

EMISSIONS TEST REPORT

Report Number: 3155341BOX-001b

Project Number: 3155341

Testing performed on the

Watch

Model: M843

To


FCC Part 15 Subpart C Section 15.249

For


Timex Corporation

Test Performed by:
Intertek – ETL SEMKO
70 Codman Hill Road
Boxborough, MA 01719

Test Authorized by:
Timex Corporation
555 Christian Road
P.O. Box 310
Middlebury, CT 06762

Prepared by: 
Kouma Sinn

Date: 08/18/08

Reviewed by: 
Jeff Goulet

Date: 08/19/08

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1.0 Job Description

1.1 Client Information

This EUT has been tested at the request of:

Company: Timex Corporation
555 Christian Road
P.O. Box 310
Middlebury, CT 06762
Contact: Mr. Ron DeRosa
Telephone: 203-346-4333
Fax: 203-346-7107
Email: RDeRosa@timex.com

1.2 Equipment Under Test

Equipment Type: Watch
Model Number(s): M843
Serial number(s): May22,08-073
Manufacturer: Timex Corporation
EUT receive date: July 8, 2008
EUT received condition: Production unit was received with no visible damage.
Test start date: July 8, 2008
Test end date: July 15, 2008

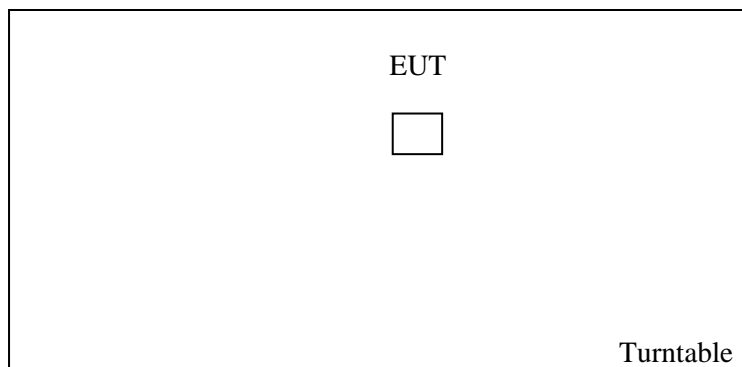
1.3 Test Plan Reference: FCC Part 15 Subpart C Section 15.249

1.4 Test Configuration:

1.4.1 EUT Voltage Range:

3Volts Battery

1.4.2 Block Diagram:



1.4.3 Cables:

None

1.4.4 Support Equipment:

None

1.5 Mode(s) of Operation:

The EUT was programmed to transmit continuously.

1.5a EUT Cycle Time:

Continuous

2.0 Test Summary

TEST STANDARD	RESULTS	
FCC Part 15 Subpart C Section 15.249		
SUB-TEST	TEST PARAMETER	COMMENT
15.249(a) – Fundamental Field Strength	2400–2483.5 MHz: The field strength of emission within this band shall not exceed 50 (millivolts/meter) or 94 (dBuV/m) at a distance of 3 meters	Pass
15.249(a) – Harmonics Field Strength	The field strength of harmonics shall not exceed 500 (microvolts/meter) or 54 (dBuV/m) at a distance of 3 meters	Pass
15.249(d) – Spurious Field Strength	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation.	Pass
15.207 – AC Line-Conducted Emissions	Not Applicable – Battery power	
20 dB Bandwidth	No limit	

REVISION SUMMARY – The following changes have been made to this Report:

<u>Date</u>	<u>Project</u> <u>No.</u>	<u>Project</u> <u>Handler</u>	<u>Page(s)</u>	<u>Item</u>	<u>Description of Change</u>
08/18/08	3155341	Kouma Sinn	10	Average Factor	Added the average factor

3.0 Sample Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$\begin{aligned} RA &= 52.0 \text{ dB}\mu\text{V} \\ AF &= 7.4 \text{ dB/m} \\ CF &= 1.6 \text{ dB} \\ AG &= 29.0 \text{ dB} \\ FS &= 32 \text{ dB}\mu\text{V/m} \end{aligned}$$

$$\text{Level in } \mu\text{V/m} = [10(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

The following is how net line-conducted readings were determined:

$$NF = RF + LF + CF + AF$$

Where

- NF = Net Reading in dB μ V
- RF = Reading from receiver in dB μ V
- LF = LISN Correction Factor in dB
- CF = Cable Correction Factor in dB
- AF = Attenuator Loss Factor in dB

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where UF = Net Reading in } \mu\text{V}$$

Example:

$$\begin{aligned} NF &= RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V} \\ UF &= 10^{(49.1 \text{ dB}\mu\text{V} / 20)} = 254 \mu\text{V/m} \end{aligned}$$

3.1 Measurement Uncertainty

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes.

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be:

± 3.5 dB at 10m, ± 3.8 dB at 3m

The expanded uncertainty ($k = 2$) for mains conducted emissions from 150 kHz to 30 MHz has been determined to be:

± 2.6 dB

The expanded uncertainty ($k = 2$) for telecom port conducted emissions from 150 kHz to 30 MHz has been determined to be:

± 3.2 for ISN and voltage probe measurements

± 3.1 for current probe measurements

3.2 Site Description

Test Site(s): 2

Our OATS are 3m and 10m sheltered emissions measurement ranges located in a light commercial environment in Boxborough, Massachusetts. They meet the technical requirements of ANSI C63.4-2003 and CISPR 22:1993/EN 55022:1994 for radiated and conducted emission measurements. The shelter structure is entirely fiberglass and plastic, with outside dimensions of 33 ft x 57 ft. The structure resembles a quonset hut with a center ceiling height of 16.5 ft.

The testing floor is covered by a galvanized sheet metal groundplane that is earth-grounded via copper rods around the perimeter of the site. The joints between individual metal sheets are bridged with a 2 inch wide metal strips to provide low RF impedance contact throughout. The sheets are screwed in place with stainless steel, round-head screws every three inches. Site illumination and HVAC are provided from beneath the ground reference plane through flush entry ports, the port covers are electrically bonded to the ground plane.

A flush metal turntable with 12 ft. diameter and 5000 lb. load capacity (12,000 lb. in Site 3) is provided for floor-standing equipment. A wooden table 80 cm high is used for table-top equipment. The turntable is electrically connected to the ground plane with three copper straps. The straps are connected to the turntable at the center of it with ground braid. The copper strap is directly connected to the groundplane at the edges of the turntable. The turntable is located on the south end of the structure and the antennas are mounted 3 and 10 meters away to the north. The antenna mast is a non-conductive with remote control of antenna height and polarization. The antenna height is adjustable from 1 to 4 meters.

All final radiated emission measurements are performed with the testing personnel and measurement equipment located below the ground reference plane. The site has a full basement underneath the turntable where support equipment may be remotely located. Operation of the antenna, turntable and equipment under test is controlled by remote controls that manipulate the antenna height and polarization and with a turntable control. Test personnel are located below the ellipse when measurements are performed, however the site maintains the ability of having personnel manipulate cables while monitoring test equipment. Ambient radiated emissions are 6 dB or more below the relevant FCC emission limits.

AC mains power is brought to the equipment under test through a power line filter, to remove ambient conducted noise. 50 Hz (240 VAC single phase), 60 Hz power (120 VAC single phase, 208 VAC three phase), and 60 Hz (480 VAC three phase) are available. Conducted emission measurements are performed with a Line Impedance Stabilization Network (LISN) or Artificial Mains Network (AMN) bonded to the ground reference plane. A removable vertical groundplane (2 meter X 2 meter area) is used for line-conducted measurements for table top equipment. The vertical groundplane is electrically connected to the reference groundplane.

Test Results: Pass

Test Standard: FCC Part 15 Subpart C Section 15.249

Test: Fundamental Field Strength

Performance Criterion: Not Applicable

Test Environment:

Environmental Conditions During Testing:	Ambient (°C):	23	Humidity (%):	56	Pressure (hPa):	1009
Pretest Verification Performed	Yes		Equipment under Test:	M843		
Test Engineer(s):	Kouma Sinn		EUT Serial Number:	MAY22,08-073		

Maximum Test Disturbance Parameters: Emissions below 15.249(a)

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	HORN ANTENNA	EMCO	3115	9610-4980	03/03/2009
2	40 GHz Cable	Megaphase	TM40-K1K1-197	7030801 002	06/05/2009
3	4 Line Digital Barometer *	Mannix	0ABA116	SAF291	01/30/2009
4	Spectrum Analyzer	Agilent	E7405A	US40240205	08/09/2008

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	3/07/07 Revision

Test Details:

Test Point	Standard Limit (as published)	Compliance Level	Pass/Fail	Comment
Around the EUT	Specified limits	Below specified limits	Pass	None

Test Results:

Fundamental Field Strength

Company: Timex Corp
 Model #: M843
 Serial #: MAY22,08-073
 Engineers: Kouma Sinn
 Project #: 3155341
 Standard: FCC Part 15 Subpart C 15.249
 Receiver: Agilent E7405A (AGL001)
 PreAmp: PRE8 11-09-08.txt
 Antenna & Cables: HF Bands: N, LF, HF, SHF
 Antenna: HORN3 V3m 3-03-09.txt HORN3 H3m 3-03-09.txt
 Cable(s): MEG002 06-05-09.txt None
 Barometer: SAF291
 Location: Site 2
 Date(s): 07/15/08
 Temp/Humidity/Pressure: 23C 56% 1009mbar
 Limit Distance (m): 3
 Test Distance (m): 3
 PreAmp Used? (Y or N): N Voltage/Frequency: Fresh Battery Frequency Range: 2474MHz
 Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth
Fundamental Frequency 2.457GHz. No preamp, filter. MEG002 only. Fresh battery. EUT wired to Tx continuously											
Maxh PK	V	2474.000	51.6	28.5	2.9	0.0	0.0	83.1	114.0	-30.9	1/3MHz
AVG	V	2474.000	31.6	28.5	2.9	0.0	0.0	63.1	94.0	-30.9	1/3MHz
Maxh PK	H	2474.000	56.7	28.7	2.9	0.0	0.0	88.3	114.0	-25.7	1/3MHz
AVG	H	2474.000	36.7	28.7	2.9	0.0	0.0	68.3	94.0	-25.7	1/3MHz

FCC IC

Notes: A maximum average factor of 20 dB was applied to Maxh PK readings to get AVG readings.

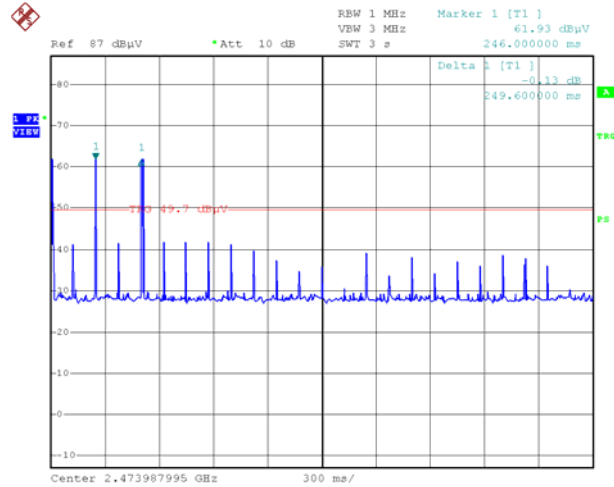
Average Factor Calculation:

Average Factor = $20 \cdot \log(3 \cdot 240 \mu\text{S} / 100 \text{ms})$

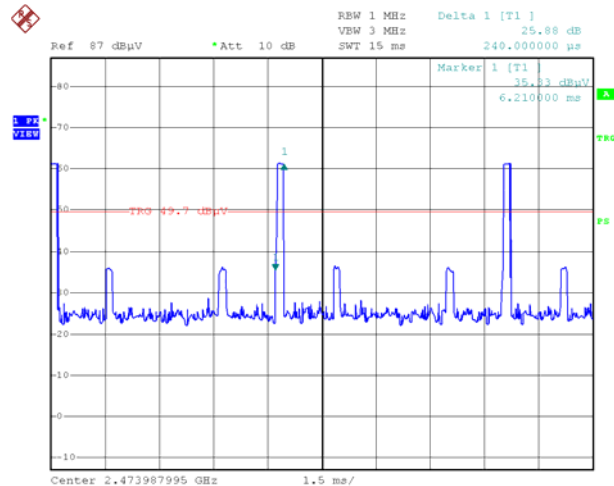
Average Factor = $20 \cdot \log(3 \cdot 0.240 / 100)$

Average Factor = -42.9dB

Maximum average factor used = -20dB



Date: 11.AUG.2008 17:18:46



Date: 11.AUG.2008 17:25:52

Test Results: Pass

Test Standard: FCC Part 15 Subpart C Section 15.249

Test: Harmonics/Spurious Field Strength

Performance Criterion: Not Applicable

Test Environment:

Environmental Conditions During Testing:	Ambient (°C):	22 23	Humidity (%):	59 56	Pressure (hPa):	1001 1009
Pretest Verification Performed	Yes		Equipment under Test:		M843	
Test Engineer(s):	Vathana Ven and Kouma Sinn		EUT Serial Number:		MAY22,08-073	

Maximum Test Disturbance Parameters: Emissions below 15.249(a) and 15.249(d)

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	12/26/2008
2	HORN ANTENNA	EMCO	3115	9610-4980	03/03/2009
3	40 GHz Cable	Megaphase	TM40-K1K1-197	7030801 002	06/05/2009
4	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL029	12/06/2008
5	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	12/06/2008
6	4 Line Digital Barometer *	Mannix	0ABA116	SAF291	01/30/2009
7	PREAMPLIFIER 1- 40 GHz	MITEQ	NSP4000-NF	507145	11/09/2008
8	Spectrum Analyzer	Agilent	E7405A	US40240205	08/09/2008
9	3GHz High Pass Filter	Reactel, Inc	7HSX-3G/18G-S11	06-1	09/18/2008
10	ANTENNA	EMCO	3142	9711-1223	02/22/2009
11	3 Meter In floor cable for site 2	ITS	RG214B/U	S2 3M FLR	09/17/2008
12	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	01/25/2009

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	3/07/07 Revision

Test Details:

Test Point	Standard Limit (as published)	Compliance Level	Pass/Fail	Comment
Around the EUT	Specified limits	Below specified limits	Pass	None

Test Results:

Radiated Emissions From 30-1000MHz

Company: Timex Corp
 Model #: M843
 Serial #: MAY22,08-073
 Engineers: Vathana Ven
 Project #: 3155341
 Standard: FCC Part 15 Subpart C 15.249
 Receiver: R&S ESCI (ROS002)
 PreAmp: PRE9 03-27-09.txt
 Antenna & Cables: N Bands: N, LF, HF, SHF
 Antenna: LOG2 2-22-09 V3m.txt LOG2 2-22-09 H3m.txt
 Cable(s): S2 3M FLR 9-17-08.txt NONE.
 Barometer: SAF291
 Location: Site 2
 Date(s): 07/08/08
 Temp/Humidity/Pressure: 22 deg C 59% 1001 mB
 Limit Distance (m): 3
 Test Distance (m): 3
 PreAmp Used? (Y or N): N Voltage/Frequency: Fresh 3V battery Frequency Range: 30-1000 MHz
 Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
No emissions were detected. Readings below are noise floor readings													
QP	V	40.000	0.5	12.9	0.7	0.0	0.0	14.1	40.0	-25.9	120/300 kHz		
QP	V	150.000	0.8	11.6	1.5	0.0	0.0	13.9	43.5	-29.6	120/300 kHz	RB	
QP	V	250.000	3.4	14.1	2.0	0.0	0.0	19.5	46.0	-26.5	120/300 kHz	RB	RB
QP	V	350.000	-3.3	16.8	2.5	0.0	0.0	16.0	46.0	-30.0	120/300 kHz		
QP	V	500.000	3.0	19.8	3.1	0.0	0.0	25.8	46.0	-20.2	120/300 kHz		
QP	V	700.000	-1.0	22.8	3.9	0.0	0.0	25.7	46.0	-20.3	120/300 kHz		

Test Results Continued:

Radiated Emissions From 1-24.740GHz

Company: Timex Corp
 Model #: M843
 Serial #: MAY22,08-073
 Engineers: Kouma Sinn
 Project #: 3155341
 Date(s): 07/15/08
 Standard: FCC Part 15 Subpart C 15.249
 Receiver: Agilent E7405A (AGL001)
 PreAmp: PRE8 11-09-08.txt
 Location: Site 2
 Limit Distance (m): 3
 Test Distance (m): 3
 Voltage/Frequency: Fresh Battery
 Frequency Range: 1-24.740GHz
 Antenna: EMC04 V 1m 12-26-2(EMC04 H 1m 12-26-2008.txt
 Antenna & Cables: HF Bands: N, LF, HF, SHF
 Antenna: HORN3 V3m 3-03-09.txt HORN3 H3m 3-03-09.txt
 Cable(s): MEG002 06-05-09.txt CBL029 12-06-08.txt
 Barometer: SAF291
 Temp/Humidity/Pressure: 23C 56% 1009mbar

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Used HORN3, MEG002, CBL029, PRE8, REA004 from 4-18GHz. No preamp or REA004 from 1-4GHz.													
Maxh PK	V	4948.000	43.7	33.9	6.3	22.6	0.0	61.4	74.0	-12.6	1/3MHz	RB	RB
AVG	V	4948.000	23.7	33.9	6.3	22.6	0.0	41.4	54.0	-12.6	1/3MHz	RB	RB
Maxh PK	V	7422.000	36.8	36.5	8.0	21.2	0.0	60.1	74.0	-13.9	1/3MHz	RB	RB
EMI AVG	V	7422.000	21.2	36.5	8.0	21.2	0.0	44.5	54.0	-9.5	1/3MHz	RB	RB
Maxh PK	V	9896.000	36.4	40.1	9.5	18.9	0.0	67.1	74.0	-6.9	1/3MHz		NF
EMI AVG	V	9896.000	16.7	40.1	9.5	18.9	0.0	47.4	54.0	-6.6	1/3MHz		NF
Maxh PK	V	12370.000	36.3	38.8	11.1	19.2	0.0	67.0	74.0	-7.0	1/3MHz	RB	RB
EMI AVG	V	12370.000	16.9	38.8	11.1	19.2	0.0	47.6	54.0	-6.4	1/3MHz	RB	RB
Test was performed at 1m for 14844MHz and 17318MHz													
Maxh PK	V	14844.000	35.1	43.0	12.8	21.0	9.5	60.4	74.0	-13.6	1/3MHz		NF
EMI AVG	V	14844.000	20.2	43.0	12.8	21.0	9.5	45.5	54.0	-8.5	1/3MHz		NF
Maxh PK	V	17318.000	36.0	43.6	15.8	24.0	9.5	61.9	74.0	-12.1	1/3MHz		NF
EMI AVG	V	17318.000	20.1	43.6	15.8	24.0	9.5	46.0	54.0	-8.0	1/3MHz		NF
Test was performed at 0.5m for all frequency below using CBL029, CBL030, PRE8, and EMC04													
Maxh PK	V	19792.000	34.8	45.4	9.7	24.7	15.6	49.6	74.0	-24.4	1/3MHz	RB	RB
EMI AVG	V	19792.000	19.7	45.4	9.7	24.7	15.6	34.5	54.0	-19.5	1/3MHz	RB	RB
Maxh PK	V	22266.000	36.3	45.4	9.8	21.4	15.6	54.6	74.0	-19.4	1/3MHz	RB	RB
EMI AVG	V	22266.000	20.0	45.4	9.8	21.4	15.6	38.3	54.0	-15.7	1/3MHz	RB	RB
Maxh PK	V	24740.000	36.6	46.3	10.5	21.6	15.6	56.2	74.0	-17.8	1/3MHz		NF
EMI AVG	V	24740.000	20.5	46.3	10.5	21.6	15.6	40.1	54.0	-13.9	1/3MHz		NF

Notes: A maximum average factor of 20 dB was applied to Maxh PK readings to get AVG readings.

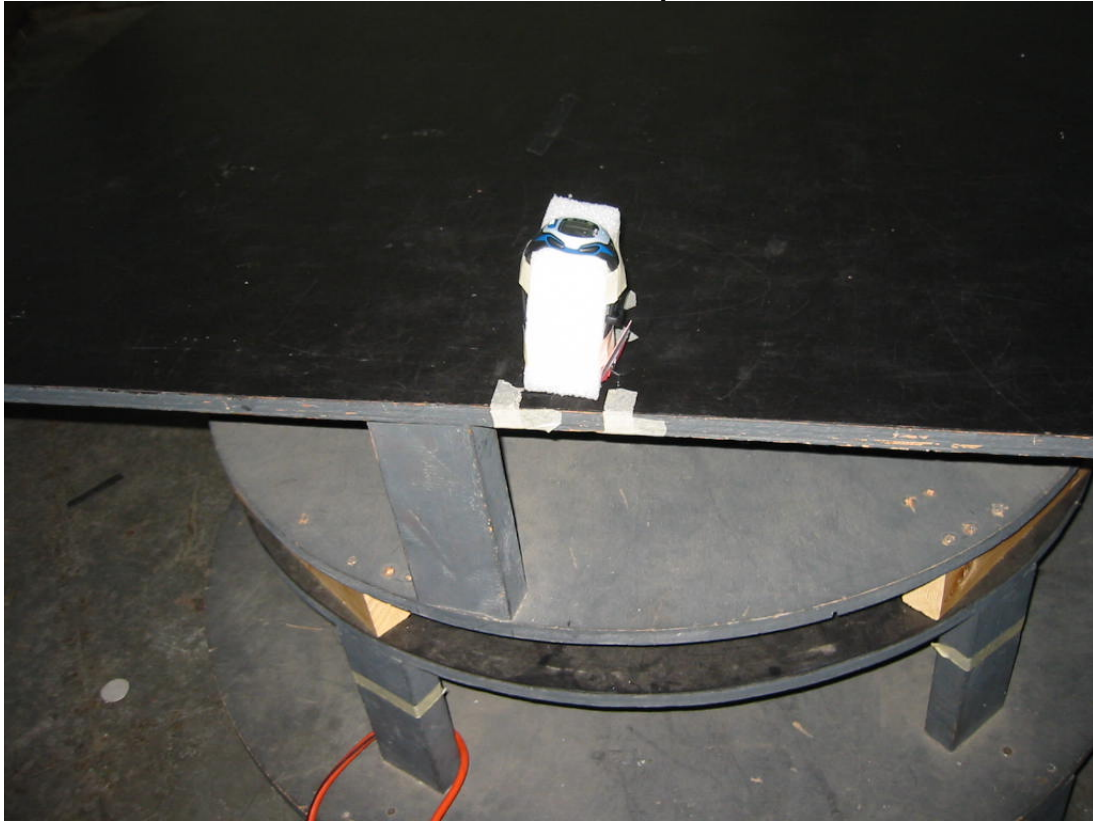
Radiated Emissions Setup Photo 1



Radiated Emissions Setup Photo 2



Radiated Emissions Setup Photo 3



Test Results: No limit

Test Standard: FCC Part 15 Subpart C Section 15.249

Test: 20 dB Bandwidth

Performance Criterion: Not Applicable

Test Environment:

Environmental Conditions During Testing:	Ambient (°C):	22	Humidity (%):	59	Pressure (hPa):	1001
Pretest Verification Performed	Yes		Equipment under Test:	M843		
Test Engineer(s):	Vathana Ven		EUT Serial Number:	MAY22,08-073		

Maximum Test Disturbance Parameters: No limit

Test Equipment Used:

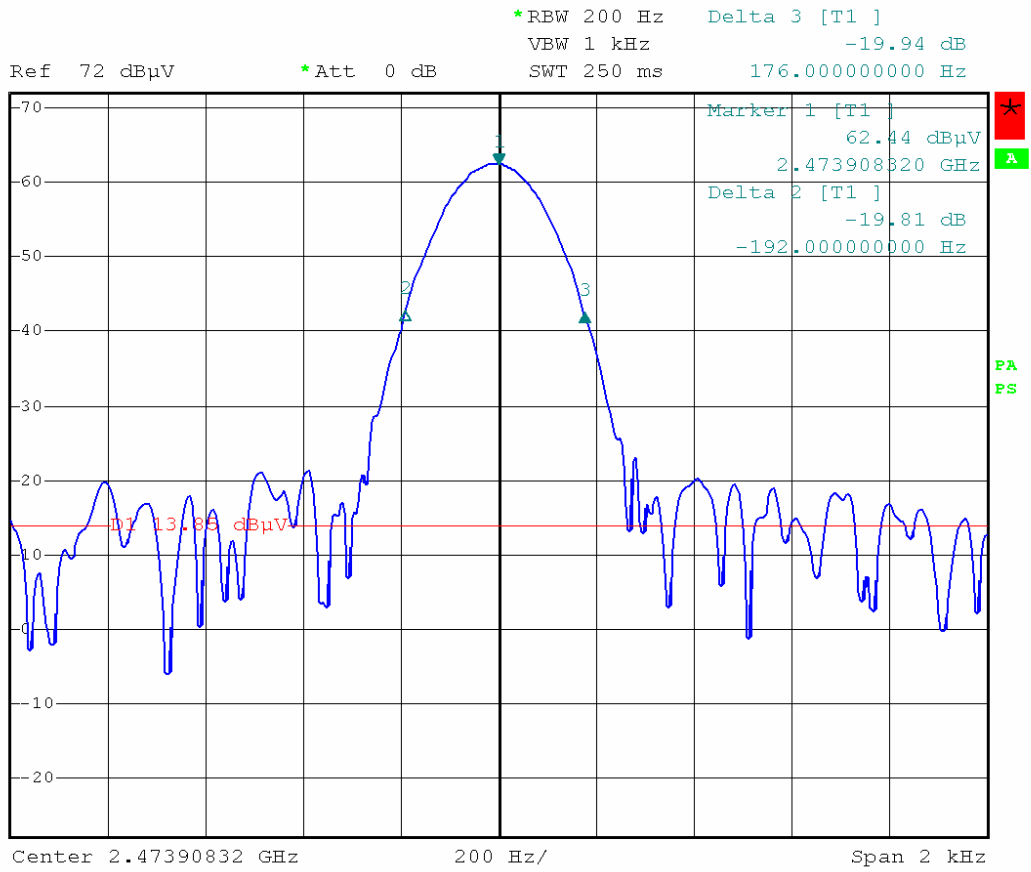
TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	HORN ANTENNA	EMCO	3115	9610-4980	03/03/2009
2	40 GHz Cable	Megaphase	TM40-K1K1-197	7030801 002	06/05/2009
3	4 Line Digital Barometer *	Mannix	0ABA116	SAF291	01/30/2009
4	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	11/26/2008

Test Details:

Test Point	Standard Limit (as published)	Compliance Level	Pass/Fail	Comment
Fundamental Frequency	No limit	No limit	No limit	None



1 PK
VIEW



Date: 8.JUL.2008 20:16:18