



Test Report

Prepared for: Transact Campus, Inc

Model: DR5000

Description: NFC reader

FCC ID: TMEDR5000X013

To

FCC Part 15.225
&
RSS 210

Date of Issue: June 24, 2019

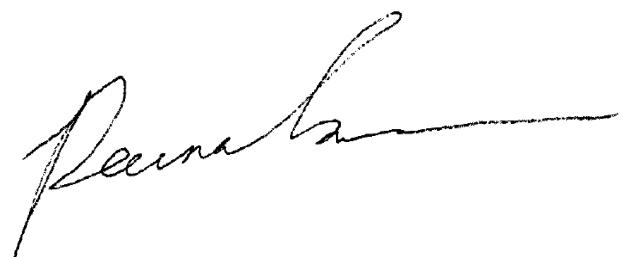
On the behalf of the applicant:

Transact Campus, 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: p1950013



Poona Saber
Project Test Engineer

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Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	June 24, 2019	Poona Saber	Original Document



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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**



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 party 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 C63.10-2009 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)
23.6	33	967

EUT Description

Model: DR5000

Description: NFC reader

Additional Information:

The DR5000 reader is designed to work with blackboard's SA3000 door access system and third-party access control systems.

Device under test incorporates a NFC transmitter at 13.56 MHz and a pre-certified 2.4 GHz module.

Unit has a single circuit board inside housing with integrated loop antenna and is provided with a AC to DC power adapter with a two 4-pin header which provides 12 VDC power to the unit.

EUT Operation during Tests

Device is put on continuous modulated mode for NFC radio and 2.4 GHz BLE transmitter is on standby mode.



Accessories:

Qty	Description	Manufacturer	Model	S/N
1	Power adapter	CUI INC	EPS120050	NA

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Termination
	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:

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

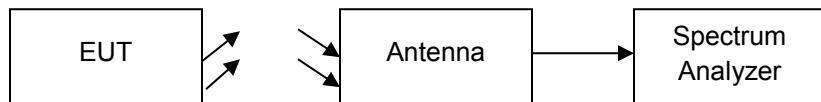
Engineer: Poona Saber

Test Date: 6/18/19

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 ($40\log(1m/30m)$). 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)	Corrected Measurement (dBuV/m)	Limit (dBuV/m)	Result
13.110_13.410	13.346	76.61	59.1	17.51	40.51	Pass
13.410_13.553	13.553	92.67	59.1	33.57	50.47	Pass
13.553_13.567	13.559	96.71	59.1	37.71	84.00	Pass
13.567_13.710	13.568	90.67	59.1	31.57	50.47	Pass
13.710_14.010	13.771	73.11	59.1	14.01	40.51	Pass



Frequency Stability

Engineer: Poona Saber

Test Date: 16/19/19

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

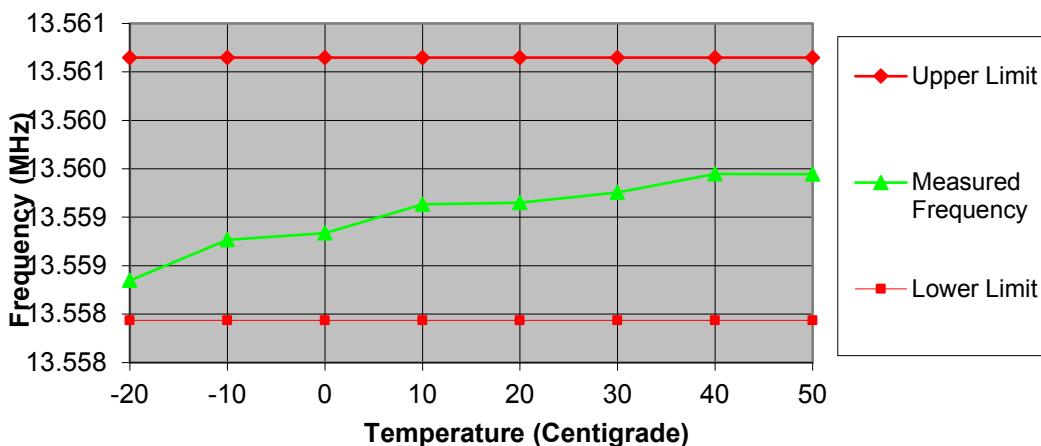
Lower Limit: 13.5579357 MHz

Upper Limit: 13.5606476 MHz

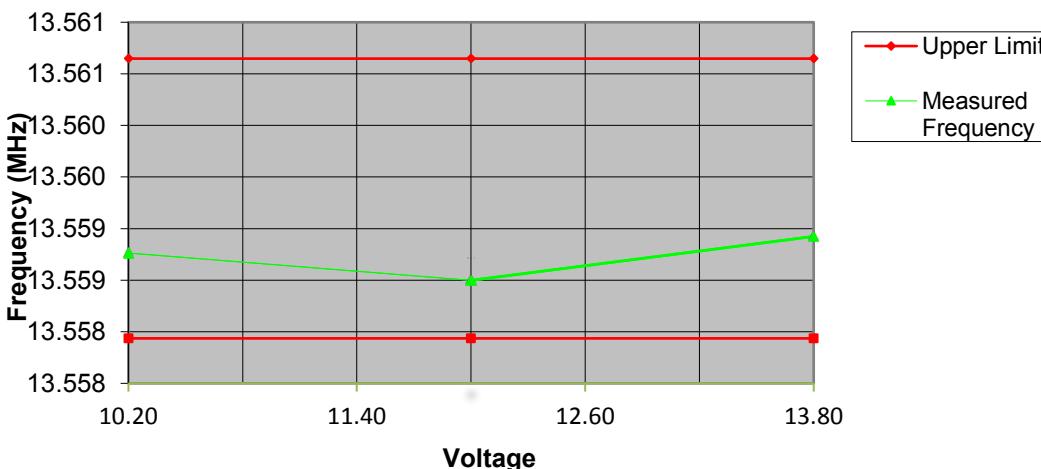
Test Setup



Frequency Stability vs. Temperature



Frequency Stability vs. Voltage





Radiated Emissions

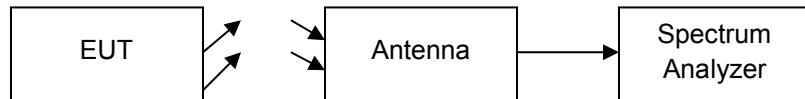
Engineer: Poona Saber

Test Date: 6/18/19

Test Procedure

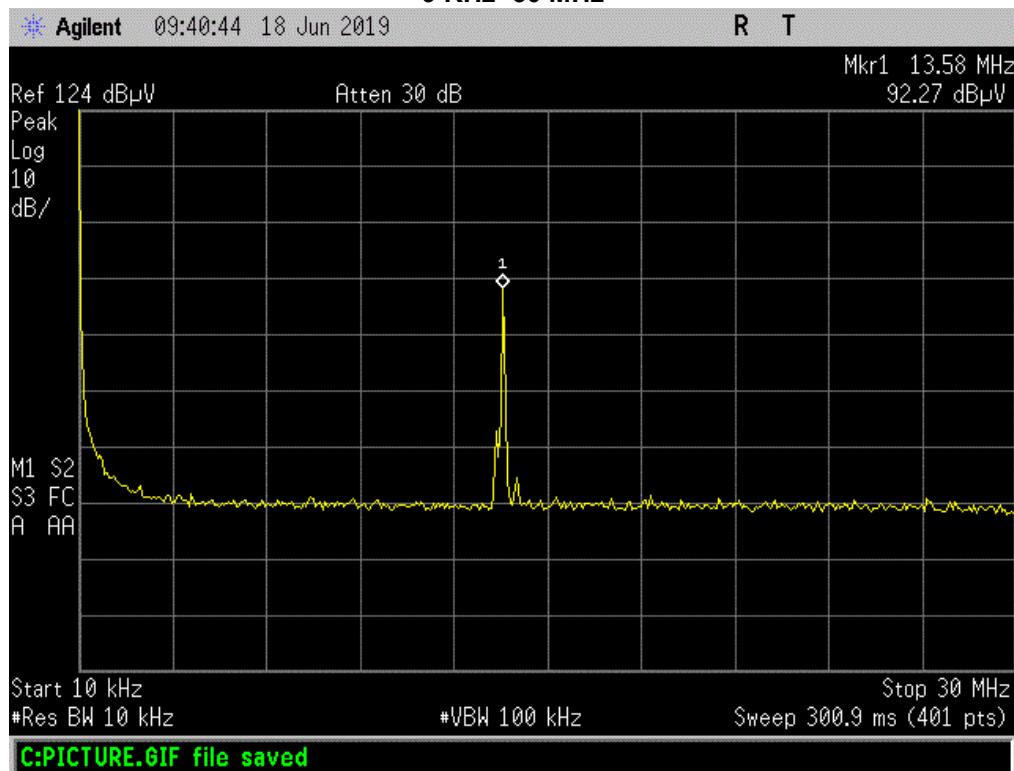
The EUT was tested in a semi-anechoic chamber at a distance of 3 meters from the receiving antenna. A spectrum analyzer was used to verify that the UUT met the requirements for Radiated Emissions of 15.209. The spectrum was examined from 9kHz to 1 GHz and except for the fundamental there were no other emissions detected above the noise floor.

Test Setup



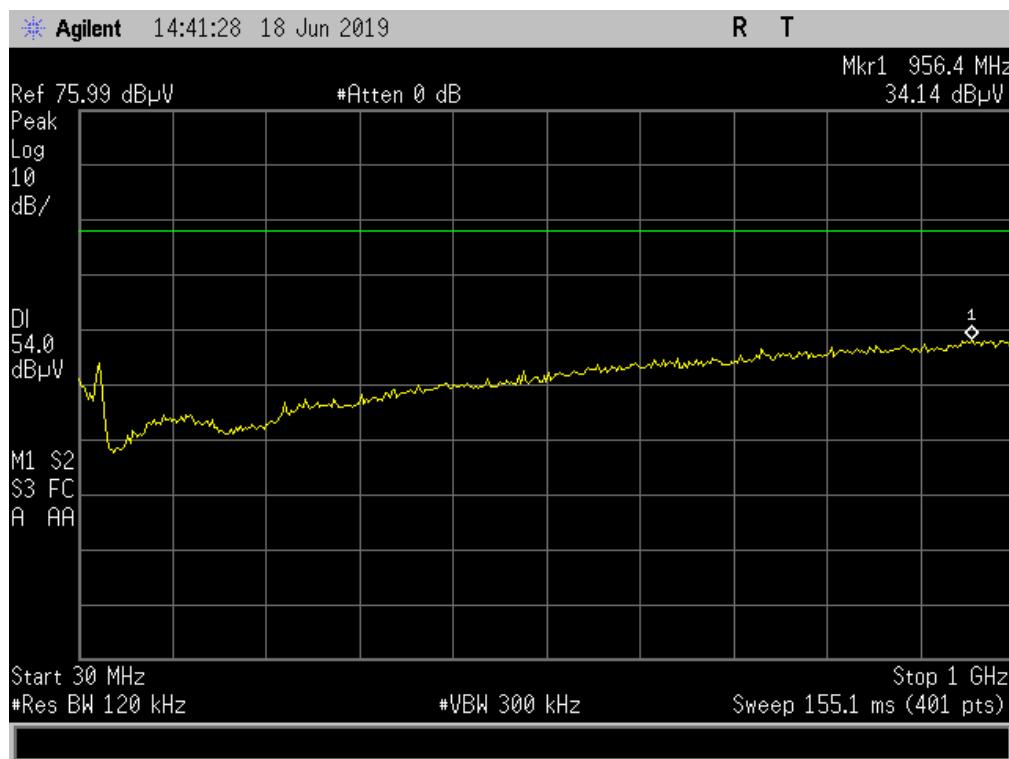
Radiated Emissions

9 KHz- 30 MHz





30 MHz-1GHz





Powerline Conducted Emissions

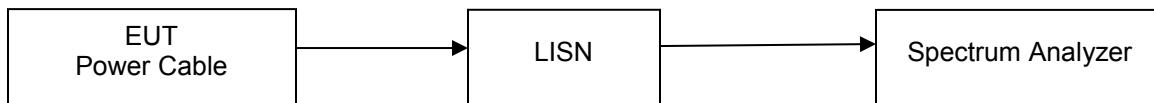
Engineer: Poona Saber

Test Date: 6/21/19

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.

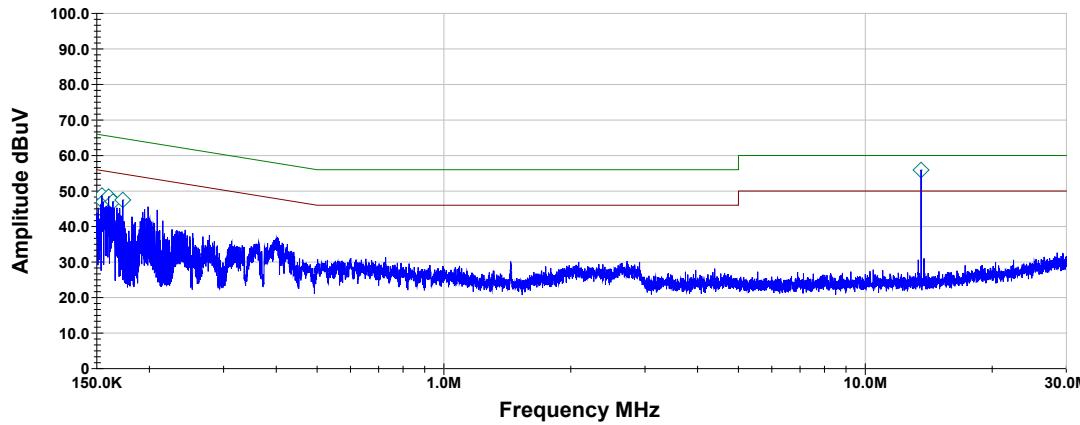
Test Setup



Line 1 Peak Plot

Compliance Testing
Conducted Emissions - Class B
Line 1 (Neutral)

- Points of Interest
- Corrected Peak Data
- CISPRB_QP
- CISPRB_AV



Operator: PS

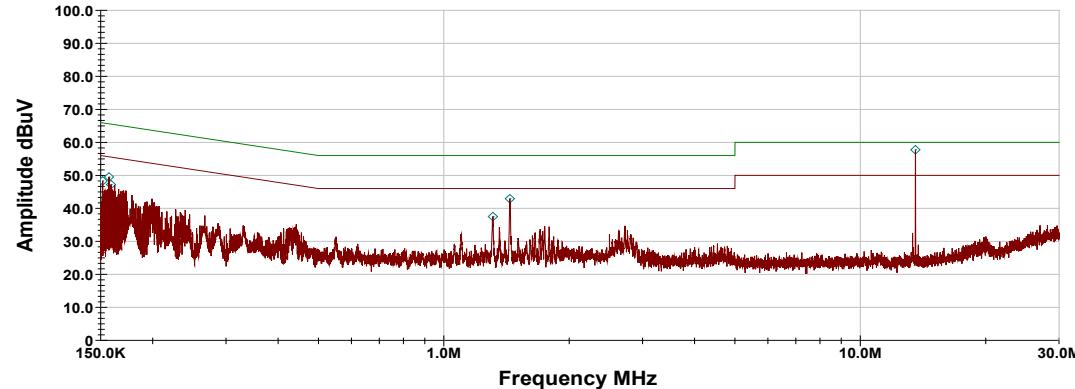
EN55032 Class B_85462 EMI Rec_V7_ACTIVE.til

Job #:

Line 2 Peak Plot

Compliance Testing
Conducted Emissions - Class B
Line 2 (Phase)

- Points of Interest
- Corrected Peak Data
- CISPRB_QP
- CISPRB_AV



Operator: PS

EN55032 Class B_85462 EMI Rec_V7_ACTIVE.til

Job #:



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)
150.65 KHz	12.94	0.29	0.02	10.2	23.453	55.981	-32.528
152.05 KHz	13.27	0.28	0.02	10.2	23.773	55.941	-32.169
159.01 KHz	13.17	0.21	0.02	10.2	23.6	55.743	-32.143
159.13 KHz	13.13	0.21	0.02	10.2	23.559	55.739	-32.18
161.21 KHz	14.44	0.2	0.02	10.188	24.848	55.68	-30.832
13.56 MHz	34.75	0	0.18	10.2	45.13	50	-4.87

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)
150.05 KHz	13.15	0.3	0.02	10.2	23.666	55.999	-32.332
150.13 KHz	13.48	0.3	0.02	10.2	23.999	55.996	-31.998
155.2 KHz	13.24	0.25	0.02	10.2	23.708	55.851	-32.143
1.31 MHz	21.99	0	0.046	10.1	32.139	46	-13.861
1.4398 MHz	27.09	0	0.052	10.1	37.239	46	-8.761
13.56 MHz	33.43	0	0.18	10.2	54.37	50	-6.19

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)
150.65 KHz	32.44	0.294	0.02	10.2	42.953	65.981	-23.028
152.05 KHz	32.58	0.28	0.02	10.2	43.079	65.941	-22.862
159.01 KHz	32.73	0.21	0.02	10.2	43.16	65.743	-22.583
159.13 KHz	32.72	0.209	0.02	10.2	43.149	65.739	-22.59
161.21 KHz	33	0.2	0.02	10.188	43.408	65.68	-22.272
13.56 MHz	47.5	0	0.18	10.2	57.88	60	-2.12

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)
150.05 KHz	32.37	0.3	0.02	10.2	42.889	65.999	-23.109
150.13 KHz	32.4	0.3	0.02	10.2	42.919	65.996	-23.078
155.2 KHz	32.48	0.25	0.02	10.2	42.948	65.851	-22.903
1.31 MHz	25.15	0	0.046	10.1	35.296	56	-20.704
1.4398 MHz	31.29	0	0.052	10.1	41.442	56	-14.558
13.56 MHz	46.86	0	0.18	10.2	57.24	60	-2.76



99% Occupied Bandwidth

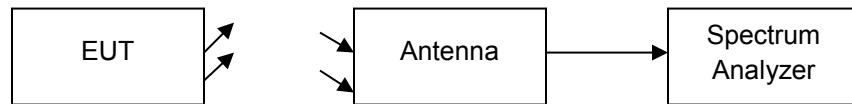
Engineer: Poona Saber

Test Date: 6/18/19

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.

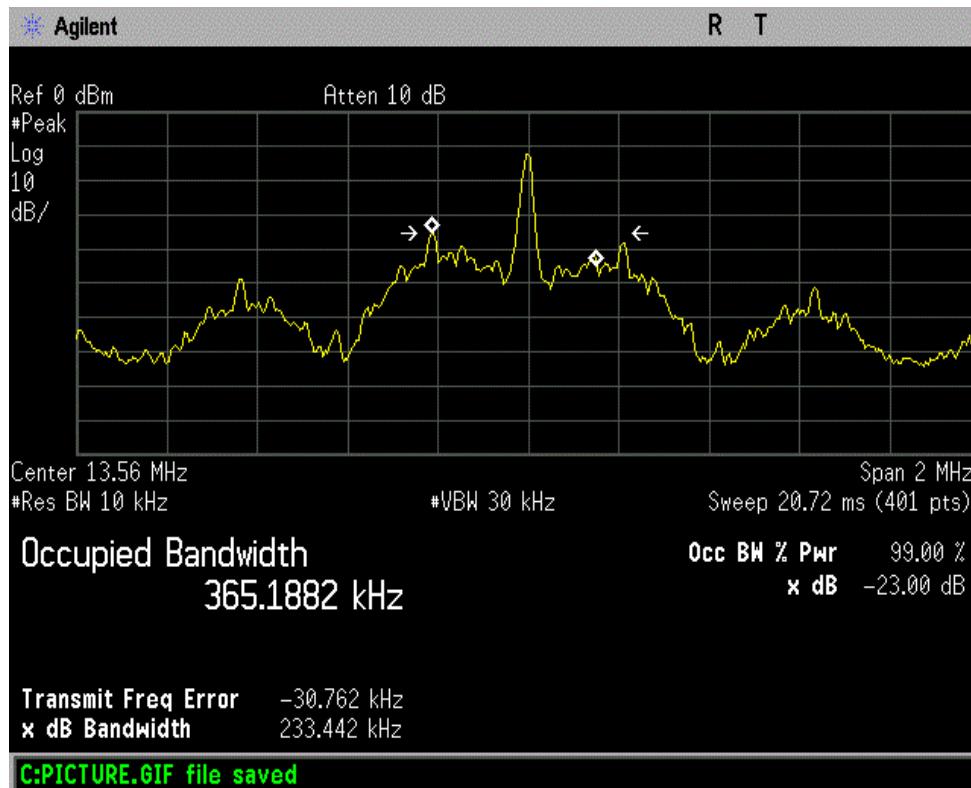
Test Setup



99% Bandwidth Summary

Frequency (MHz)	Recorded Measurement (KHz)
13.56	365.1

Plot





Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Temperature Chamber	Tenney	Tenney Jr	i00027	Verified on: 6/19/19	
EMI Receiver	HP	8546A	i00033	4/2/19	4/2/20
Transient Limiter	Com-Power	LIT-153	i00123	Verified on: 6/21/19	
Active Loop Antenna	EMCO	6507	i00326	9/25/17	9/25/19
PSA Spectrum Analyzer	Agilent	E4445A	i00471	10/16/18	10/16/19
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	1/17/19	1/17/21
AC Power Source	Behlman	BL 6000	i00362	Verified on: 6/21/19	
EMI Analyzer	Agilent	E7405A	i00379	1/16/19	1/16/20
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	8/15/16	8/15/19
LISN	COM-Power	LI-125A	i00446	10/19/18	10/19/20
LISN	COM-Power	LI-125A	i00448	10/19/18	10/19/20

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



Test Setup Photos
FCC ID: 11223344

RF Conducted #1



RF Radiated 9KHz-30 MHz





Compliance Testing, LLC
Testing since 1963

Radiated 30MHz-1GHz

