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FCC PART 15.225

RFID TEST REPORT

Applicant	Sealed Air Corp.
Address	Building A, 100 Rogers Bridge Road Duncan, SC 29334 USA
FCC ID	UPZ-QXX
IC Label	IC: 6865A-QXX
Model Number	QC-1, QC-1a
Product Description	13.56MHz RFID
Date Sample Received	November 15, 2006
Date Tested	November 24, 2006
Tested By	Joe Scoglio
Approved By	Mario de Aranzeta
Timco Report No.	3161AUT6TestReport.pdf
Test Results	☒ Pass ☐ Fail

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

ACCREDITED
Certificate # 0955-01

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STATEMENT OF COMPLIANCE

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 and demonstrate that the equipment complies with the appropriate standards.

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: December 4, 2006

Tested by: Joe Scoglio

Signature: on file

Date: November 24, 2006

REPORT SUMMARY

Disclaimer	The test result only related to the item tested.
Purpose of Test Report	To demonstrate the DUT compliance with FCC Pt 15.225 requirements for a 13.110 – 14.010 MHz transmitter. The DUT has two versions. One uses DC power adapter; the other is battery operated exclusively. Two versions were tested and the unit with the power adapter as described in the report represents the worst case scenario.
Applicable Rule(s)	FCC Pt 15.225, ANSI C63.4 2003
Related Report	3161BUT6TestReport.PDF digital interface report 3161CUT6TestReport.PDF IC report

TEST ENVIRONMENT AND SYSTEM

Test Facility	All tests were performed by Timco Engineering Inc. which is located at 849 NW State Road 45 Newberry, FL 32669 USA. Timco Engineering accreditations are on file with regulatory agencies.
Test Condition:	The DUT was tested in the laboratory in an environment with normal temperature and humidity. The temperature was 26ºC with a relative humidity of 50%.
Test Exercise (e.g software description, test signal, etc.):	The DUT was placed in continuous transmit mode of operation.
Supporting Peripheral Equipment	Not applicable. The device is a stand-alone transmitter
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-QXX		
IC Label	IC: 6865A-QXX		
Model Name	QC-1a		
Family Model number	QC-1 (QC-1 is battery operated exclusively.)		
DUT Accessories	AC Power Adapter Made by: CUI Inc. Input: 100 – 240 V Output: 9V, 1.67A		
Tx Frequency	13.56 MHz		
DUT Power Source	☐ 110–120Vac/50– 60Hz		
	☒ DC Power		
	☒ Battery Operated Exclusively		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☐ Fixed	☐ Mobile	☒ Portable
Antenna	Integrated		

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

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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

TEST PROCEDURE

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

Radiation Interference: The test procedure used was ANSI standard 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 Standard C63.4-2003 10.1.7 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

Requirements:

Fundamental Frequency (MHz)	Field Strength of Fundamental dBμV/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:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV At 3m	Ant. Pol. V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m @ 3 m	Margin dB
13.56	13.56	20.6	H	0.54	34.62	55.76	28.24
13.56	13.56	22.4	V	0.54	34.62	57.56	26.44
13.56	27.20	4.7	H	0.80	34.15	39.65	29.89
13.56	27.20	9.6	V	0.80	34.15	44.55	24.99
13.56	108.80	19.4	V	1.46	10.80	31.66	11.34
13.56	108.80	22.0	H	1.46	10.27	33.73	9.27
13.56	122.40	11.7	V	1.56	11.72	24.98	18.02
13.56	122.40	12.5	H	1.56	11.03	25.09	17.91
13.56	136.00	6.3	V	1.65	15.00	22.95	20.05
13.56	136.00	14.1	H	1.65	14.40	30.15	12.85

** -Denotes restricted bands

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

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 DUT 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.

dB = -6.3

The worst case duty cycle per the manufacturer gives a correction factor of 6.3 dB.

FREQUENCY TOLERANCE

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

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

Test Data:

Assigned Frequency (MHz)	13.5607 MHz	
Temperature °C	Measured Frequency MHz	PPM
-20	13.560900	14.75
-10	13.560800	7.37
0	13.560800	7.37
+10	13.560800	7.37
+20	13.560700	0.00
+30	13.560700	0.00
+40	13.560500	-14.75
+50	13.560400	-22.12
Battery 85% End-point at 20°C	13.560700	0.00
Battery 115% End-point at 20°C	13.560700	0.00

POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Pt 15.207

Requirements:

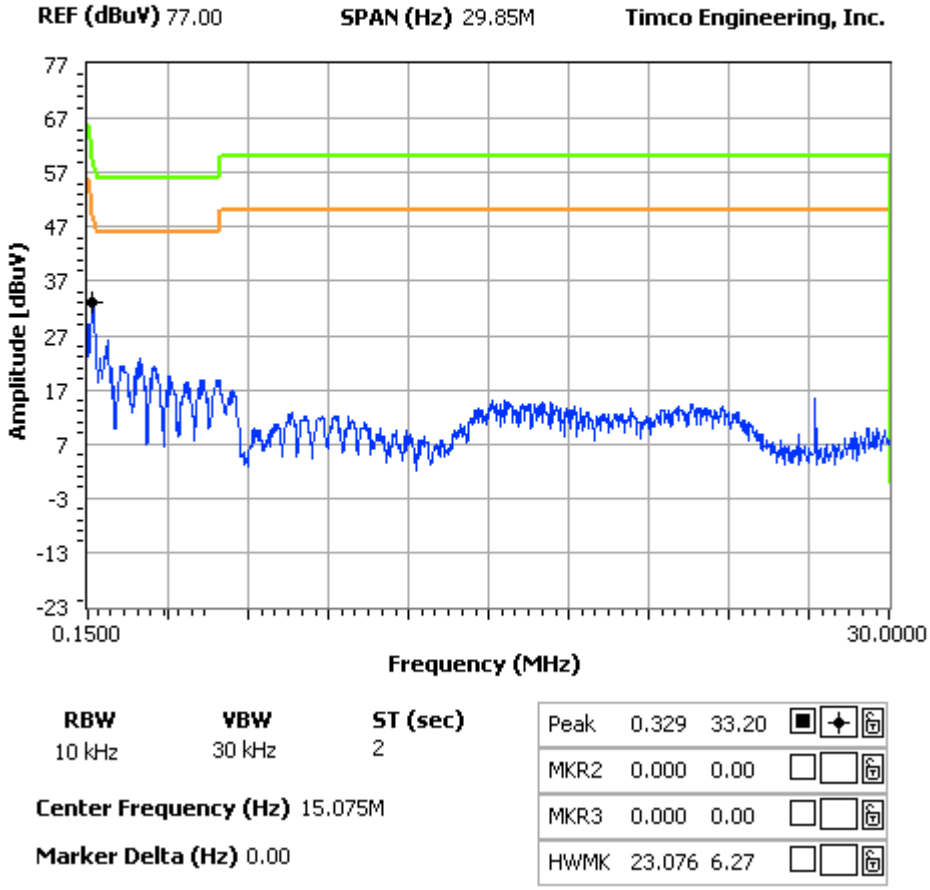
Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

Test Data: The plots indicated that both lines were observed

Line 1

NOTES:
3161but6 ac liine conducted line 1

FCC 15.107 Mask Class B



Line 2

NOTES:

3161but6 ac line conducted line 2

FCC 15.107 Mask Class B