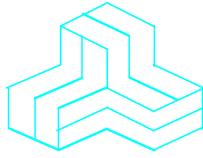


ENGINEERING TEST REPORT



IXM TOUCH ENXP
Model: IXM201
FCC ID: S38-TSEXP

Applicant:

Invoxium Access Inc.
#5 – 205 Riviera Drive
Markham, Ontario
Canada L3R 5J8

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C
Unlicensed Low Power Transmitter Operating in the Band 13.110-14.010 MHz

UltraTech's File No.: 16INVX027_FCC15C225

This Test report is Issued under the Authority of
Tri M. Luu
Vice President of Engineering
UltraTech Group of Labs

Date: February 10, 2016

Report Prepared by: Dan Huynh

Tested by: Hung Trinh

Issued Date: February 10, 2016

Test Date(s): Sep. 23 & Oct. 4, 2014

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

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NVLAP LAB
CODE 200093-0



AT-1945



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Korea
KCC-RRA

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TL363_B



TPTDP
DA1300

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Sec. 15.225 - Operation within the band 13.110 – 14.010 MHz.
Title:	Code of Federal Regulations (CFR), Title 47 Telecommunication, Part 15, Subpart C - Intentional Radiators
Purpose of Test:	Equipment Certification for FCC Part 15C.
Test Procedures:	ANSI C63.4 and ANSI C63.10
Environmental Classification:	Commercial, industrial or business environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC 47 CFR 15	2015	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
ANSI C63.4	2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
CISPR 22 & EN 55022	2008-09, Edition 6.0 2006	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement

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EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

Applicant	
Name:	Invixium Access Inc.
Address:	#5 – 205 Riviera Drive Markham, Ontario Canada L3R 5J8
Contact Person:	Shiraz Kapadia Phone #: 647-282-1745 (M) Fax #: N/A Email Address: skapadia@invixium.com

Manufacturer	
Name:	Mara Technologies Inc.
Address:	5680 14th Avenue Markham, Ontario Canada L3S 3K8
Contact Person:	Matthew Ruscica Phone #: 1-905-201-1787 Fax #: 1-905-201-9114 Email Address: matthew@maratech.ca

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Invixium Access Inc.
Product Name:	IXM TOUCH ENXP
Model Name or Number:	IXM201
Serial Number:	Test sample
Type of Equipment:	Part 15 Low Power Communication Device Transmitter
Input Power Supply Type:	12-24V DC external power supply
Primary User Functions of EUT:	Identifies person, either by fingerprint matching, or by card (proximity or contactless smart card), or typing PIN. Sends result of identification to Access Control Panel, or to Time and Attendance software application, or to a Smart Home controller.

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Intended Operating Environment:	Commercial, light industry & heavy industry
Power Supply Requirement:	5V, 3.3V DC
Field Strength:	55.11 dBµV/m at 3 m
Operating Frequency Range:	13.56 MHz
RF Output Impedance:	50 Ω
20 dB Bandwidth:	1.52 kHz
Modulation Type:	ASK
Oscillator Frequencies:	125 kHz and 27.12 MHz
Antenna Connector Type:	Integral

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Wiegand Output (to Access Control Panel), 2 lines	1	Header	Non-shielded
2	Wiegand Input (from external RFID), 2 lines	1	Header	30cm, non-shielded
3	Ethernet !00 BASETX	1	RJ-45 on cable	Non-shielded
4	RS-485 (slave), 2 lines	1	Header	Non-shielded
5	RS-232, 2 lines (Service Port)*	1	DB-9, socket on cable	Non-shielded
6	Form C Relay, 3 lines	1	Header	Non-shielded
7	GPO, 4 lines	1	Header	Non-shielded
8	GPI, 8 lines	1	Header	Non-shielded
9	GND, 5 lines	1	Header	Non-shielded
10	USB OTG (Service Port)*	1	USB-Micro-AB	Shielded (service port)
11	Power Input (12-24V)	1	Header	Non-shielded
12	EGND	1	Header	Non-shielded

* Used for service by administrator only.

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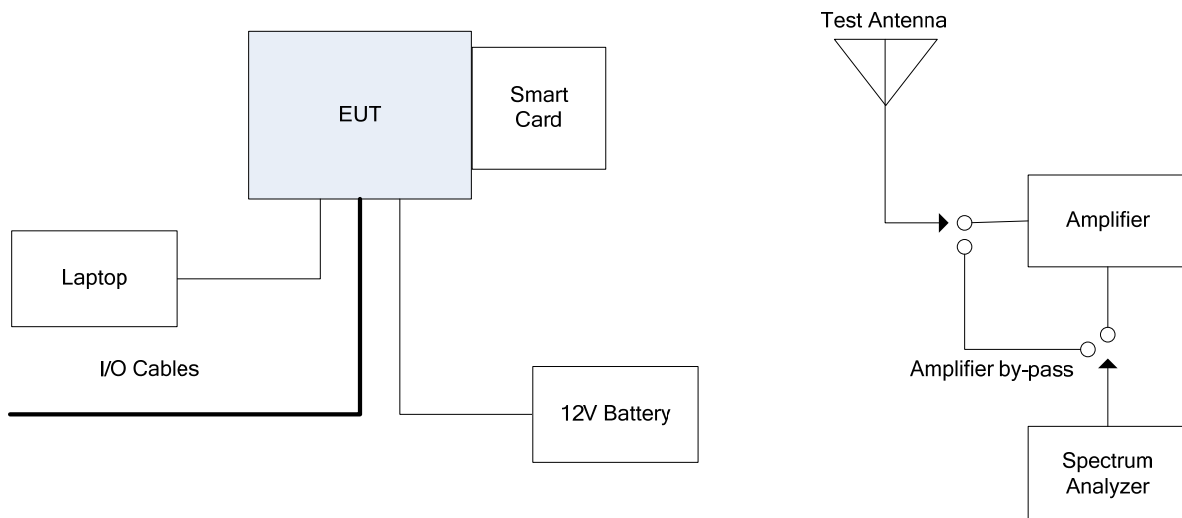
2.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Smart Card
Brand Name:	MIFARE, DESFire
Model Name or Number:	1440 MGGMN
Serial Number:	N/A
Cable Length & Type:	N/A
Connected to EUT's Port:	N/A

2.6. GENERAL TEST SETUP

2.6.1. Radiated Emission Test Setup



2.6.2. Frequency Stability Test Setup

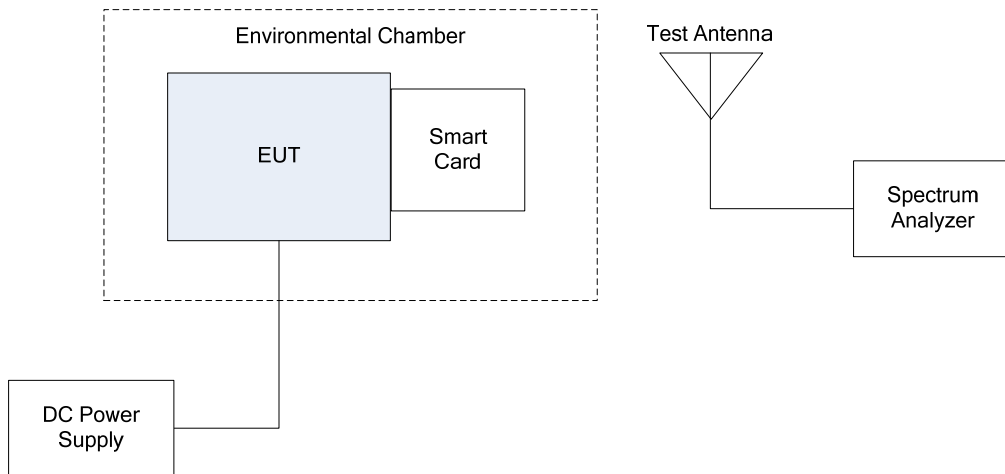


EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	12-24 VDC

3.2. OPEPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The EUT was configured for continuous transmission for the duration of testing.
Special Test Software:	N/A
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT was tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment.

Transmitter Test Signals:	
Frequency Band(s):	13.56 MHz
Test Frequency(ies):	13.56 MHz
Transmitter Wanted Output Test Signals:	
▪ RF Power Output (measured maximum output power):	55.11 dBµV/m at 3 m
▪ Normal Test Modulation:	ASK
▪ Modulating signal source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).
- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2017-04-02.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Regulations	Test Requirements	Compliance (Yes/No)
15.203 & 15.204	The transmitter shall use a transmitting antenna that is an integral part of the device	Yes*
15.207(a)	Class B - Power Line Conducted Emissions	Yes**
15.215(c)	Emission Bandwidth	Yes
15.225(a) – (d)	Field Strength of Emissions Inside and Outside the Permitted Band 13.110 - 14.010 MHz	Yes
15.225(e)	Frequency Stability	Yes

* The EUT complies with the requirement; it employs integral antenna.

** Refer to attestation letter from the Applicant.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

The following were made for compliance:

The device shall be installed with a Steward Ferrite on Ethernet and DC power line cables in order to meet the limit of radiated emissions. Part # 28A2432 will be used for Ethernet wires with 2 ½ turns. Part # 28A3039 will be used for DC power line wires with 2 ½ turns.



EXHIBIT 5. TEST DATA

5.1. EMISSION BANDWIDTH

5.1.1. Limit(s)

The 20 dB bandwidth of the emission shall be contained within the band 13.110–14.010 MHz.

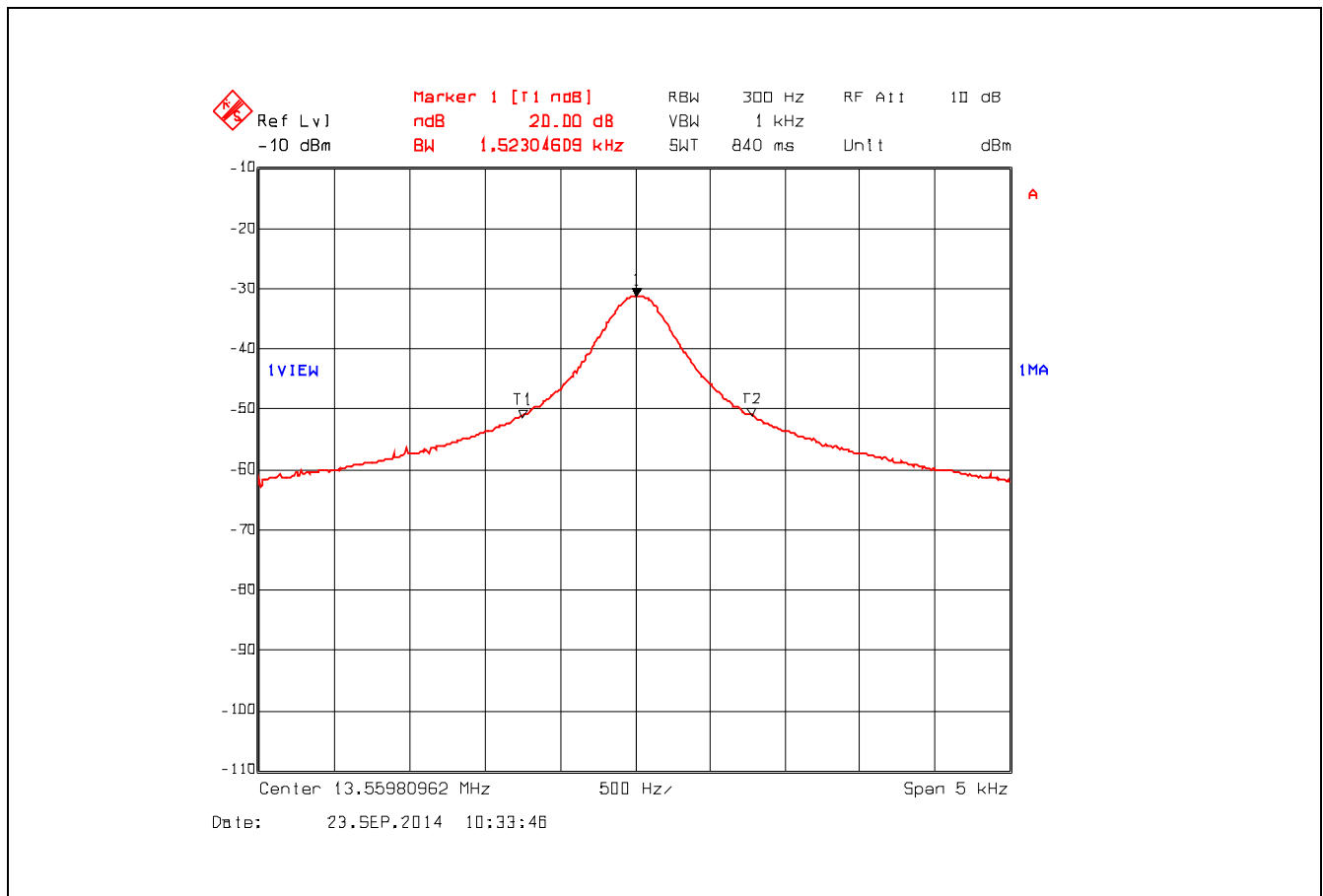
5.1.2. Method of Measurements

The measurements were performed in accordance with Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4.

5.1.3. Test Data

Test Frequency (MHz)	Occupied Bandwidth (kHz)	
	20 dB BW	99 % BW
13.56	1.52	2.65

Plot 5.1.3.1. 20 dB Bandwidth, Fc: 13.56 MHz



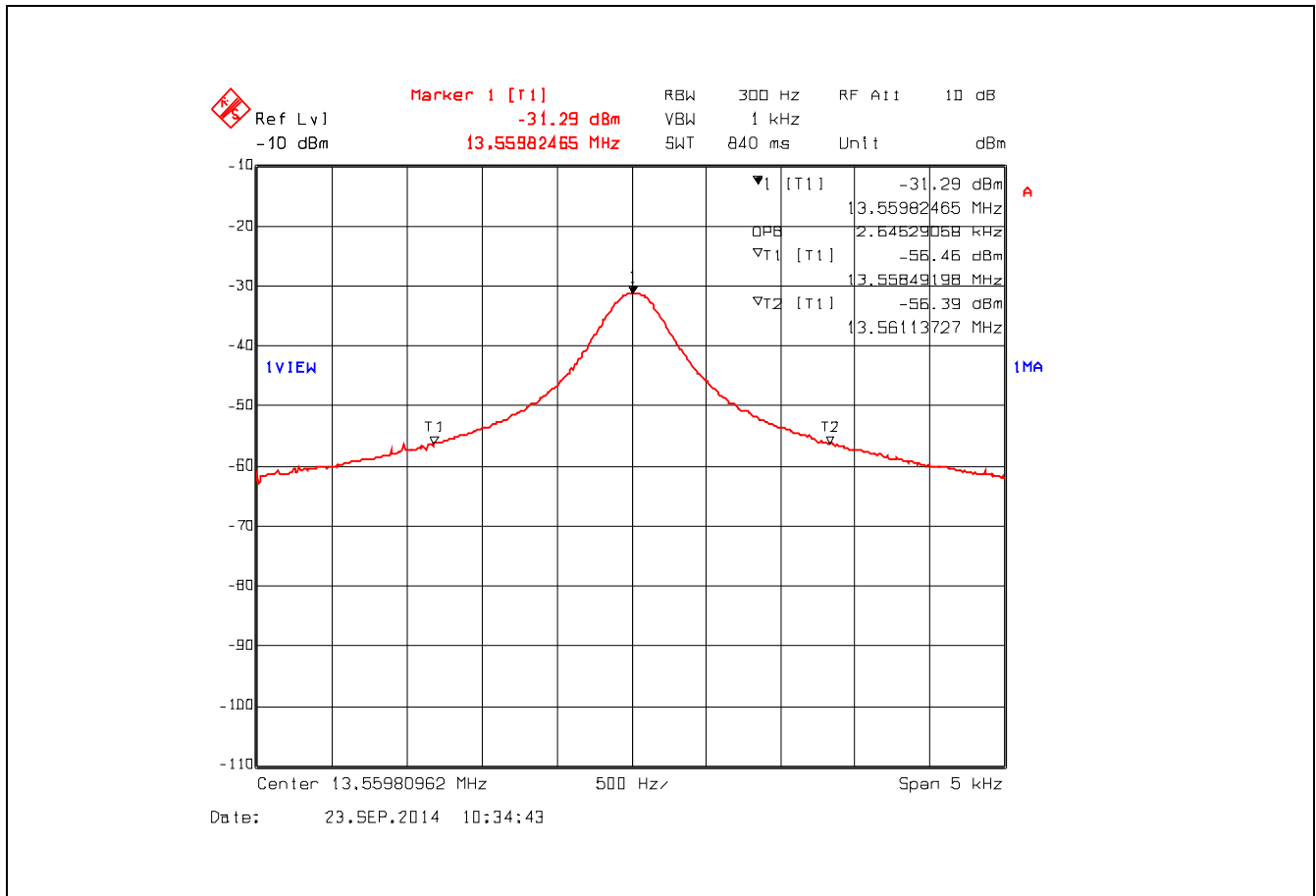
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Plot 5.1.3.2. 99% Occupied Bandwidth, Fc: 13.56 MHz



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5.2. FIELD STRENGTH OF EMISSIONS WITHIN & OUTSIDE THE PERMITTED BAND 13.110-14.010 MHz [47 CFR 15.225 (a) to (d)]

5.2.1. Limits

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

47 CFR 15.209(a) – Radiated Emission Limits; general requirements

Frequency (MHz)	Field Strength Limits (microvolts/m)	Distance (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.2.2. Method of Measurements

ANSI C63.10 and ANSI C63.4 for measurement methods.

5.2.3. Test Data

Remarks:

- Radiated spurious emissions measurements were performed at a measuring distance of 3 m, from 10 kHz – 10th harmonic of the fundamental and all spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- For frequencies below 30 MHz, the results measured at 3 m distance shall be extrapolated to the specified distance using an extrapolation factor of 40 dB/decade for determining compliance.

5.2.3.1. Field Strength of Emissions Within the Permitted Band at 3 m

Frequency (MHz)	Measured Field Strength @ 3 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Field Strength Extrapolated Value (dBµV/m)	§ 15.225 Field Strength Limits (dBµV/m)	Margin (dB)
13.56	55.11	Peak	V	15.1	84.0	-68.9
13.56	49.25	Peak	H	9.3	84.0	-74.8

5.2.3.2. Field Strength of Emissions Outside the Permitted Band Below 30 MHz at 3 m

Frequency (MHz)	Measured Field Strength @ 3 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Field Strength Extrapolated Value (dBµV/m)	§ 15.209 Field Strength Limits (dBµV/m)	Margin (dB)
All spurious emissions are more than 20 dB below the specified limit.						

5.2.3.3. Field Strength of Emissions Outside the Permitted Band at or Above 30 MHz at 3 m

Frequency (MHz)	Measured Field Strength @ 3 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	§ 15.209 Field Strength Limits (dBµV/m)	Margin (dB)
67.80	26.80	Peak	V	40.0	-13.2
67.80	20.21	Peak	H	40.0	-19.8
94.92	29.31	Peak	V	43.5	-14.2
108.48	27.00	Peak	V	43.5	-16.5

5.3. FREQUENCY STABILITY [47 CFR 15.225(e)]

5.3.1. Limit(s)

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C 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 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.3.2. Method of Measurements

ANSI C63.10.

5.3.3. Test Data

Frequency Band:	13.56 MHz
Center Frequency:	13.56 MHz
Frequency Tolerance Limit:	$\pm 0.01\%$ (± 1356 Hz)
Max. Frequency Tolerance Measured:	+200 Hz
Input Voltage Rating:	12-24 VDC on DC input

Ambient Temperature (°C)	Frequency Drift (Hz)		
	Supply Voltage (Nominal) 12 VDC	Supply Voltage (85 % of Nominal) 10.2 VDC	Supply Voltage (115% of Nominal) 27.6 VDC
-20	+40	--	--
-10	+10	--	--
0	0	--	--
+10	-10	--	--
+20	0	0	0
+30	+40	--	--
+40	+20	--	--
+50	+120	--	--
+60	+200	--	--

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EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz	08 Nov 2014
Loop Antenna	EMCO	6502	9104-2611	10 kHz – 30 MHz	27 Aug 2015
Spectrum Analyzer	Rohde & Schwarz	ESU40	100037	20 Hz – 40 GHz	05 Apr 2015
RF Amplifier	AH System	PAM-0118	225	20 MHz – 18 GHz	07 Apr 2015
Biconi-Log Antenna	ETS Lindgren	3142C	26873	26 – 3000 MHz	14 Apr 2015
Environmental Chamber	Envirotronics	SSH32C	11994847-S-11059	-60 to 177 °C	01 May 2015

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EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.79	± 5.2

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.78	± 5.2

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.87	Under consideration
U	Expanded uncertainty U: $U = 2u_c(y)$	± 3.75	Under consideration

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