Flom Test Lab
EMI, EMC, RF Testing Experts Since 1963

toll-free: (866) 311-3268
fax: (480) 926-3598
www.flomlabs.com
info@flomlabs.com

**Date:** April 16, 2009

**Applicant:** Blackboard, Inc.
22601 North 19th Ave, Suite 200
Phoenix, AZ 85027

**Attention of:** Tom Kuestersteffen
623-476-1263
email: tkuestersteffen@blackboard.com
and/or Tim Mattson
623-476-1400

**Equipment:** VR4000

**FCC Rules:** Part 15, Subpart B. Class B Limits.

Gentlemen:

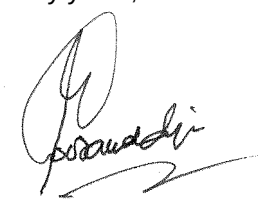
Enclosed please find your copy of the Test Data Report for the referenced equipment.

Please keep the original on record for submission to the FCC, **but only if and when they request it**.

In the event the FCC ever requests this submission, please complete all the documentation requirements, (as per the LIST OF EXHIBITS) before sending.

Should you have any questions, please do not hesitate to call.

Sincerely yours,



Hoosamuddin S. Bandukwala, Lab Director

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**(Unintentional Radiator)**

of

**Model:** VR4000

to

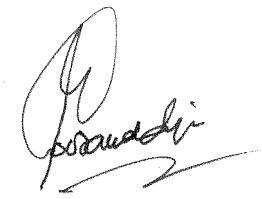
**Federal Communications Commission**

**Rule Part 15, Subpart B - Unintentional Radiators**

**Class B Limits**

**Date of Report:** April 16, 2009

| | |
|---|---|
| **At the Request of:** | Blackboard, Inc.<br>22601 North 19th Ave, Suite 200<br>Phoenix, AZ 85027 |
| **Attention of:** | Tom Kuestersteffen<br>623-476-1263<br>email: tkuestersteffen@blackboard.com<br>and/or Tim Mattson<br>623-476-1400 |



Reviewed By: Hoosamuddin S. Bandukwala, Lab Director

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## Test Report Revision History

| Revision | Date | Revised By | Reason for revision |
|---|---|---|---|
| 1.0 | April 16, 2009 | J Erhard | Original Document |
| | | | |
| | | | |
| | | | |

**The applicant has been cautioned as to the following:**

15.21 Information to User.

The users manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) Special Accessories.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.

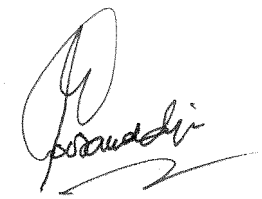
Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Flom Test Lab

# Testimonial And Statement Of Certification

**This is to certify that**:

1. **That** the application was prepared either by, or under the direct supervision of, the undersigned.
2. **That** the technical data supplied with the application was taken under my direction and supervision.
3. **That** the data was obtained on representative units, randomly selected.
4. **That**, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.



Certifying Engineer: Hoosamuddin S. Bandukwala, Lab Director

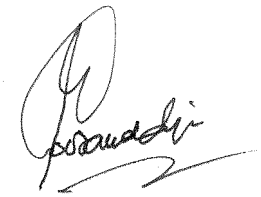
Flom Test Lab
3356 N. San Marcos Place, Suite 107
Chandler, Arizona 85225-7176
(866) 311-3268 phone, (480) 926-3598 fax

Flom Test Lab

# Table Of Contents

*Required information per ISO 17025-2005, paragraph 5.10.2:*

a) **Test Report**

| | |
|---|---|
| b) Laboratory:<br>(FCC: 31040/SIT)<br>(Canada: IC 2044A-1) | Flom Test Lab, Inc.<br>3356 N. San Marcos Place, Suite 107<br>Chandler, AZ 85225 |
| c) Report Number: | d0940010 |
| d) Client: | Blackboard, Inc. |
| e) Identification: | VR4000 |
| Description: | Wireless Vending Machine Coin Unit |
| f) EUT Condition: | Not required unless specified in individual tests. |
| g) Report Date: | April 16, 2009 |
| h, j, k): | As indicated in individual tests. |
| i) Sampling method: | No sampling procedure used. |
| l) Uncertainty: | In accordance with FTL internal quality manual. |
| m) Supervised by: |  <br>Hoosamuddin S. Bandukwala, Lab Director |
| n) Results: | The results presented in this report relate only to the item tested. |
| o) Reproduction: | This report must not be reproduced, except in full, without written permission from this laboratory. |

Sub-part 2.1033(b): **Test And Measurement Data**

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2 and the following individual Parts: 15.107, 15.109; Unintentional Radiators

**Standard Test Conditions and Engineering Practices**

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.4-2004, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst-case measurements.

**A2LA**

"A2LA has accredited Flom Test Labs, Inc. Chandler, AZ for technical competence in the field of Electrical testing. The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO 17025:2005 'General Requirements for the Competence of Testing and Calibration Laboratories' and any additional program requirements in the identified field of testing."

Please refer to www.a2la.org for current scope of accreditation.

Certificate number: 2152.01


**FCC OATS Reg. #933597**

**IC O.A.T.S. Number: 2044A-1**

**Test Results Summary**

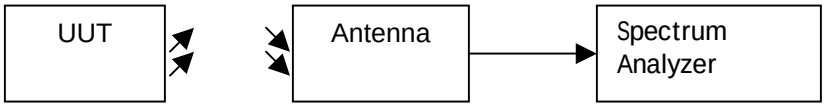
| Specification | Test Name | Pass, Fail, N/A | Comments |
|---|---|---|---|
| 15.109 | Radiated Emissions | Pass | |
| 15.107 | Powerline Conducted Emissions | Pass | |

**Name of Test**: Radiated Emissions
**Specification**: 15.109 **Engineer: J Erhard**
**Test Equipment Utilized** i00049, i00088, i00089 **Test Date: 4/16/2009**

**Test Procedure**

The UUT was tested in an Open Area Test Site (OATS) set 3m from the receiving antenna. A spectrum analyzer was used to verify that the UUT met the requirements for Radiated Emissions. The UUT was tested by rotating it 360° with the antennas in both the vertical and horizontal orientation and raised from 1 to 4 meters to ensure the TX signal levels were maximized. All emissions from 30 MHz to 1 GHz were examined.

**Test Setup**




Settings
RBW = 100 KHz
VBW = 100KHz
Detector – Quasi Peak
Sample Calculations
Corrected Value = Measured Value + Correction factor
Correction factor = ACF + Cable loss

**Radiated Emissions with Wi-Fi operational**

| Emission Freq (MHz) | Measured Value (dBuV/m) | Correction Factor (dB) | Corrected Value (dBuV/m) | Limit (dBuV/m) | Margin dB |
|---|---|---|---|---|---|
| 50.465 | 9.5 | 9.8 | 19.3 | 40.0 | -20.7 |
| 117.990 | 15.8 | 13.2 | 29.0 | 43.0 | -14.0 |
| 221.699 | 22.2 | 12.2 | 34.4 | 46.0 | -11.6 |
| 224.449 | 8.6 | 12.5 | 21.1 | 46.0 | -24.9 |
| 346.424 | 20.9 | 17.4 | 38.3 | 46.0 | -7.7 |
| 406.235 | 10.8 | 19.2 | 30.0 | 46.0 | -16.0 |

**Radiated Emissions with cabled Ethernet operational**

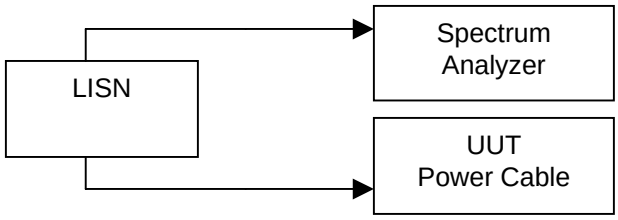
| Emission Freq (MHz) | Measured Value (dBuV/m) | Correction Factor (dB) | Corrected Value (dBuV/m) | Limit (dBuV/m) | Margin dB |
|---|---|---|---|---|---|
| 47.474 | 10.2 | 11.3 | 21.5 | 40.0 | -18.5 |
| 116.324 | 15.6 | 13.1 | 28.7 | 43.0 | -14.3 |
| 221.699 | 28.6 | 12.2 | 40.9 | 46.0 | -5.1 |
| 223.279 | 22.0 | 12.4 | 34.4 | 46.0 | -11.7 |
| 232.404 | 15.7 | 13.1 | 28.8 | 46.0 | -17.2 |
| 352.624 | 25.0 | 17.6 | 42.7 | 46.0 | -3.3 |

**Name of Test**: Powerline Conducted Emissions
**Specification**: 15.107 **Engineer: J Erhard**
**Test Equipment Utilized** i00033, i00270 **Test Date: 4/16/2009**

**Test Procedure**

The UUT power cable connected to a LISN and the monitored output of the LISN was connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were monitored and compared to the specification limits.

**Test Setup**




**Line 1 Quasi-Peak Test Results**

| Emission Frequency | Monitored Level (dBuV/m) | LISN Factor (dB) | Attenuation (dB) | Corrected Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 208.93 KHz | 43.93 | 0.2 | 10 | 54.16 | 64.32 | -10.16 |
| 200.84 KHz | 44.1 | 0.2 | 10 | 54.33 | 64.55 | -10.22 |
| 200.44 KHz | 43.88 | 0.2 | 10 | 54.1 | 64.56 | -10.46 |
| 184.11 KHz | 43.83 | 0.2 | 10 | 54.03 | 65.03 | -10.99 |
| 183.14 KHz | 43.76 | 0.2 | 10 | 53.96 | 65.05 | -11.09 |
| 162.08 KHz | 44.31 | 0.2 | 10 | 54.54 | 65.65 | -11.11 |

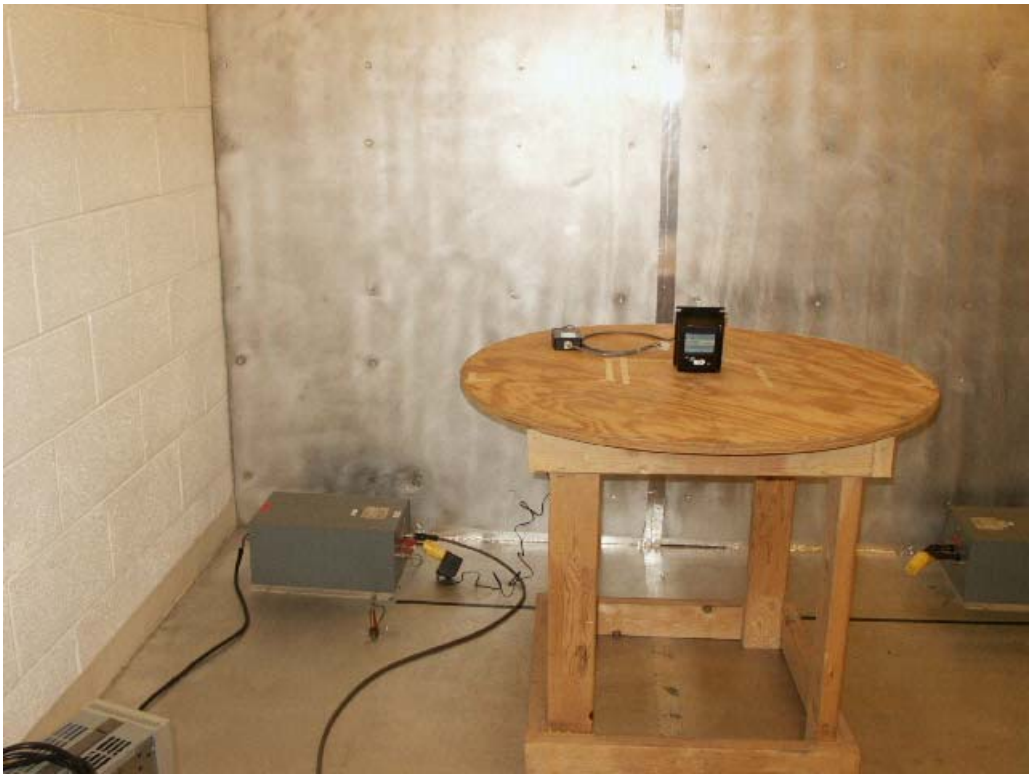
**Line 2 Quasi-Peak Test Results**

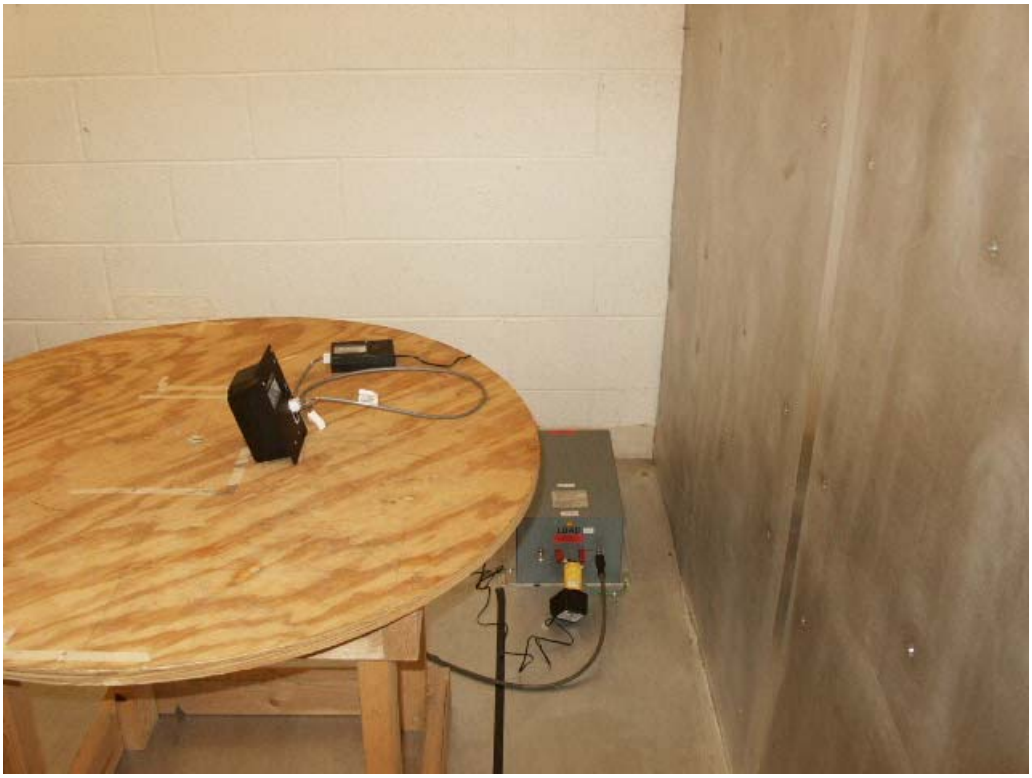
| Emission Frequency | Monitored Level (dBuV/m) | LISN Factor (dB) | Attenuation (dB) | Corrected Level (dBuV/m) | Limit (dBuV/m) | Limit (dB) |
|---|---|---|---|---|---|---|
| 162.32 KHz | 44.02 | 0.2 | 10 | 54.25 | 65.65 | -11.39 |
| 162.02 KHz | 44 | 0.2 | 10 | 54.23 | 65.66 | -11.42 |
| 158.94 KHz | 44.21 | 0.21 | 10 | 54.46 | 65.74 | -11.29 |
| 156.58 KHz | 44.21 | 0.23 | 10 | 54.48 | 65.81 | -11.33 |
| 154.08 KHz | 43.95 | 0.26 | 10 | 54.24 | 65.88 | -11.64 |
| 151.81 KHz | 44.03 | 0.28 | 10 | 54.35 | 65.95 | -11.6 |

All other results were greater than 20 dB below the limit.

**Radiated Emissions Test Setup Photos**

**AC Conducted Emissions Test Setup Photos**





**Test Equipment Utilized**

| Description | MFG | Model Number | FTL Asset Number | Last Cal Date | Cal Due Date |
|---|---|---|---|---|---|
| Spectrum Analyzer | HP | 8546A | i00033 | 10/14//08 | 10/14//09 |
| Spectrum Analyzer | HP | 8566B | i00049 | 8/22/08 | 8/22/09 |
| Bi-conical Antenna | EMCO | 3109B | i00088 | 10/16/07 | 10/16/09 |
| Log Periodic Antenna | Aprel | 2001 | i00089 | 10/22/07 | 10/22/09 |
| LISN | FCC | FCC-LISN-50-32-2-01 | i00270 | 9/17/08 | 9/17/10 |

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT