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RADIO FREQUENCY IDENTIFICATION DEVICE

PER FCC PART 15.225 & IC RSS-210

TEST REPORT

Applicant	Sealed Air Corp.
Address	Building A, 100 Rogers Bridge Road Duncan, SC 29334 USA
FCC ID	UPZ-TMU
IC Label	IC: 6865A-TMU
Model Number	TMUSB
Product Description	13.56MHz RFID
Date Sample Received	June 22, 2009
Date Tested	7/20/2009
Tested By	Joe Scoglio
Approved By	Mario de Aranzeta
Timco Report No.	1428AUT9TestReport.pdf
Test Results	☒ Pass ☐ Fail

ACCREDITED
Certificate # 0955-01

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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.

ACCREDITED

Certificate #0955-01

Authorized by: Mario de Aranzeta

Signature: On file

Function: Engineer

Date: July 22, 2009

REPORT SUMMARY

Disclaimer	The test result only related to the item tested.
Purpose of Test Report	Indicates the DUT in compliance with FCC Pt 15.225 requirements for a 13.110 – 14.010 MHz transmitter. Also indicates the DUT in compliance with IC RSS-210 requirements for a 13.110 – 14.010 MHz transmitter.
Applicable Rule(s)Procedure(s)	FCC Pt 15.225, ANSI C63.4-2003, ANSI TIA 603, IC RSS-210, IC RSS-GEN
Related Report	1428AUT9TestReport.pdf 1428CUT9TestReport. Pdf (DoC for digital interface portion)

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: 26ºC 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	Description: N/A Manufacturer: N/A M/N: N/A
Deviation to the standard(s)	No deviation was made
Modification to the DUT:	No modification was made.

DUT SPECIFICATION

Manufacturer	Sealed Air Corp.		
Description	RFID radio		
FCC ID	UPZ-TMU		
IC Label	IC: 6865A-TMU		
Model Name	TMUSB		
Family Model number	N/A		
DUT Accessories	N/A		
Tx Frequency	13.56 MHz		
DUT Power Source	☐ 110–120Vac/50– 60Hz Power Adapter 1 Manufacturer: CUI INC M/N: 3A-061WP12 Power Adapter 2 Manufacturer: CUI INC M/N: 3A-161WU09		
	☒ DC Power		
	☐ Battery Operated Exclusively		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☐ Fixed	☐ Mobile	☒ 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 1/11/09	1/10/12
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/07	12/12/09
Antenna: Biconnical	Eaton	94455-1	1096	CAL 10/11/08	10/11/10
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/09	4/29/11
Analyzer Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 4/13/09	4/13/11
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 4/13/09	4/13/11
LISN	Electro-Metrics	ANS-25/2	2604	CAL 10/5/08	10/5/10
LISN	Electro-Metrics	EM-7820	2682	CAL 4/28/09	4/28/11
Antenna: Log-Periodic	Eaton	96005	1243	CAL 12/14/07	12/14/09
Antenna: Passive Loop	Electro-Metrics	6512	9706-1211	CAL 4/27/09	4/27/12

TEST PROCEDURES

(As 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.

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 ±0.01% of the operating frequency over a temperature variation of –20ºC to +50ºC 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 ºC.

The test was conducted as follows: The transmitter was placed in the temperature chamber at 25ºC 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 -20ºC 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 10ºC increments up to +50ºC.

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

RADIATION INTERFERENCE

Rules Part No.: Pt 15.225, Pt 15.209, RSS-210

Requirements:

Fundamental Frequency (MHz)	Field Strength of Fundamental dBµV/m @ 30 meters	Strength of Fundamental µV @ 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

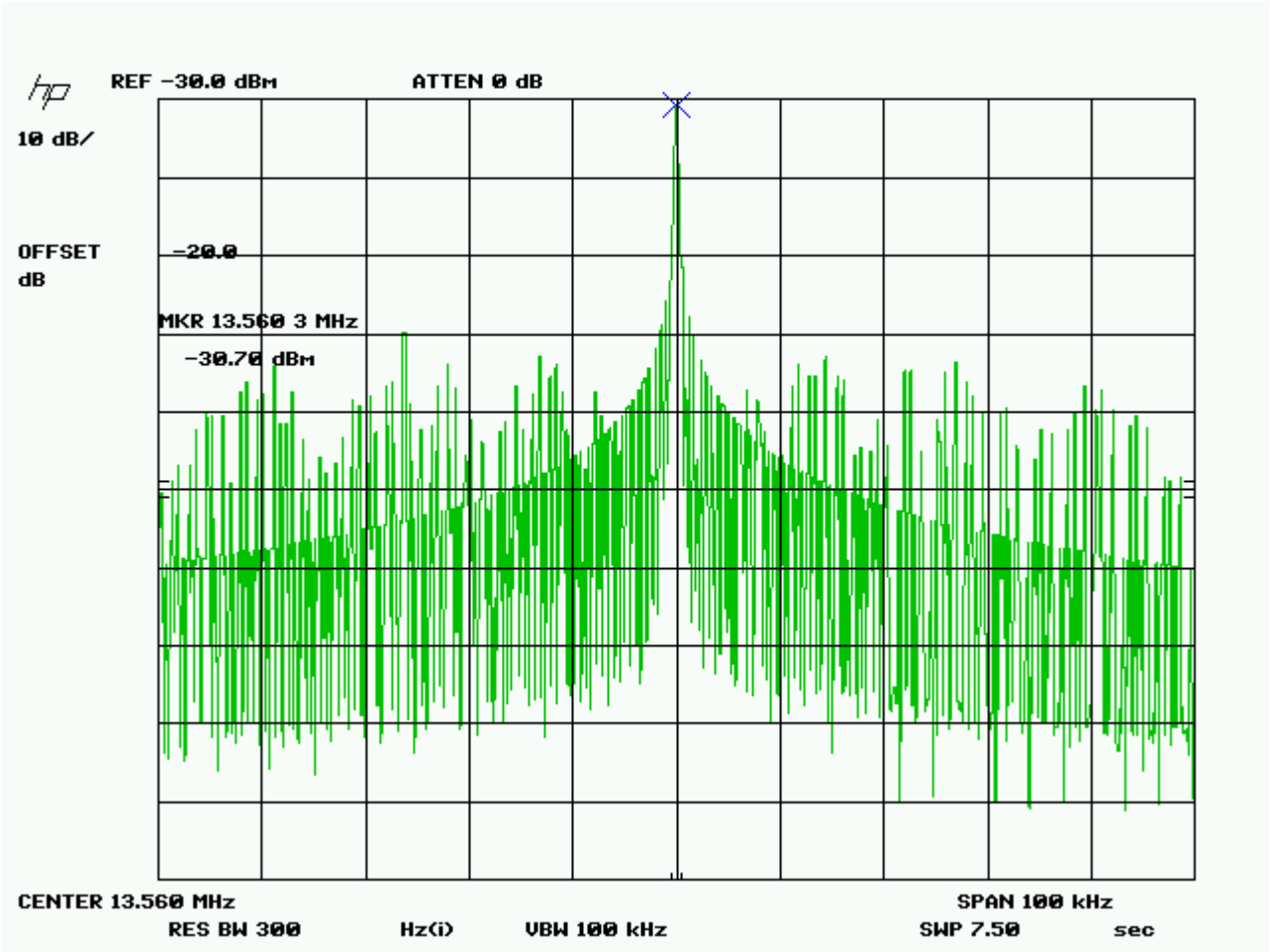
Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m	Margin dB
13.5	13.50	16.0	V	0.27	34.61	50.88	29.12
13.5	13.50	18.2	H	0.27	34.61	53.08	26.92
13.5	27.10	1.0	H	0.54	34.16	35.70	4.30
13.5	27.10	2.5	V	0.54	34.16	37.20	2.80
13.5	40.60	6.7	V	0.87	12.33	19.90	20.11

* -Denotes restricted bands

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

OCCUPIED BANDWIDTH



FREQUENCY TOLERANCE

Rules Part No.: Pt 15.225 (e), Pt 2.1055, RSS-210

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

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

Assigned Frequency (MHz)	13.560685 MHz	
Temperature °C	Measured Frequency MHz	PPM
-20	13.561179	-16.44
-10	13.561202	-14.75
0	13.561354	-3.54
+10	13.561387	-1.11
+20	13.561408	0.44
+30	13.561224	-13.13
+40	13.561103	-22.05
+50	13.561128	-20.20
Battery 85% End-point at 20°C	13.561391	-0.81
Battery 115% at 20°C	13.561402	0.0

POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Pt 15.207, RSS-210

Requirements:

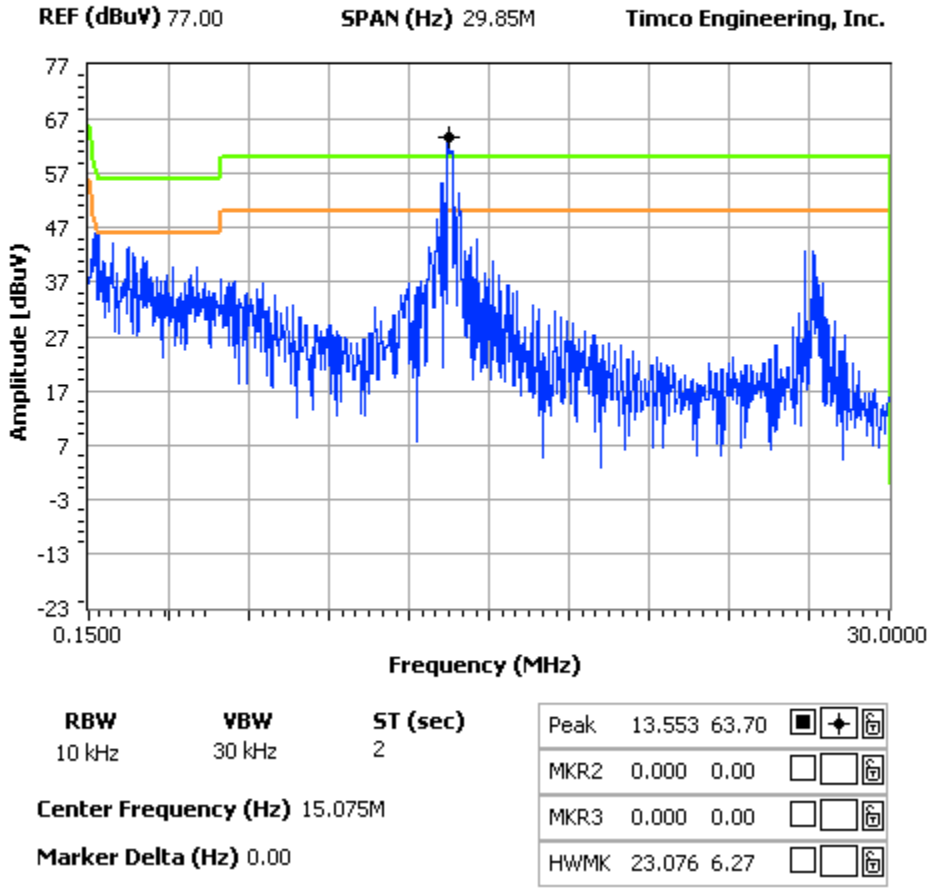
Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

Test Data: The plots indicated that both lines were observed

Line 1
With antenna connected

NOTES:
ac line conducted line 1

FCC 15.107 Mask Class B

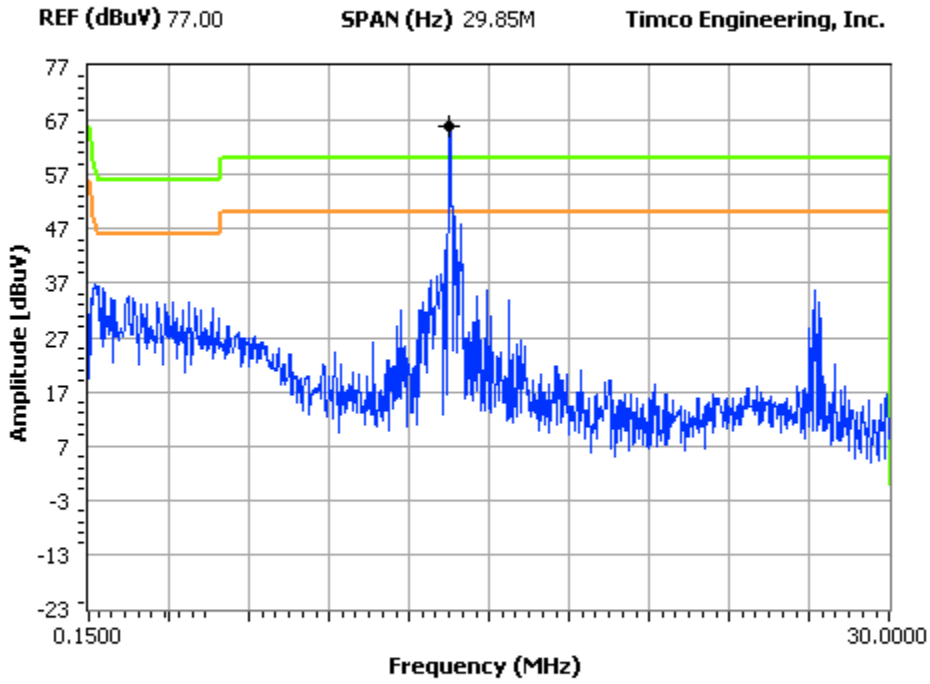


Line 2
With antenna connected

NOTES:

ac line conducted line 2

FCC 15.107 Mask Class B



RBW	VBW	ST (sec)
10 kHz	30 kHz	2

Center Frequency (Hz) 15.075M

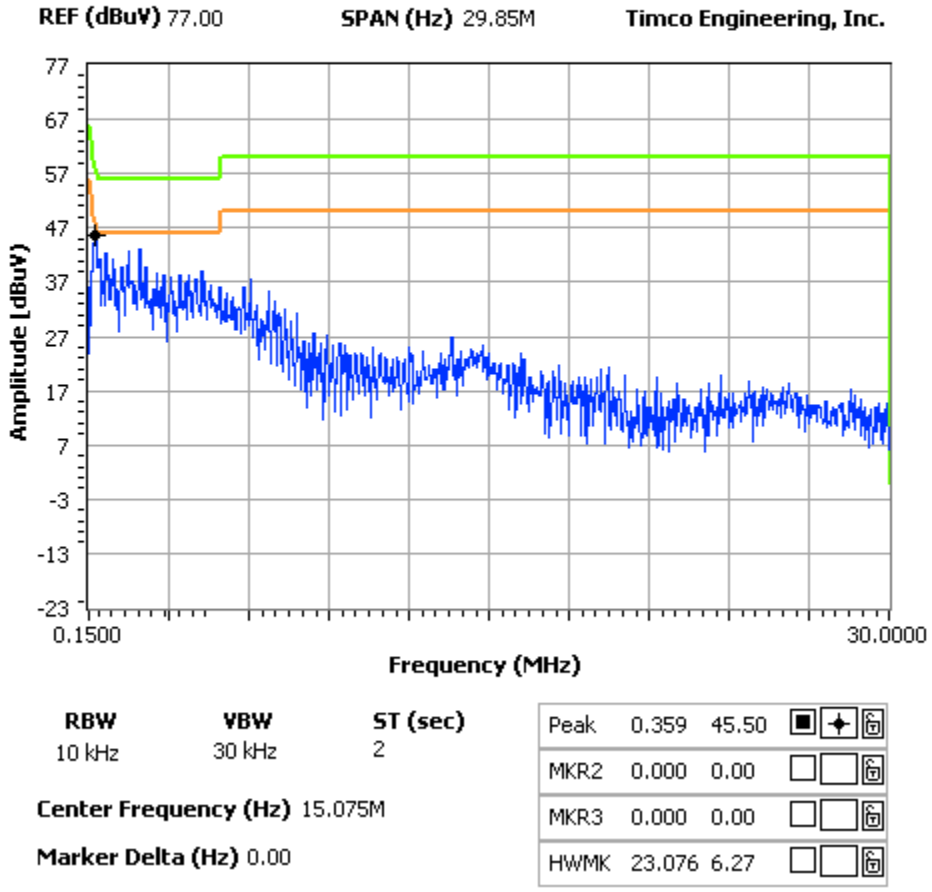
Marker Delta (Hz) 0.00

Peak	13.612	66.00
MKR2	0.000	0.00
MKR3	0.000	0.00
HWMK	23.076	6.27

Line 1
antenna removed and terminated with 50 ohm resistor

NOTES:
ac line conducted line 1
50 ohm load

FCC 15.107 Mask Class B



Line 2

antenna removed and terminated with 50 ohm resistor

NOTES:
ac line conducted line 2
50 ohm load

FCC 15.107 Mask Class B