



849 NW STATE ROAD 45
NEWBERRY, FL 32669 USA
PH: 888.472.2424 OR 352.472.5500
FAX: 352.472.2030
EMAIL: INFO@TIMCOENGR.COM
[HTTP://WWW.TIMCOENGR.COM](http://WWW.TIMCOENGR.COM)

RADIO FREQUENCY IDENTIFICATION DEVICE
PER FCC PART 15.225
TEST REPORT

Applicant	Icon Time Systems
Address	15201 NW Greenbrier Pkwy, Suite 1 Beaverton, OR 97006 USA
FCC ID	VRW08101
Model Number	Colorado
Product Description	13.56MHz RFID
Date Sample Received	February 19, 2008
Date Tested	February 26, 2008
Tested By	Richard Block
Approved By	Mario de Aranzeta
Timco Report No.	346AUT78estReport.pdf
Test Results	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

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



Certificate # 0955-01

TABLE OF CONTENTS

ATTESTATION.....	3
REPORT SUMMARY	4
TEST ENVIRONMENT	4
TEST SETUP.....	4
DUT SPECIFICATION	5
EMC EQUIPMENT LIST.....	6
TEST PROCEDURE.....	7
RADIATION INTERFERENCE	9
FREQUENCY TOLERANCE.....	10
OCCUPIED BANDWIDTH/BAND-EDGES COMPLIANCE.....	11
POWER LINE CONDUCTED INTERFERENCE.....	14

ATTESTATION

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.



Certificate #0955-01

Authorized by: Mario de Aranzeta

Signature: On file

Function: Engineer

Date: March 14, 2008

REPORT SUMMARY

Disclaimer	The test result only related to the item tested.
Purpose of Test Report	Shows the DUT in compliance with FCC Pt 15.225 requirements for a 13.110 – 14.010 MHz transmitter.
Applicable Rule(s)Procesure(s)	FCC Pt 15.225, ANSI C63.4-2003
Related Report	346BUT8Testreport for DoC

TEST ENVIRONMENT

Test Facility	All tests were performed by Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA.
Test Condition:	Temperature: 26°C Relative humidity: 50%.

TEST SETUP

Test Exercise (e.g software description, test signal, etc.):	The DUT was placed in continuous transmit mode of operation.
Supporting Peripheral Equipment	N/A
Deviation to the standard(s)	No deviation was made
Modification to the DUT:	No modification was made.

DUT SPECIFICATION

Manufacturer	Icon Time Systems		
Description	RFID radio		
FCC ID	VRW08101		
Model Name	Colorado		
Family Model number	N/A		
DUT Accessories	N/A		
Tx Frequency	13.56 MHz		
DUT Power Source	<input checked="" type="checkbox"/> 110–120Vac/50– 60Hz The DUT uses an AC/DC Class 2 adapter Manufacturer: Mingway M/N: MWY-DA120-DC090500 Input: 110V ~ 60Hz 0.1A Output: 9V 500mA Made in China		
	<input type="checkbox"/> DC Power		
	<input type="checkbox"/> Battery Operated Exclusively		
Test Item	<input type="checkbox"/> Prototype	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Production
Type of Equipment	<input type="checkbox"/> Fixed	<input type="checkbox"/> Mobile	<input checked="" type="checkbox"/> Portable
Antenna	Integral		

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/20/07	3/19/10
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/07	12/12/09
Antenna: Biconnical	Eaton	94455-1	1096	CAL 10/11/06	10/11/08
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/07	4/29/09
Analyzer Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 4/13/07	4/13/09
Analyzer Blue Tower RF Preselector	HP	85685A	2926A00983	CAL 9/5/07	9/5/09
Analyzer Blue Tower Spectrum Analyzer	HP	8568B	2928A04729 2848A18049	CAL 4/13/07	4/13/09
LISN	Electro-Metrics	ANS-25/2	2604	CAL 10/5/06	10/5/08
LISN	Electro-Metrics	EM-7820	2682	CAL 4/28/07	4/28/09
Antenna: Log-Periodic	Eaton	96005	1243	CAL 12/14/07	12/14/09
Antenna: Passive Loop	EMC Test Systems	EMCO 6512	9706-1211	CAL 4/27/06	4/27/08

TEST PROCEDURE

(Where applicable)

Power Line Conducted Interference: The procedure used was ANSI C63.4-2003 using a 50uH LISN. The resolution bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

Radiation Interference: The test procedure used was ANSI C63.4-2003 using an Agilent 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.

Occupied Bandwidth: A small sample of the transmitter output was fed into the spectrum analyzer and the above plot was captured. The Marker Delta Method of DA 00-705 was used to show compliance at the band-edges.

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 + ACF +CL= FS

33 20 dBuV + 10.36 dB/m+1.2 = 31.56 dBuV/m @ 3m

ANSI C63.4-2003 Measurement Procedures: The DUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The DUT 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 if necessary and the highest readings were converted to average readings based on the duration of "ON" time in 100 mseconds.

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.

Frequency Stability: The test procedure used was ANSI C63.4: 2003. Temperature and voltage tests were performed to verify that the frequency tolerance of the carrier signal remains within the $\pm 0.01\%$ of the operating frequency over a temperature variation of -20°C to $+50^{\circ}\text{C}$ at normal supply voltage and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20°C .

The test was conducted as follows: The transmitter was placed in the temperature chamber at 25°C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which time four frequency readings were recorded at 15-second intervals. The worse case number was recorded. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -20°C after which the transmitter was again allowed to stabilize. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15-second intervals. This procedure was repeated in 10°C increments up to $+50^{\circ}\text{C}$.

Readings were also taken at plus and minus 15% of the battery voltage.

RADIATION INTERFERENCE

Rules Part No.: Pt 15.225, Pt 15.209

Requirements:

Fundamental Frequency (MHz)	Field Strength of Fundamental dB μ V/m @ 30 meters	Strength of Fundamental uV @ 30 meters
13.553 – 13.567	84	15,848
13.410 – 13.553 13.567 – 13.710	50.5	334
13.110 – 13.410 13.710 – 14.010	40.5	106

Fundamental Frequency (MHz)	Field Strength of Harmonics and Spurious Emissions
0.009 – 0.490	2400/F (kHz) uV/m @ 300 meters
0.490 – 1.705	24000/F (kHz) uV/m @ 30 meters
1.705 – 30.0	29.54 dBuV/m @ 30 meters or 69.54 dBuV/m @ 3 meters
30 – 88	40.00 dBuV/m @ 3 meters
88 – 216	43.50 dBuV/m @ 3 meters
216 – 960	46.00 dBuV/m @ 3 meters
Above 960	54.00 dBuV/m @ 3 meters

Test Data: The data indicates the DUT met this specific requirement.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Margin dB
13.5654`	13.56	15.2	H	0.27	34.61	50.08	29.92

* -Denotes restricted bands

Note: Emissions attenuated more than 20 dB below the limit are not reported.

FREQUENCY TOLERANCE

Rules Part No.: Pt 15.225 (e), Pt 2.1055

Requirements: The frequency tolerance shall be maintained within $\pm 0.01\%$ (100PPM) of the operating frequency.

Test Data: The data indicates the DUT passed this specific requirement.

Assigned Frequency (MHz)	13.560750 MHz	
Temperature °C	Measured Frequency MHz	PPM
-20	13.560 750	0.00
-10	13.560 775	1.84
0	13.560 775	1.84
+10	13.560 760	0.74
+20	13.560 750	0.00
+30	3.560 735	-1.11
+40	13.560 725	-1.84
+50	13.560 660	-6.64
Battery 85% End-point at 20°C	N/A	
Battery 115% End-point at 20°C	N/A	

OCCUPIED BANDWIDTH/BAND-EDGES COMPLIANCE

Rules Part No.: 15.209, 15.205, 15.215(c), and 15.205 (d)(7)

Requirements: 15.205 (d)(7): Devices operated pursuant to § 15.225 are exempt from complying with the limit of 15.209 for the restricted band 13.36-13.41 MHz band.

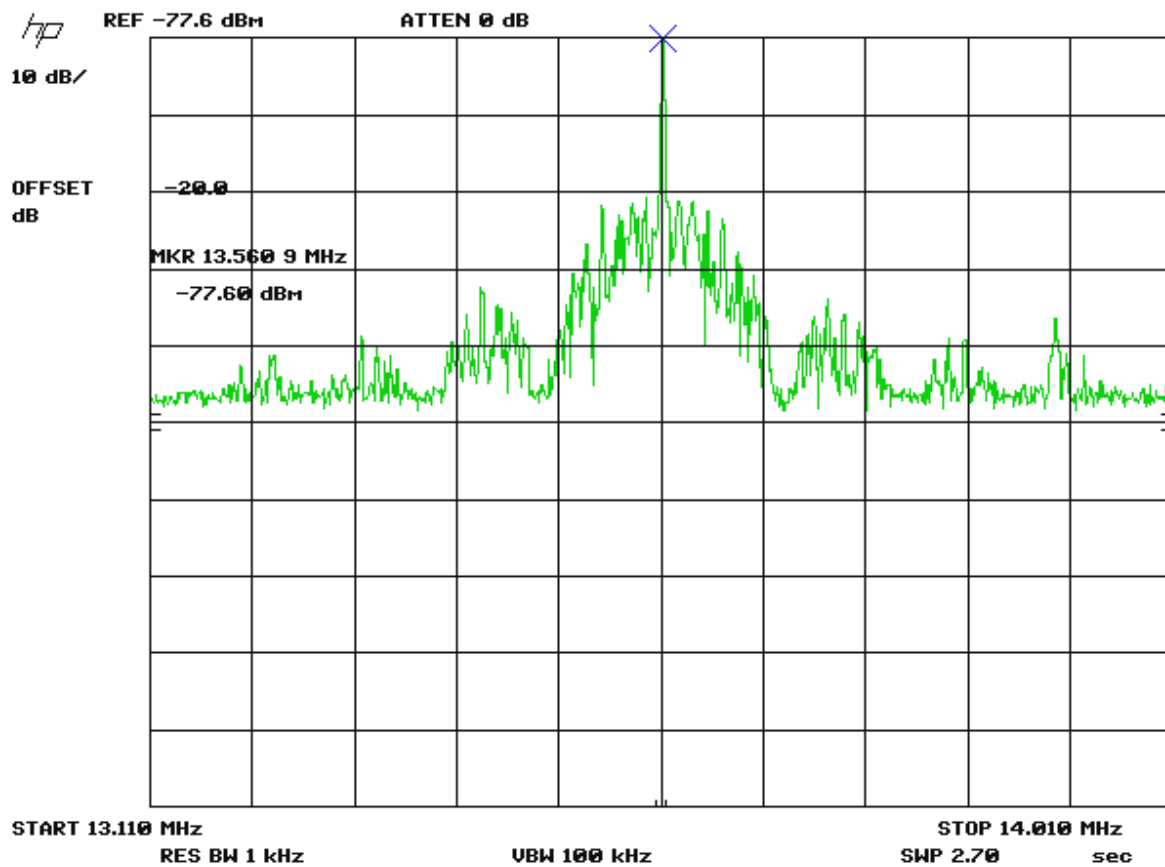
In lieu, the following field strength emissions limits apply:

- a) 13.553-13.567 MHz: 84 dBuV/m (15,848uV/m)at 30 meters.
- b) 13.410-13.553 and 13.567-13.710 MHz: 50.5dBuV/m (334 uV/m) at 30 meters.
- c) 13.110-13.410 and 13.710-14.010 MHz: 40.5dBuV/m (106 uV/m) at 30 meters.

The field strength of any emissions appearing outside of these bands shall not exceed the general radiated emission limits shown in §15.209.

The graph on the following page represents the emissions taken for the device.

Fundamental Frequency (MHz)	Field Strength Level of Fundamental (dBuV/m)	Peak or Avg (P/A)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) *	Calculated Max. Out of Band Emission Level (dBuV/m) **	Limit (dBuV/m)	Margin (dB)
13.56	50.08	P	13.2180	-41.3	8.78	60.5	51.72
13.56	50.08	P	13.2954	-39.2	10.88	60.5	49.62
13.56	50.08	P	13.4016	-33.2	16.88	60.5	43.62
13.56	50.08	P	13.5078	-22.3	27.78	70.5	42.72
13.56	50.08	P	13.5465	-20.7	29.38	70.5	41.12
13.56	50.08	P	13.5753	-21.3	28.78	70.5	41.72
13.56	50.08	P	13.6005	-22.5	27.58	70.5	42.92
13.56	50.08	P	13.7058	-33.9	16.18	70.5	54.32
13.56	50.08	P	13.8120	-39.1	10.98	60.5	49.52
13.56	50.08	P	13.9056	-36.5	13.58	60.5	46.92
* According to step 2 of Marker-Delta Method DA 00-705 (following plots included).							
** According to step 3 of Marker-Delta Method: Calculated Emission Level = Field Strength Level - Delta Marker Level							



POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Pt 15.207

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

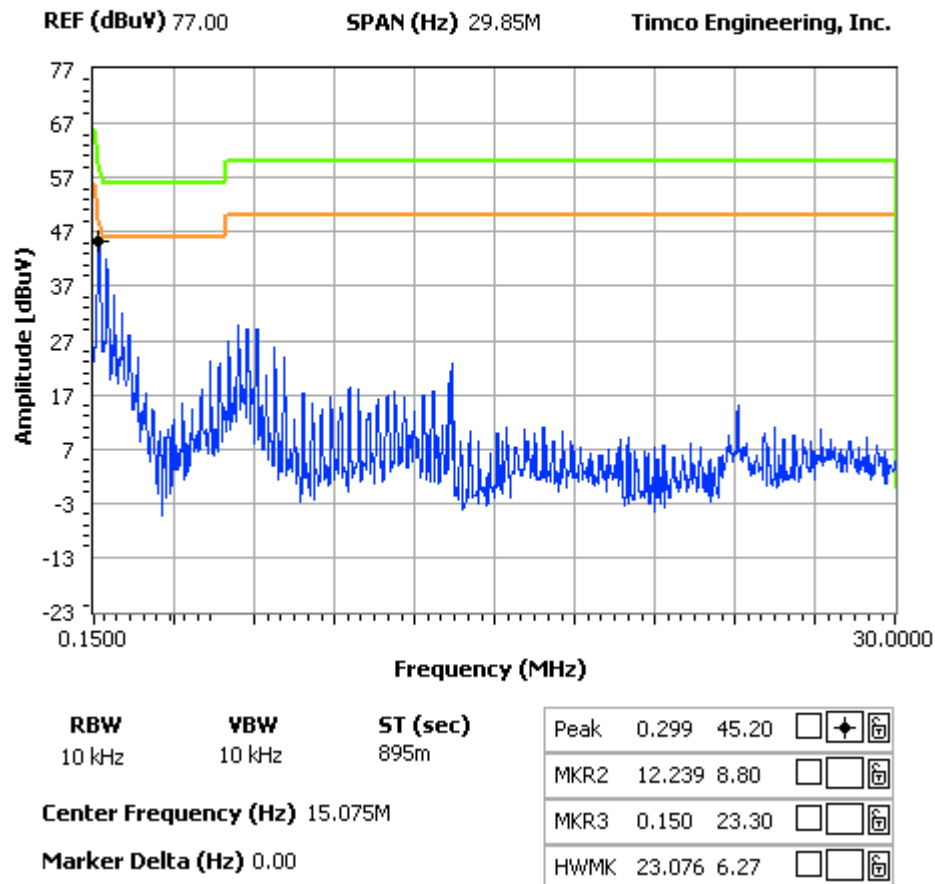
Test Data: The plots indicated that both lines were observed

Line 1

NOTES:

POWERLINE CONDUCTED -- LINE 1
ICON TIME SYSTEMS -- FCC ID: COLORADO

FCC 15.107 Mask Class B



Line 2

NOTES:

POWERLINE CONDUCTED -- LINE 2
ICON TIME SYSTEMS -- FCC ID: COLORADO

FCC 15.107 Mask Class B

