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

Test Report

Prepared for: Blackboard, Inc.

Model: WR5000

Description: Security Access systems and as an attendance wall reader

Serial Number: N/A

FCC ID: TMEWR5000X012
IC: 8327A-WR5000X012

To

FCC Part 15.225

Date of Issue: January 19, 2018

On the behalf of the applicant:	**Blackboard, Inc.** **22601 N 19th Ave** **Suite 130** **Phoenix, AZ 85027**
Attention of:	**Tim Mattson, Hardware Engineer** **Ph: (623)476-1141** **E-Mail: Tim.Mattson@blackboard.com**

Prepared by
Compliance Testing, LLC
1724 S. Nevada Way
Mesa, AZ 85204
(480) 926-3100 phone / (480) 926-3598 fax
www.compliancetesting.com
Project No: p1770014

Alex Macon
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	October 9, 2017	Alex Macon	Original Document
2.0	January 18, 2018	Alex Macon	Updated table on page 8 Added measured frequency to page 9 Updated C63.10 version on page 6 Clarified test procedure on page 10
3.0	January 19, 2018	Alex Macon	Included additional statement in the field strength test procedure

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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted in the table below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

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TESTING CERT
#2152.01

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

The applicant has been cautioned as to the following:

15.21 Information to User

The user's 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 part may employ other methods of ensuring that the special accessories are provided to the consumer, without an 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.

Standard Test Conditions Engineering Practices

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

In accordance with ANSI C63.10-2013 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 specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

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

Environmental Conditions		
Temperature (°C)	**Humidity (%)**	**Pressure (mbar)**
23.2 – 24.8	31 - 36	966 - 969

EUT Description
Model: WR5000
Description: Security Access systems and as an attendance wall reader
Firmware: N/A
Software: N/A
Serial Number: N/A
Additional Information:
The device incorporated and NFC transmitter at 13.56MHz and a pre-certified 2.4GHz module.

EUT Operation during Tests
The device was placed in continuous transmit tone during all testing.

Accessories: None

Cables: None

Modifications: None

Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
15.225(a)	Fundamental Field Strength	Pass	
15.225(b)(c)(d)	Out of Band Spurious Emissions	Pass	
15.225(e)	Frequency Stability	Pass	
12.209	Radiated Emissions	Pass	
12.207	Conducted Powerline Emissions	Pass	
RSS-210	99% Occupied Bandwidth	Pass	

15.203: Antenna Requirement:

X	The antenna is permanently attached to the EUT
	The antenna uses a unique coupling
	The EUT must be professionally installed
	The antenna requirement does not apply

Field Strength

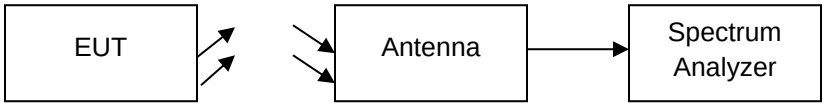
Engineer: Alex Macon

Test Date: 9/12/17

Test Procedure

The EUT was tested in an anechoic chamber at a distance of 1 meter from the receiving loop antenna and characterized to the 30 meter limit(40log (1m/30m) A spectrum analyzer was used to verify that the EUT met the requirements for Fundamental Field Strength. The antenna correction and distance correction factors were summed with the quasi-peak measurement to ensure accurate readings were obtained. The following table indicates the highest emission in each of the indicated bands. Measurements were made with an amplified loop antenna and converted to field strength.

Test Setup



Field Strength

Frequency Band (MHz)	Measured Frequency (MHz)	Monitored Level (dBuV/m)	Distance CF (dB)	Antenna CF (dB)	Corrected Measurement (dBuV/m)	Limit (dBuV/m)	Result
13.110_13.410	13.347	62.95	59.1	17.8	21.65	40.51	Pass
13.410_13.553	13.553	73.94	59.1	17.8	32.64	50.47	Pass
13.553_13.567	13.5593	78.13	59.1	17.8	36.83	84.00	Pass
13.567_13.710	13.567	70.76	59.1	17.8	29.46	50.47	Pass
13.710_14.010	13.773	58.71	59.1	17.8	17.41	40.51	Pass

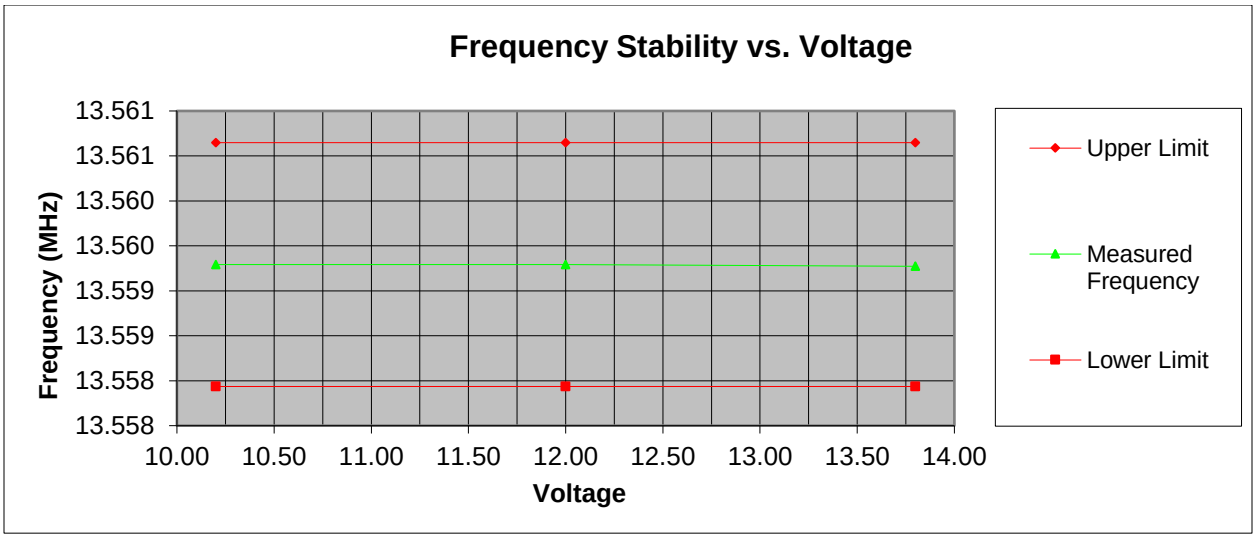
Note: Cable correction factors are not included in this measurement as the low loss of the high quality TWINAX cable at low frequencies in practically non-existent.

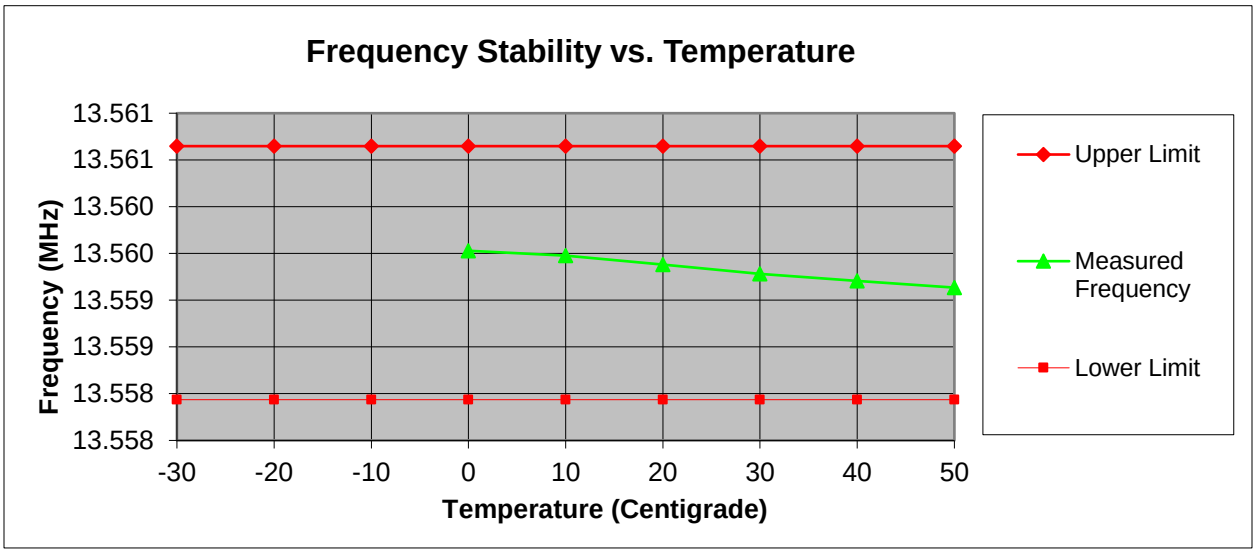
Frequency Stability
Engineer: Alex Macon
Test Date: 9/20/17

Test Procedure

The EUT was placed in an environmental test chamber and a frequency counter was utilized to verify that the frequency stability met the requirement for frequency stability across the temperature range from -20°C to +50°C. A variable DC power supply was used to vary the voltage from 85% to 115% of the rated voltage.
Transmitter Frequency: 13.559291667 MHz
Lower Limit: 13.5579357 MHz
Upper Limit: 13.5606476 MHz

Test Setup





***Note:** The hardware is limited by the LCD screens minimum temperature rating of 0˚C

Radiated Emissions

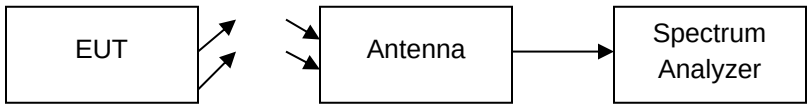
Engineer: Alex Macon

Test Date: 9/20/17

Test Procedure

The EUT was tested in a semi-anechoic chamber at a distance of 3 meters from the receiving antenna. A spectrum analyzer was used to verify that the UUT met the requirements for Radiated Emissions. The spectrum was examined from 9kHz to 1 GHz those emissions closest to their respective limits have been documented below.

Test Setup



Radiated Emissions

Emission Frequency (MHz)	Measured Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Antenna Polarity (dB)	Turntable Position (degrees)	Detector
124.146	29.788	43.5	-13.712	400	V	241	PK
136.9357	31.247	43.5	-12.253	175	V	261	PK
593.8103	36.524	46	-9.476	325	V	292	PK
757.9441	36.528	46	-9.472	100	V	122	PK
996.3289	36.541	53.9	-17.359	400	V	127	PK
999.8816	38.704	53.9	-15.196	250	V	263	PK

Powerline Conducted Emissions

Engineer: Alex Macon

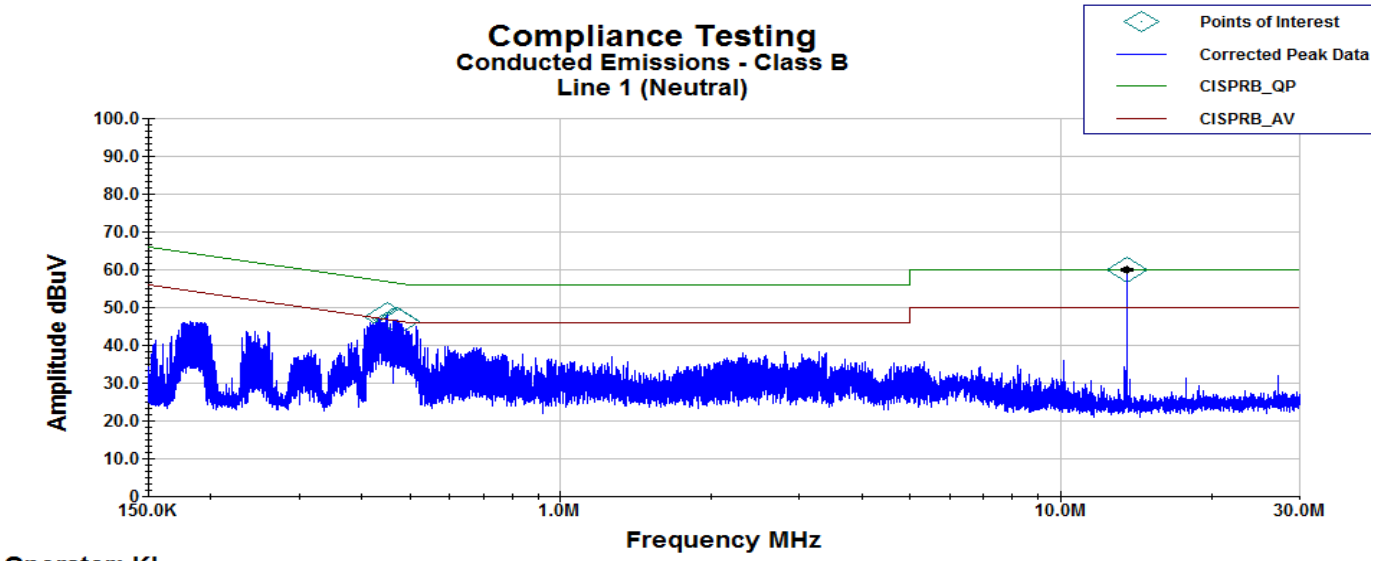
Test Date: 9/20/17

Test Procedure

The EUT 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. The average measurements were the worst case and are recorded in the tables below.

Test Setup

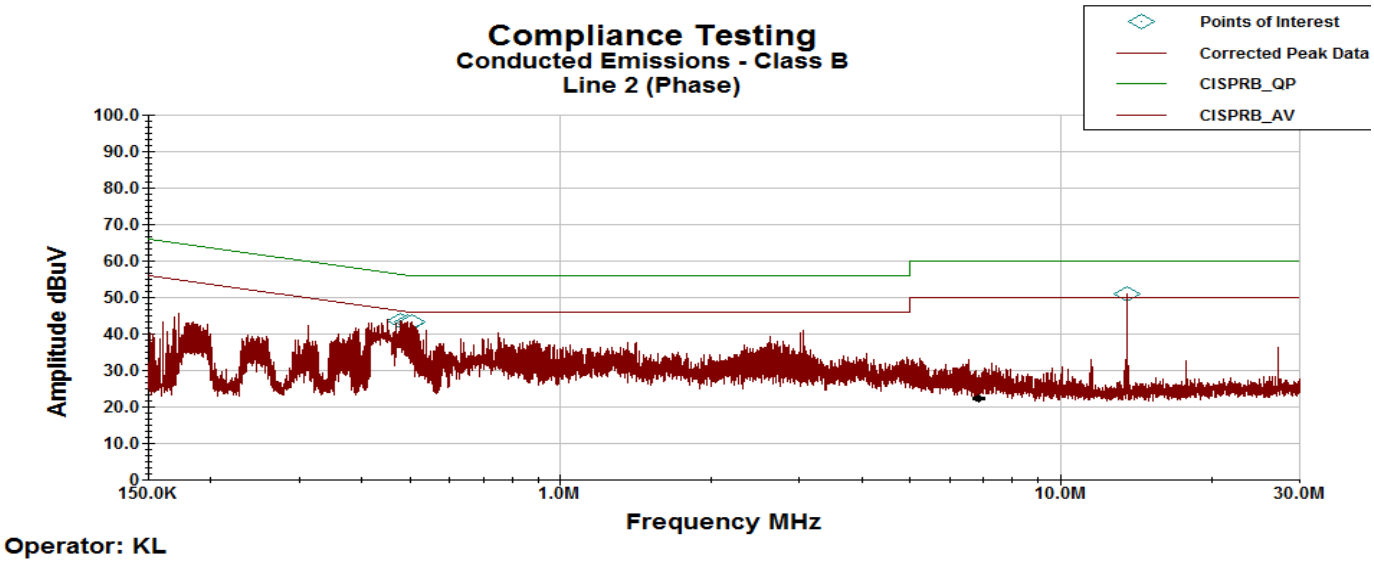
Line 1 Peak Plot



Operator: KL

Conducted Emissions - 207.til **Job #: p1770014**

Line 2 Peak Plot



Operator: KL

Conducted Emissions - 207.til **Job #: p1770014**

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

Line 1 Neutral Avg Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Attenuator (dB)	Final Data (dBuV)	Limit (dBuV)	Avg Margin (dB)
439.4 KHz	16.51	0.1	0.03	10.1	26.74	47.731	-21.00
445.14 KHz	17.46	0.1	0.03	10.1	27.69	47.567	-19.88
457.45 KHz	12.97	0.1	0.03	10.1	23.20	47.216	-24.01
459.05 KHz	11.89	0.1	0.03	10.1	22.12	47.17	-25.05
490.33 KHz	13.09	0.1	0.03	10.1	23.32	46.276	-22.96
13.562 MHz	36.66	0	0.18	10.2	47.04	50	-2.96

Line2 Phase Avg Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Attenuator (dB)	Final Data (dBuV)	Limit (dBuV)	Avg Margin (dB)
476.09 KHz	15.62	0.1	0.03	10.1	25.85	46.683	-20.83
478.24 KHz	15.34	0.1	0.03	10.1	25.57	46.622	-21.06
491.23 KHz	14.12	0.1	0.03	10.1	24.35	46.251	-21.90
494.93 KHz	13.62	0.1	0.03	10.1	23.85	46.145	-22.30
495.1 KHz	13.81	0.1	0.03	10.1	24.04	46.14	-22.10
13.56 MHz	37.93	0	0.18	10.2	48.31	50	-1.69

Line 1 Neutral QP Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Attenuator (dB)	Final Data (dBuV)	Limit (dBuV)	QP Margin (dB)
439.4 KHz	32.84	0.1	0.03	10.1	43.07	57.731	-14.66
445.14 KHz	32.85	0.1	0.03	10.1	43.08	57.567	-14.49
457.45 KHz	30.46	0.1	0.03	10.1	40.69	57.216	-16.53
459.05 KHz	29.8	0.1	0.03	10.1	40.03	57.17	-17.14
490.33 KHz	29.21	0.1	0.03	10.1	39.44	56.276	-16.84
13.562 MHz	47.89	0	0.18	10.2	58.27	60	-1.73

Line 2 Phase 2 QP Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Attenuator (dB)	Final Data (dBuV)	Limit (dBuV)	QP Margin (dB)
476.09 KHz	28.66	0.1	0.03	10.1	38.89	56.683	-17.79
478.24 KHz	28.80	0.1	0.03	10.1	39.03	56.622	-17.59
491.23 KHz	28.03	0.1	0.03	10.1	38.26	56.251	-17.99
494.93 KHz	27.78	0.1	0.03	10.1	38.01	56.145	-18.14
495.1 KHz	28.29	0.1	0.03	10.1	38.52	56.14	-17.62
13.56 MHz	47.86	0	0.18	10.2	58.24	60	-1.76

99% Occupied Bandwidth

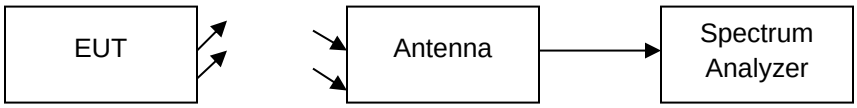
Engineer: Alex Macon

Test Date: 9/12/17

Test Procedure

The EUT was tested on an anechoic chamber at a distance of 1 meter from the receiving loop antenna. A spectrum analyzer was used to measure the 99% occupied bandwidth.

Test Setup



99% Bandwidth Summary

Frequency (MHz)	Recorded Measurement	Result
13.56	847 Hz	Pass

Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Temperature Chamber	Tenney	Tenney Jr	i00027	Verified on: 9/20/17	
EMI Receiver	HP	8546A	i00033	3/28/17	3/28/18
Transient Limiter	Com-Power	LIT-153	i00123	Verified on: 9/20/17	
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	6/9/17	6/9/18
Active Loop Antenna	EMCO	6507	i00326	9/25/17	9/25/19
Spectrum Analyzer	Agilent	E4407B	i00331	10/19/16	10/19/17
Data Logger	Fluke	Hydra Data Bucket	i00343	5/25/17	5/25/18
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	8/3/16	8/3/18
AC Power Source	Behlman	BL 6000	i00362	Verified on: 9/20/17	
EMI Analyzer	Agilent	E7405A	i00379	2/22/17	2/22/18
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	8/15/16	8/15/19
LISN	COM-Power	LI-125A	i00447	9/11/17	9/11/19
LISN	COM-Power	LI-125A	i00449	9/11/17	9/11/19

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