Storm Products Co.	PR90-195-7MTR	ST-3	08/18/2009	08/18/2010
Cable, N-N 3 meters, 18GHz	Megaphase	TM18 NKNK 118	E203	05/04/2010	05/04/2011
Cable, N-N, 3 meters, 18GHz	Megaphase	TM18-NKNK-118	E204	05/04/2010	05/04/2011
EMI Receiver	Hewlett Packard	8546A	211505	02/02/2010	02/02/2011
EMI Receiver, Preselector section	Hewlett Packard	85460A	015762	02/02/2010	02/02/2011
Excel spreadsheet for radiated emissions	Software	Excel - RE Worksh	SW004	12/09/2009	12/09/2010
Filter, 1 GHz High Pass	Filtek	HP12/1000-5AB	213156a	04/21/2010	04/21/2011
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	04/21/2010	04/21/2011
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/19/2009	10/19/2010
Tile - software profile for radiated and conducted emissions testing.	Software	Tile - Emissions	SW006	12/09/2009	12/09/2010

**Results: The sample tested was found to Comply.**

## 8.0 Radiated Emissions (FCC 15C - 15.231(b))

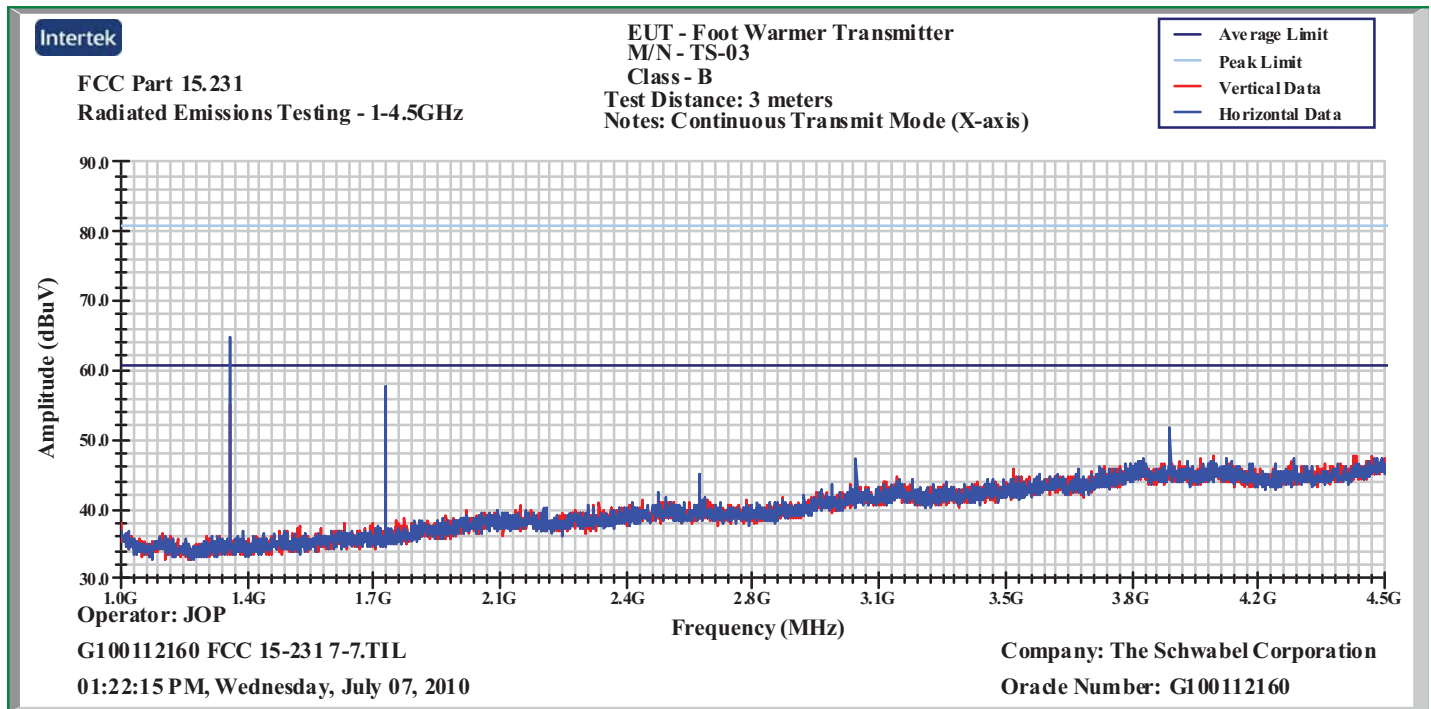
Plot:



Peak Plot - 30MHz-1GHz

## 8.0 Radiated Emissions (FCC 15C - 15.231(b))

Plot:

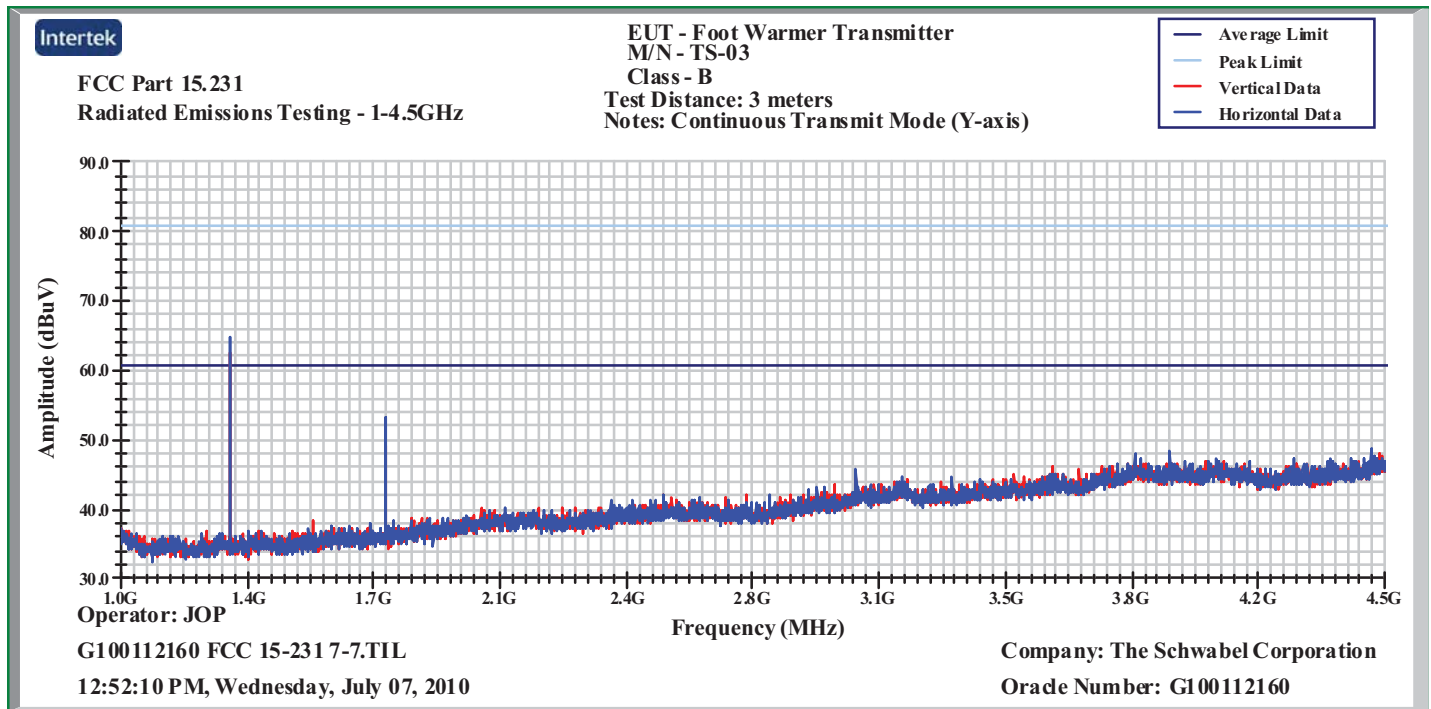


Peak Plot - 1-4.5GHz (X-axis)



## 8.0 Radiated Emissions (FCC 15C - 15.231(b))

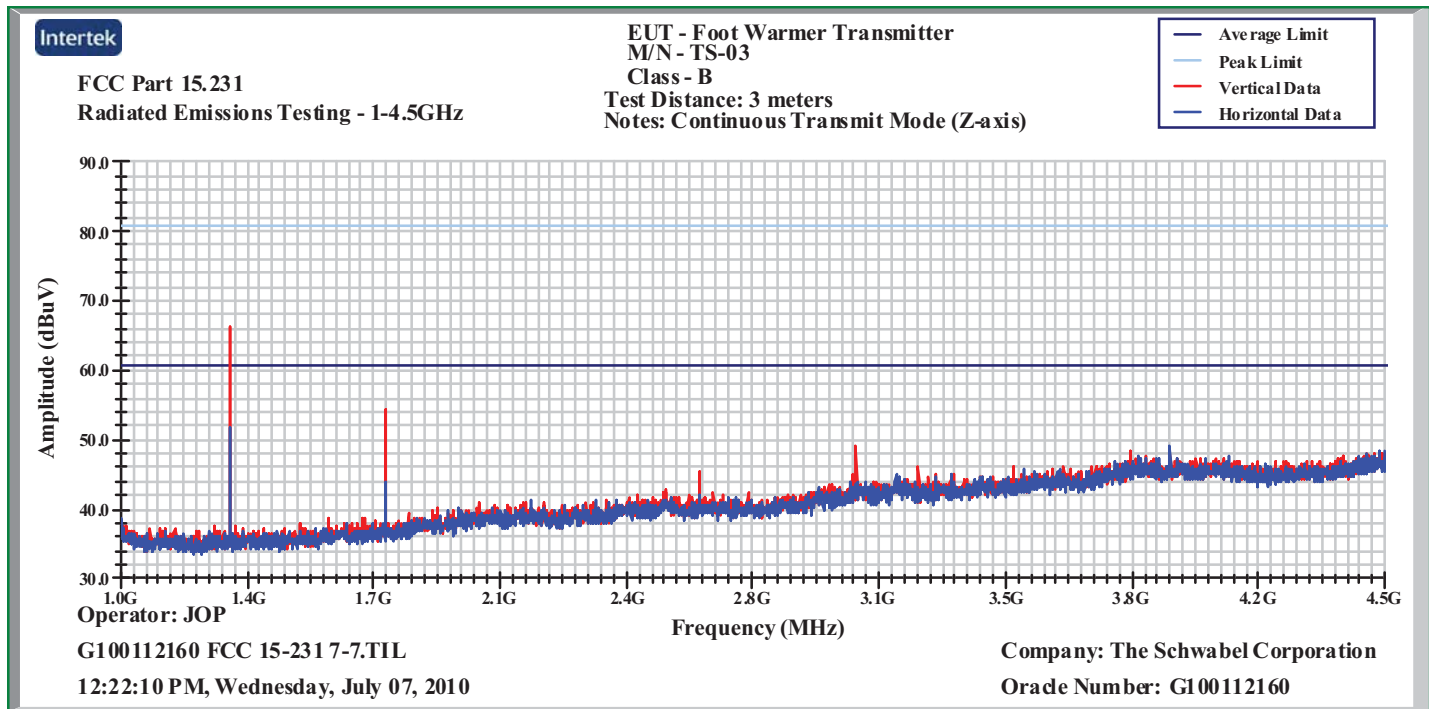
Plot:



Peak Plot - 1-4.5GHz (Y-axis)

## 8.0 Radiated Emissions (FCC 15C - 15.231(b))

Plot:



Peak Plot - 1-4.5GHz (Z-axis)

## 8.0 Radiated Emissions (FCC 15C - 15.231(b))

## Data:

Date: 7/7/2010

Frequency Range (MHz): 30-1000

Test Distance (m): 3

Input power: 3V Battery

Limit: 15.231

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Duty-Cycle Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Detectors / Bandwidths Det/RBW/VBW
Y-Axis									
h	433.965	51.1	16.9	3.5	0.0	71.4	100.8	-29.4	Pk/120k/300k
v	433.965	52.3	17.2	3.5	0.0	72.9	100.8	-27.9	Pk/120k/300k
h	433.965	51.1	16.9	3.5	12.6	58.8	80.8	-22.0	Pk/120k/300k
v	433.965	52.3	17.2	3.5	12.6	60.3	80.8	-20.5	Pk/120k/300k
h	867.930	45.1	20.3	5.0	0.0	70.4	80.8	-10.4	Pk/120k/300k
v	867.930	37.2	21.1	5.0	0.0	63.3	80.8	-17.5	Pk/120k/300k
h	867.930	45.1	20.3	5.0	12.6	57.8	60.8	-3.0	Pk/120k/300k
v	867.930	37.2	21.1	5.0	12.6	50.7	60.8	-10.1	Pk/120k/300k
X-Axis									
h	433.965	54.4	16.9	3.5	0.0	74.7	100.8	-26.1	Pk/120k/300k
v	433.965	45.1	17.2	3.5	0.0	65.7	100.8	-35.1	Pk/120k/300k
h	433.965	54.4	16.9	3.5	12.6	62.1	80.8	-18.7	Pk/120k/300k
v	433.965	45.1	17.2	3.5	12.6	53.1	80.8	-27.7	Pk/120k/300k
h	867.930	44.8	20.3	5.0	0.0	70.1	80.8	-10.7	Pk/120k/300k
v	867.930	33.9	21.1	5.0	0.0	60.0	80.8	-20.8	Pk/120k/300k
h	867.930	44.8	20.3	5.0	12.6	57.5	60.8	-3.3	Pk/120k/300k
v	867.930	33.9	21.1	5.0	12.6	47.4	60.8	-13.4	Pk/120k/300k
Z-Axis									
h	433.965	48.2	16.9	3.5	0.0	68.5	100.8	-32.3	Pk/120k/300k
v	433.965	51.7	17.2	3.5	0.0	72.3	100.8	-28.5	Pk/120k/300k
h	433.965	48.2	16.9	3.5	12.6	55.9	80.8	-24.9	Pk/120k/300k
v	433.965	51.7	17.2	3.5	12.6	59.7	80.8	-21.1	Pk/120k/300k
h	867.930	36.7	20.3	5.0	0.0	62.0	80.8	-18.8	Pk/120k/300k
v	867.930	41.0	21.1	5.0	0.0	67.1	80.8	-13.7	Pk/120k/300k
h	867.930	36.7	20.3	5.0	12.6	49.4	60.8	-11.4	Pk/120k/300k
v	867.930	41.0	21.1	5.0	12.6	54.5	60.8	-6.3	Pk/120k/300k
Calculations		G=C+D+E-F		I=G-H					

Tabular Data - 30MHz-1GHz

## 8.0 Radiated Emissions (FCC 15C - 15.231(b))

## Data:

Date: 7/7/2010

Frequency Range (MHz): 1000-4500

Test Distance (m): 3

Input power: 3V Battery

Limit: 15.231

A	B	C	D	E	F	G	H	I	J	K
Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Duty Cycle Correction dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Detectors / Bandwidths Det/RBW/VBW
Z-Axis										
h	1301.880	54.6	25.7	6.8	37.3	0.0	49.7	74.0	-24.3	Pk/1M/3M
v	1301.880	69.6	25.6	6.8	37.3	0.0	64.7	74.0	-9.3	Pk/1M/3M
h	1301.880	54.6	25.7	6.8	37.3	12.6	37.1	54.0	-16.9	Pk/1M/3M
v	1301.880	69.6	25.6	6.8	37.3	12.6	52.1	54.0	-1.9	Pk/1M/3M
v	1735.850	59.7	26.2	7.7	37.3	0.0	56.4	80.8	-24.4	Pk/1M/3M
v	1735.850	59.7	26.2	7.7	37.3	0.0	56.4	60.8	-4.4	Pk/1M/3M
v	3037.675	48.3	30.3	9.8	37.4	12.6	38.4	80.8	-42.4	Pk/1M/3M
v	3037.675	48.3	30.3	9.8	37.4	12.6	38.4	60.8	-22.4	Pk/1M/3M
Y-Axis										
h	1301.880	69.7	25.7	6.8	37.3	0.0	64.8	74.0	-9.2	Pk/1M/3M
v	1301.880	66.5	25.6	6.8	37.3	0.0	61.6	74.0	-12.4	Pk/1M/3M
h	1301.880	69.7	25.7	6.8	37.3	12.6	52.2	54.0	-1.8	Pk/1M/3M
v	1301.880	66.5	25.6	6.8	37.3	12.6	49.0	54.0	-5.0	Pk/1M/3M
h	1735.850	58.4	26.3	7.7	37.3	0.0	55.1	80.8	-25.7	Pk/1M/3M
v	1735.850	54.3	26.2	7.7	37.3	0.0	51.0	80.8	-29.8	Pk/1M/3M
h	1735.850	58.4	26.3	7.7	37.3	12.6	42.5	60.8	-18.3	Pk/1M/3M
v	1735.850	54.3	26.2	7.7	37.3	12.6	38.4	60.8	-22.4	Pk/1M/3M
X-Axis										
h	1301.880	68.6	25.7	6.8	37.3	0.0	63.7	74.0	-10.3	Pk/1M/3M
v	1301.880	64.5	25.6	6.8	37.3	0.0	59.6	74.0	-14.4	Pk/1M/3M
h	1301.880	68.6	25.7	6.8	37.3	12.6	51.1	54.0	-2.9	Pk/1M/3M
v	1301.880	64.5	25.6	6.8	37.3	12.6	47.0	54.0	-7.0	Pk/1M/3M
h	1735.850	62.7	26.3	7.7	37.3	0.0	59.4	80.8	-21.4	Pk/1M/3M
v	1735.850	48.3	26.2	7.7	37.3	0.0	45.0	80.8	-35.8	Pk/1M/3M
h	1735.850	62.7	26.3	7.7	37.3	12.6	46.8	60.8	-14.0	Pk/1M/3M
v	1735.850	48.3	26.2	7.7	37.3	12.6	32.4	60.8	-28.4	Pk/1M/3M
h	3905.669	48.8	32.5	11.2	37.5	0.0	55.0	80.8	-25.8	Pk/1M/3M
h	3905.669	48.8	32.5	11.2	37.5	12.6	42.4	60.8	-18.4	Pk/1M/3M
Calculations		H=C+D+E-F-G			J=H-I					

Tabular Data - 1GHz-4.5GHz

## 9.0 Bandwidth Requirements (FCC 15C - 15.231(c))

### Method:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

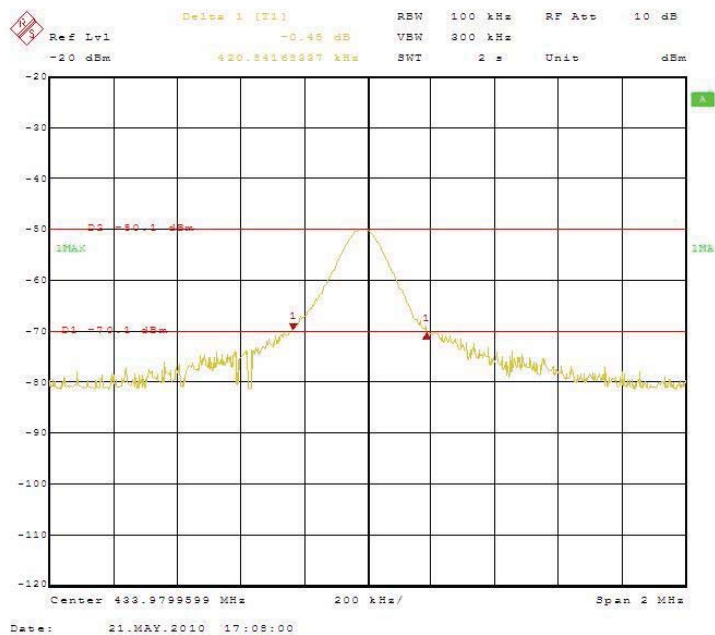
- Center Frequency is set to the fundamental of transmitter.
- Resolution Bandwidth is set to approximately 1% of the emission bandwidth.
- Video Bandwidth is set greater than or equal to the Resolution Bandwidth.

### Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	10/19/2009	10/19/2010

**Results: The sample tested was found to Comply.**

### Plot:



Bandwidth Plot

**9.0 Bandwidth Requirements (FCC 15C - 15.231(c))****Data:**

Fundamental Frequency MHz	Measured Bandwidth MHz	Bandwidth Limit MHz
433.96	0.4208	1.0849

Instrument Parameters	Suggested Instrument Settings	Actual Instrument Settings
RBW (kHz):	11	100k
VBW (kHz):	33	300k
Span (MHz):	1.085	2.000
Sweep time (s):	>1	2