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Transmitter Certification

FCC ID: WYU-HAND001

FCC Rule Part: 15.249

ACS Report Number: 08-0307-15C Handheld DXX

Manufacturer: Orderite, Inc.
Model: TR1000

Test Begin Date: August 12, 2008
Test End Date: August 22, 2008

Report Issue Date: September 4, 2008

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

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This report contains 18 pages

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1.0 GENERAL

1.1 Purpose
The purpose of this report is to demonstrate compliance with Part 15, Subpart C of the FCC's Code of Federal Regulations.

1.2 Product Description

1.2.1 General
The TouchBlock TR1000 is a handheld device used in a process management and food safety system which electronically gathers, records and reports product specific data that is used in maintaining day-to-day operations of your business and can be tailored to the specific needs of any individual type of business. It can be used to complete simple checklists, for tracking current inventory and ordering replacement items, as well as monitoring temperature of foods to maintain proper food safety.

The TR1000 contains an 802.11b/g radio as well as a low power 902 – 928 MHz transmitter. This report only addresses the low power 902 – 928 MHz operation of the TR1000. A separate report will be issued to address operation of the 802.11b/g radio.

Manufacturer Information:
Orderite, Inc.
296 N. Jackson St.
Athens, GA 30604

Test Sample Serial Number(s):
ACS#7

Test Sample Condition:
The test sample and accessories were provided in good working order with no discernable defects.

Detailed photographs of the EUT are filed separately with this filing.

1.2.2 Intended Use
The TouchBlock TR1000 is a handheld device used as a component in a process management and food safety system.

1.3 Test Methodology and Considerations
The TR1000 can operate in multiple orientations with the 902 – 928 MHz radio operational therefore the device was tested in multiple orientations and worst case data provided in this report.

2.0 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment. In addition, ACS is compliant to ISO/IEC 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. The following certification numbers have been issued in recognition of these accreditations and certifications:

FCC Registration Number: 894540
Industry Canada Lab Code: IC 4175
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

NVLAP Lab Code: 200612-0

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

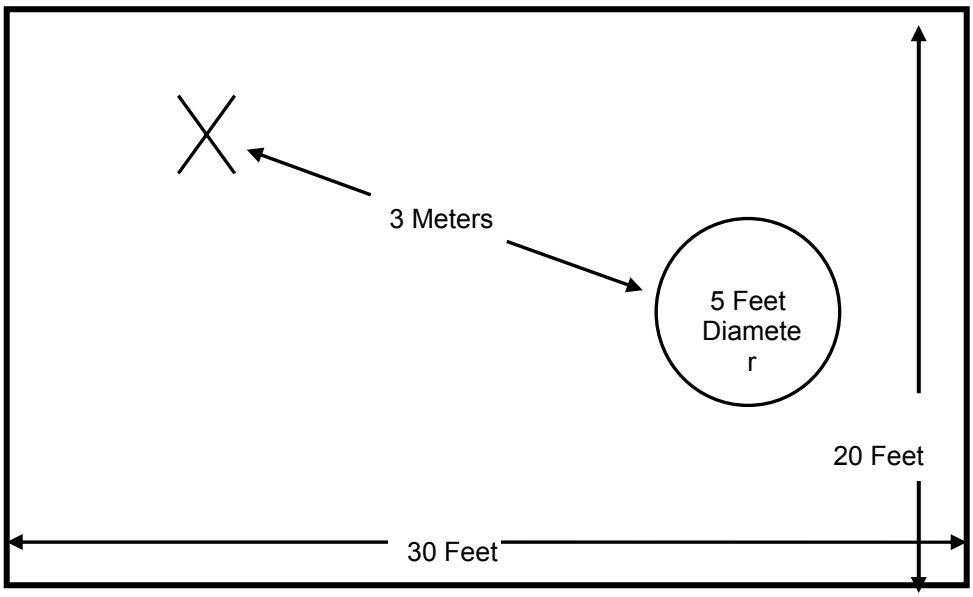

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

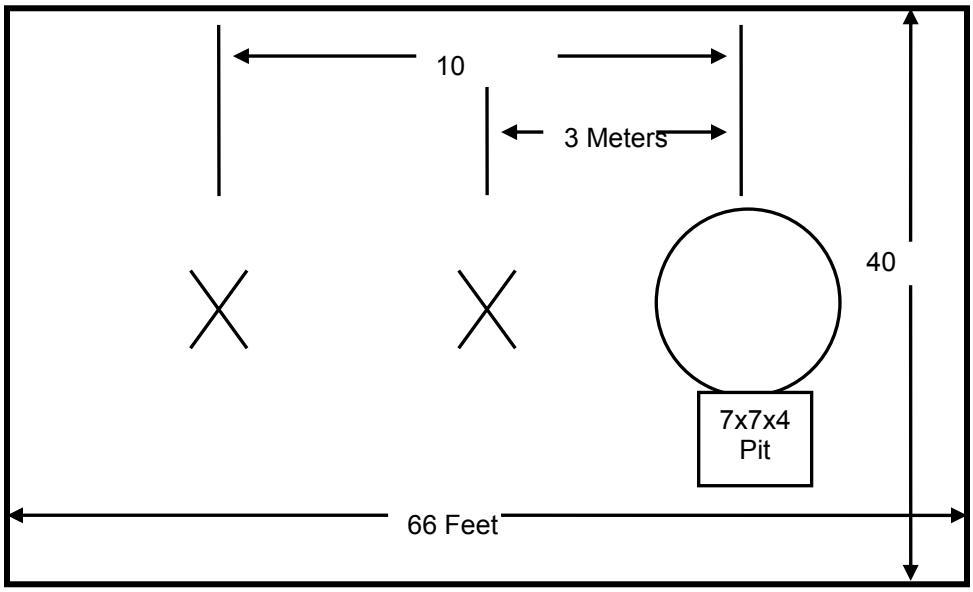

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

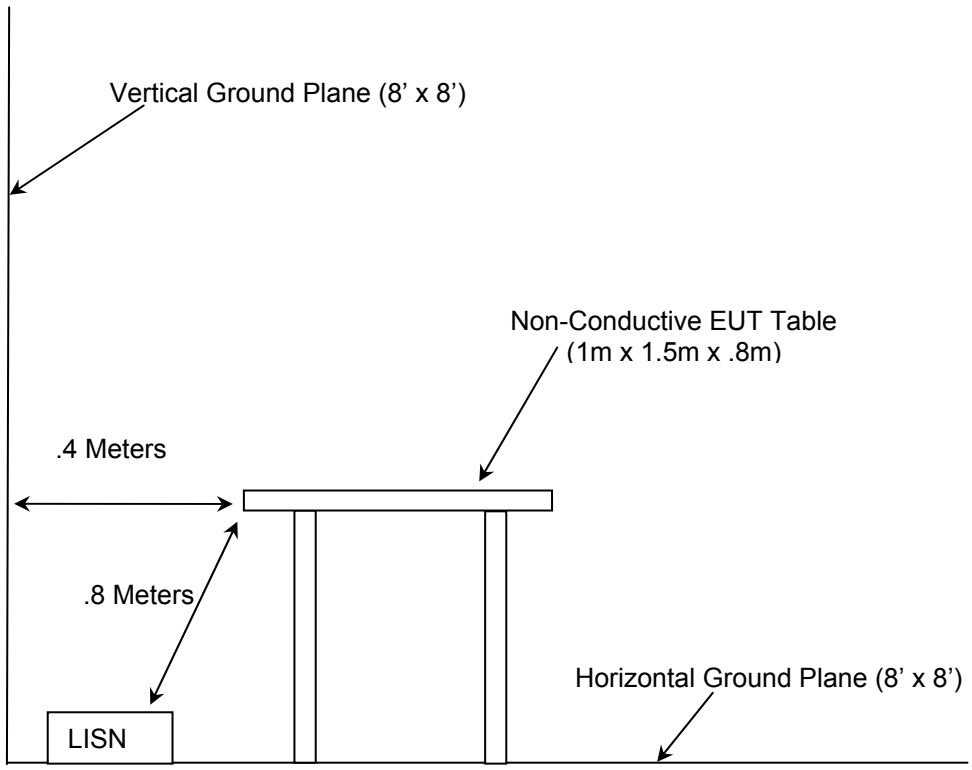

Figure 2.4-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2008
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2008

❖ 4.0 LIST OF TEST EQUIPMENT

All test equipment used for regulatory testing is calibrated yearly or according to manufacturer's specifications.

Table 4-1: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
3	Rohde & Schwarz	ESMI-Display	839379/011	Spectrum Analyzer	10/26/08
4	Rohde & Schwarz	ESMI-Receiver	833827/003	Spectrum Analyzer	10/26/08
22	Aglient	8449B	3008A00526	Pre-Amplifier	10/25/08
30	Spectrum Technologies	DRH-0118	970102	Antenna	05/07/09
152	EMCO	LISN	Feb-25	9111-1905	03/26/09
168	Hewlett Packard	Attenuators	11947A	44829	02/18/09
291	Florida RF Cables	SMRE-200W-12.0-SMRE	NA	Cables	11/21/08
283	Rohde & Schwarz	FSP40	1000033	Spectrum Analyzer	11/09/08
292	Florida RF Cables	SMR-290AW-480.0-SMR	NA	Cables	11/21/08
41	Electro Metrics	BIA-25	2925	Antenna	06/5/09
193	ACS	OATS cable Set	0193	Cables	01/4/09
412	Electro Metrics	LPA-25	1241	Antenna	07/8/09
331	Microwave Circuits	H1G513G1	31417	Filter	07/28/09
211	Eagle	C7RFM3NFNM	HLC-700	Filter	1/04/09
277	Emco	93146	9904-5199	Antenna	09/12/08
213	TEC	PA 102	44927	Pre-Amplifier	12/19/08
324	ACS	Conducted EMI Cable	Belden	8214	07/28/09
422	Florida RF Cables	SMS-200AW-72.0-SMR	0805	Cables	02/25/09

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	EUT	Orderite	TR1000	ACS #10
2	Docking Station	Orderite	NA	ACS #1
3	Power Supply	CUI, Inc.	EPAS-101W-05	ACS #8

Note: Items 2 and 3, docking station and power supply, were used for showing compliance to the ac power line conducted emissions limits. See section 7.2.

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

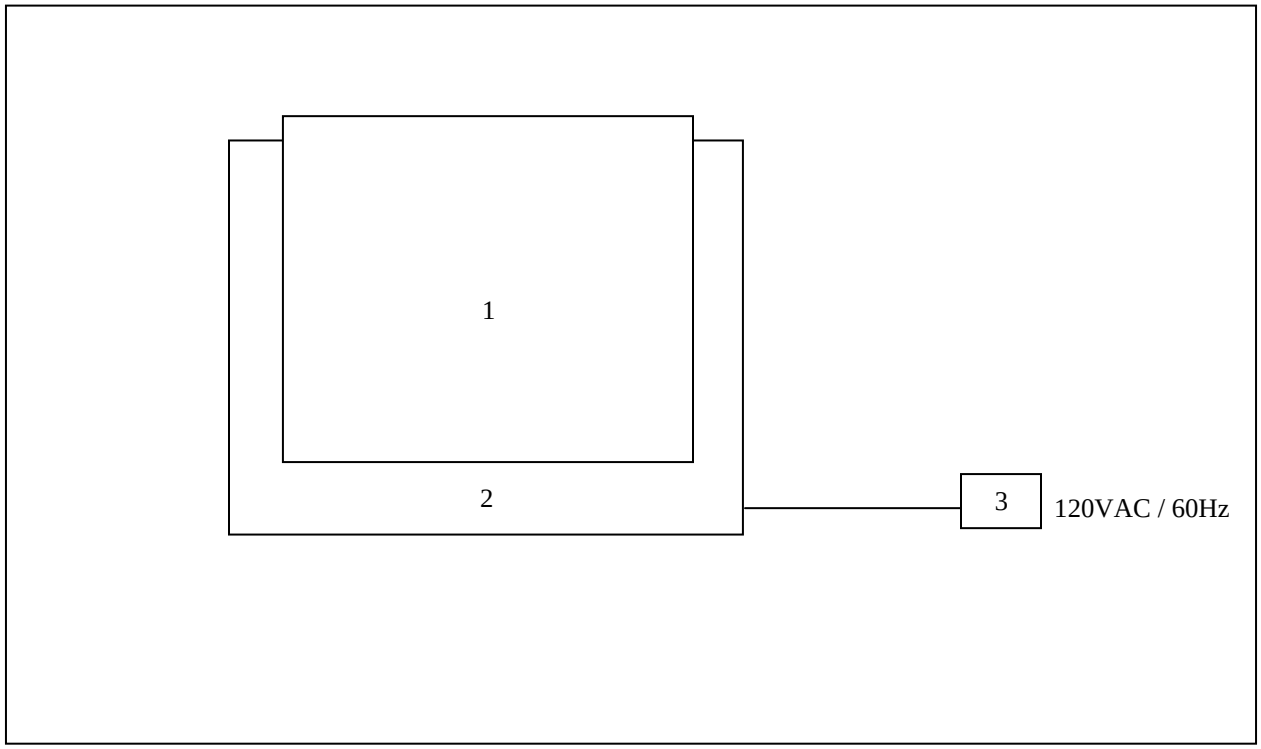

Figure 6-1: EUT Test Setup

*See Test Setup photographs for additional detail.

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The TR1000 utilizes an integral wire antenna, AX100776-001 – Antenna Wire, 20AWG, 3.12" length, with gain of 0dBi.

7.2 Power Line Conducted Emissions – FCC: Section 15.207

7.2.1 Test Methodology

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.2.2 Test Results

Results of the test are shown below in and Table 7.2.2-1.

Table 7.2.2-1: Conducted EMI Results

Frequency (MHz)	Uncorrected Reading (dBuV)		Total Correction Factor (dB)	Corrected Level (dBuV)		Limit (dBuV)		Margin (dB)		Line
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	
Line 1										
0.2	41.9	37.1	9.80	51.70	46.90	63.61	53.61	11.9	6.7	GND
0.51	32.7	27.3	9.80	42.50	37.10	56.00	46.00	13.5	8.9	GND
0.61	32.8	27.1	9.80	42.60	36.90	56.00	46.00	13.4	9.1	GND
1.02	31.6	22.5	9.80	41.40	32.30	56.00	46.00	14.6	13.7	GND
1.43	31.3	21.3	9.80	41.10	31.10	56.00	46.00	14.9	14.9	GND
3.56	33.1	22.5	9.80	42.90	32.30	56.00	46.00	13.1	13.7	GND
Line 2										
0.2	39.4	31.3	9.80	49.20	41.10	63.61	53.61	14.4	12.5	GND
0.6	30.7	24.4	9.80	40.50	34.20	56.00	46.00	15.5	11.8	GND
1.01	29.7	22.1	9.80	39.50	31.90	56.00	46.00	16.5	14.1	GND
1.41	31.3	22.8	9.80	41.10	32.60	56.00	46.00	14.9	13.4	GND
1.82	30.5	18	9.80	40.30	27.80	56.00	46.00	15.7	18.2	GND
3.44	30.9	23.1	9.80	40.70	32.90	56.00	46.00	15.3	13.1	GND

7.3 Radiated Emissions – FCC: Section 15.109(Unintentional Radiation)

7.3.1 Test Methodology

Radiated emissions tests were performed over the frequency range of 30MHz to 12.5 GHz. Measurements of the radiated field strength were made at a distance of 3m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements were made with the Spectrum Analyzer's resolution bandwidth set to 120 KHz for measurements from 30-1000MHz. Average and peak measurements are taken with the RBW and VBW set to 1MHz for measurements above 1000MHz.

7.3.2 Test Results

Results of the test are given in Table 7.3.2-1 below:

Table 7.3.2-1: Radiated Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
202.2223	---------	32.66	H	-11.83	---------	20.83	--------	43.5	---------	22.67
213.7906	---------	35.28	H	-12.30	---------	22.98	--------	43.5	---------	20.52
351.1284	---------	42.17	H	-7.82	---------	34.35	--------	46.4	---------	12.05
368.4428	---------	42.71	H	-7.75	---------	34.96	--------	46.4	---------	11.44
378.1564	---------	37.74	H	-6.97	---------	30.77	--------	46.4	---------	15.63
642.162	---------	33.67	H	-0.09	---------	33.58	--------	46.4	---------	12.82
195.7928	---------	36.87	H	-6.02	---------	30.85	--------	43.5	---------	12.65
186.254	---------	28.39	H	-5.48	---------	22.91	--------	43.5	---------	20.59
184.0238	---------	31.71	H	-5.48	---------	26.23	--------	43.5	---------	17.27
38.6547	---------	34.79	V	-13.79	---------	21.00	--------	39.1	---------	18.10

* Note: All emissions above 642.162 MHz were attenuated below the permissible limit.

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7.4 Occupied Bandwidth – FCC: Section 15.215

7.4.1 Test Methodology

The spectrum analyzer span was set to 2 to 3 times the estimated bandwidth of the emission. The RBW was to ≥ 1% of the estimated emission bandwidth. The trace was set to max hold with a peak detector active. Bandwidth is determined at the points 20 dB down from the modulated carrier for FCC compliance.

7.4.2 Test Results

The 20dB bandwidth was determined to be 248.0 kHz. The frequency band designated under Part 15.249 is 902-928 MHz, therefore the 20dB bandwidth is contained within the frequency band designated under this rule part. Results are shown below in Table 7.4.2-1 and Figures 7.4.2-1 through 7.4.2-3.

Table 7.4.2-1

Frequency (MHz)	20dB Bandwidth (kHz)
904.3968	248.0
915.0	244.0
924.4672	243.0

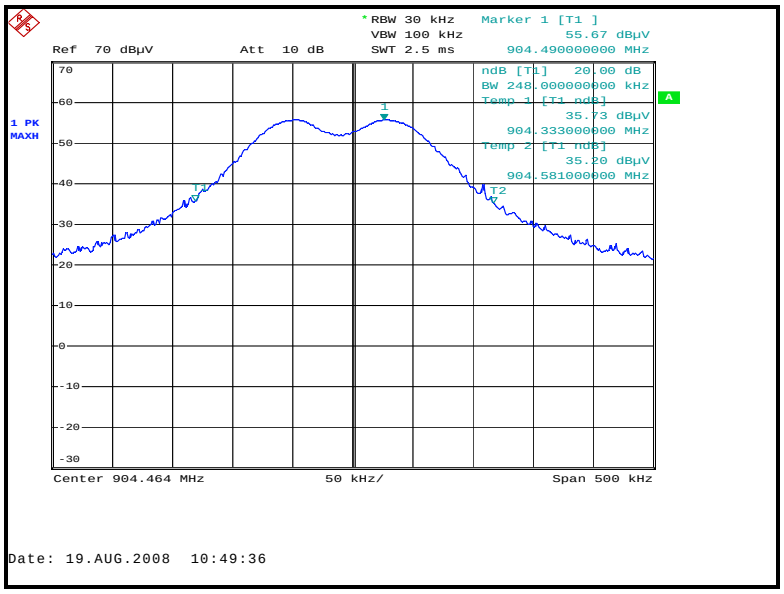

Figure 7.4.2-1: 20dB Bandwidth Low Channel

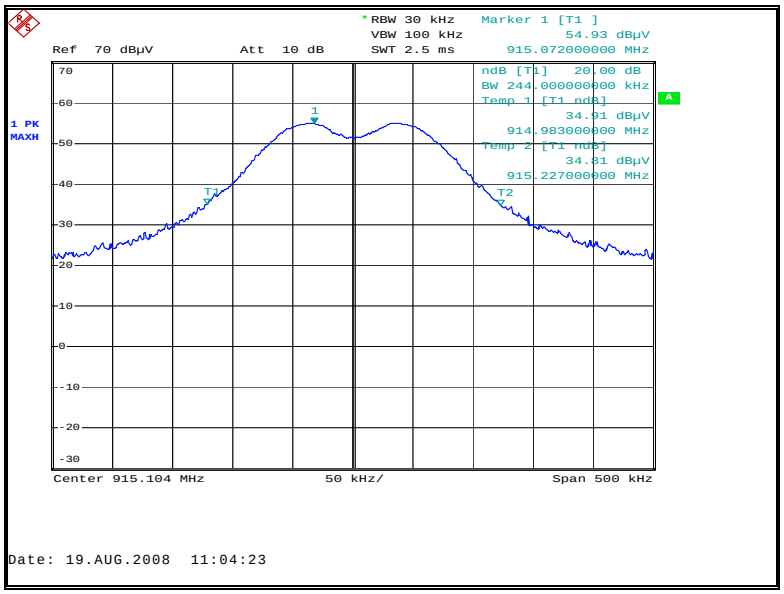

Figure 7.4.2-2: 20dB Bandwidth Mid Channel

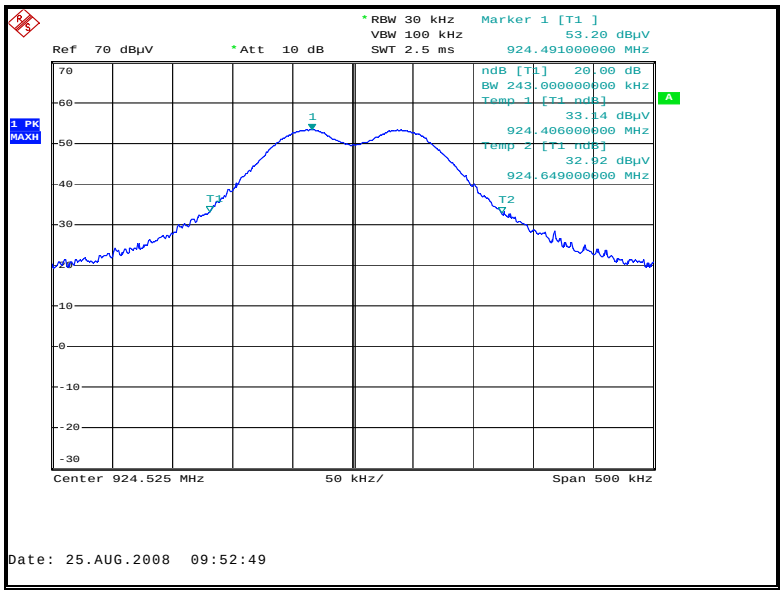

Figure 7.4.2-3: 20dB Bandwidth High Channel

7.5 Fundamental Field Strength – FCC: Section 15.249(a)

7.5.1 Test Methodology

Radiated emissions tests were made on the 3 channels in the 902 MHz to 928 MHz frequency range, the low channel being 904.3968 MHz, the middle channel being 915 MHz, and the high channel being 924.4672 MHz.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements made with RBW and VBW of 1 MHz and 3MHz respectively.

7.5.2 Test Results

Results are shown below in table 7.5.2-1 below:

Table 7.5.2-1: Fundamental Field Strength

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
904.3968	---------	55.40	H	27.79	---------	83.19	---------	94.0	---------	10.81
904.3968	---------	56.89	V	27.19	---------	84.08	---------	94.0	---------	9.92
Mid Channel										
915	---------	51.79	H	27.95	---------	79.74	---------	94.0	---------	14.26
915	---------	56.87	V	27.30	---------	84.17	---------	94.0	---------	9.83
High Channel										
924.4672	---------	52.83	H	28.04	---------	80.87	---------	94.0	---------	13.13
924.4672	---------	54.38	V	27.30	---------	81.68	---------	94.0	---------	12.32

7.6 Band-Edge Compliance and Spurious Emissions – FCC: Section 15.249

7.6.1 Band-Edge Compliance – FCC: Section 15.249(d)

7.6.1.1 Test Methodology

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.

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. Band-edge compliance for the lower and upper band-edge was determined using the radiated mark-delta method as outlined in FCC DA 00-705. The radiated field strength of the fundamental emission was first determined and then the mark-delta method was used to determine the field strength of the band-edge emissions as compared to the emission limits of 15.209.

The device does have frequency hopping capabilities therefore band-edge measurements were made in hopping and non-hopping modes.

7.6.1.2 Test Results

Band-edge compliance is displayed in Tables 7.6.1.2-1 to 7.6.1.2-2 and Figures 7.6.1.2-1 – 7.6.1.2-4.

Table 7.6.1.2-1: Lower Band-edge Marker Delta Method

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity	Correction Factors	Fundamental Level (dBuV/m)		Marker-Delta	Band-Edge Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
904.3968	--------	56.89	--------	27.19	--------	84.08	33.36	--------	50.72	--------	54.0	--------	3.28

Table 7.6.1.2-2: Upper Band-edge Marker Delta Method

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity	Correction Factors	Fundamental Level (dBuV/m)		Marker-Delta	Band-Edge Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
924.4672	---------	54.38	V	27.30	---------	81.68	30.89	---------	50.79	---------	54.0	---------	3.21

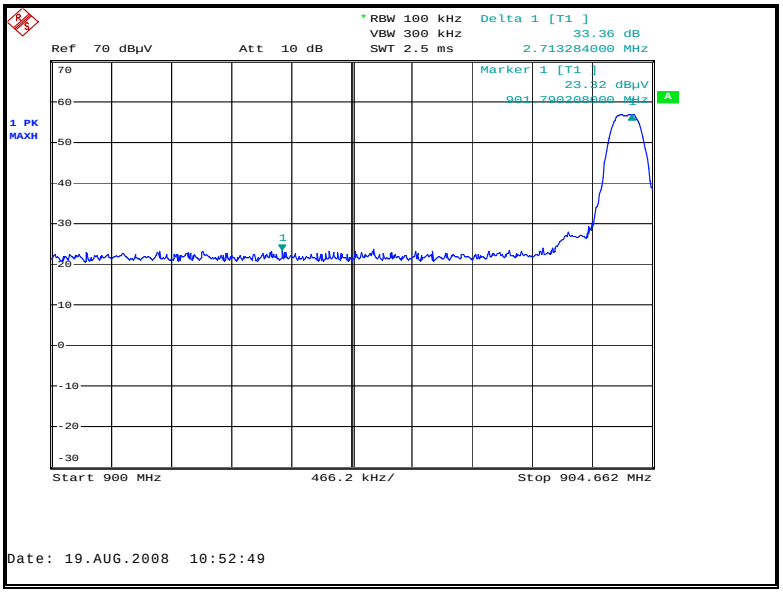

Figure 7.6.1.2-1 Lower Band-edge

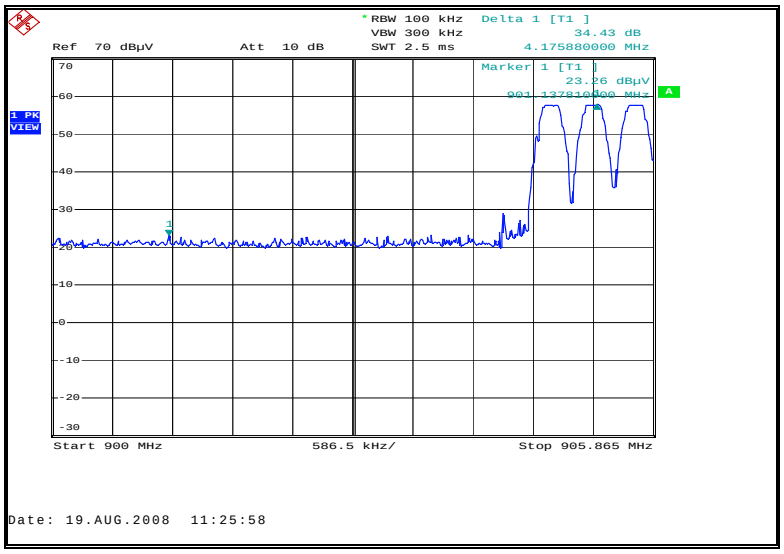

Figure 7.6.1.2-2 Lower Band-edge – Hopping Mode

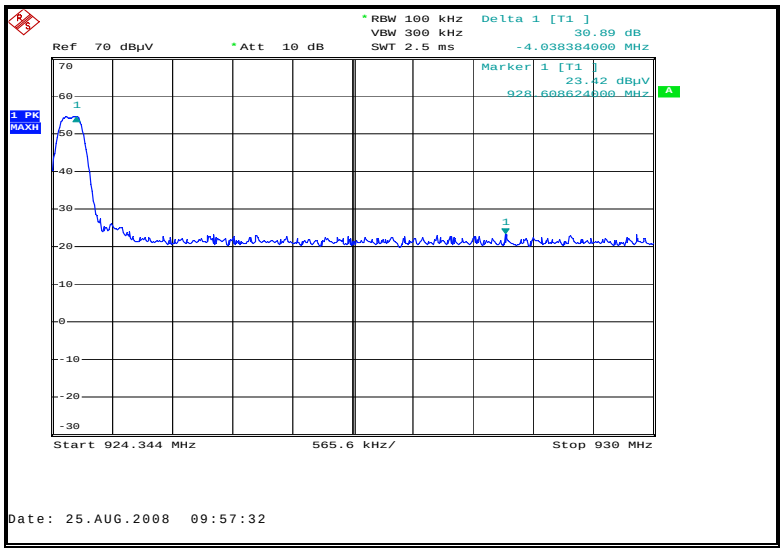

Figure 7.6.1.2-3 Upper Band-edge

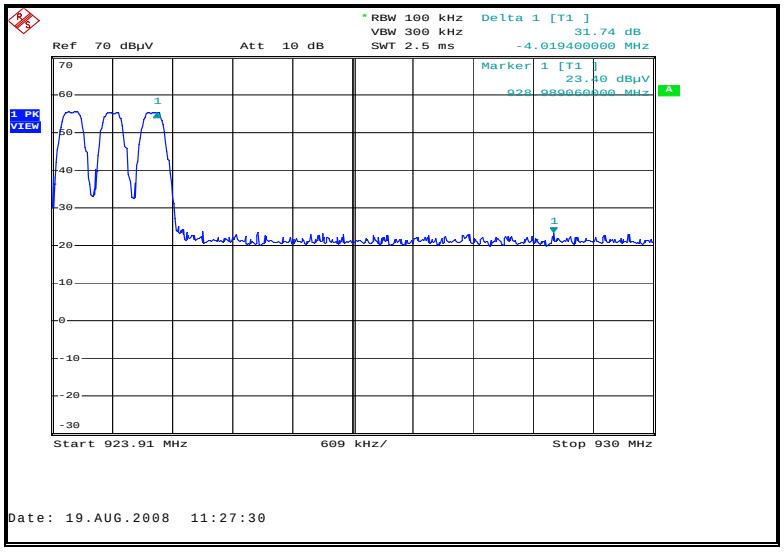

Figure 7.6.1.2-4 Upper Band-edge – Hopping Mode

7.7.2 Radiated Spurious Emissions – FCC: Section 15.249(a), (c), (d), (e)

7.7.2.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 10 GHz, 10 times the highest fundamental frequency for each the low, middle, and high channels.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements made with RBW and VBW of 1 MHz and 3MHz respectively.

7.7.2.2 Test Results

Radiated spurious emissions found in the band of 30MHz to 10 GHz are reported in Table 7.7.2.2-1.

Table 7.7.2.2-1: Radiated Spurious Emissions

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
1808.98	49.10	49.10	H	-3.19	45.91	45.91	74.0	54.0	28.09	8.09
1808.98	48.24	48.24	V	-3.21	45.03	45.03	74.0	54.0	28.97	8.97
2713.47	45.60	38.59	H	0.58	46.18	39.17	74.0	54.0	27.82	14.83
2713.47	44.84	37.10	V	0.38	45.22	37.48	74.0	54.0	28.78	16.52
3617.96	44.11	35.29	H	3.69	47.80	38.98	74.0	54.0	26.20	15.02
3617.96	44.00	35.93	V	3.72	47.72	39.65	74.0	54.0	26.28	14.35
Mid Channel										
1830	48.36	42.09	H	-3.13	45.23	38.96	74.0	54.0	28.77	15.04
1830	48.18	42.37	V	-3.17	45.01	39.20	74.0	54.0	28.99	14.80
2745	44.91	35.65	H	0.69	45.60	36.34	74.0	54.0	28.40	17.66
2745	43.21	34.61	V	0.49	43.70	35.10	74.0	54.0	30.30	18.90
High Channel										
1848.9344	48.21	39.00	H	-3.09	45.12	35.91	74.0	54.0	28.88	18.09
1848.9344	48.37	40.86	V	-3.13	45.24	37.73	74.0	54.0	28.76	16.27
2773.4016	46.92	38.69	H	0.79	47.71	39.48	74.0	54.0	26.29	14.52
2773.4016	46.67	36.65	V	0.59	47.26	37.24	74.0	54.0	26.74	16.76

7.6.2.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation

PEAK:
Corrected Level: 45.60 - 0.58 = 46.18dBuV
Margin: 74dBuV – 46.18dBuV = 27.82dB

AVERAGE:
Corrected Level: 38.59 - 0.58 - 0 = 39.17dBuV
Margin: 54dBuV – 39.17dBuV = 14.83dB

8.0 CONCLUSION

In the opinion of ACS, Inc. the TR1000 manufactured by Orderite, Inc.meet the requirements of FCC Part 15 subpart C.

END REPORT