ENGINEERING TEST REPORT

IXM SENSE PROXL
Model: IXM122
FCC ID: S38-TSPROX

Applicant:

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

In Accordance With
Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.209

UltraTech's File No.: 16INVX028_FCC15C209

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 Issued Date: February 10, 2016	Tested by: Hung Trinh Test Date(s): September 15, 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.*

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
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

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 SENSE PROXL
Model Name or Number:	IXM122
Serial Number:	Test sample
Type of Equipment:	Part 15 Low Power Transmitter Below 1705 kHz
Input Power Supply Type:	12-24V DC external power supply
Primary User Functions of EUT:	Identifies person, either by fingerprint matching, or by proximity card, or both. Sends result of identification to Access Control Panel, or to Time and Attendance software application., or to Smart Home controller

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Intended Operating Environment:	Commercial, light industry & heavy industry
Power Supply Requirement:	5V DC
RF Output Power Rating:	53.85 dBµV/m peak at 3m distance
Operating Frequency Range:	125 kHz
20 dB Bandwidth:	1.21 kHz
Modulation Type:	Unmodulated carrier
Oscillator Frequencies:	125 kHz
Antenna Connector Type:	720 uH coil,125 kHz, Air Tuned Antenna

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.

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:	Proximity Card
Brand Name:	HID
Model Name or Number:	Prox Card II
Serial Number:	N/A
Cable Length & Type:	N/A
Connected to EUT's Port:	N/A

2.6. TEST SETUP BLOCK DIAGRAM

2.6.1. Radiated Emission Test Setup

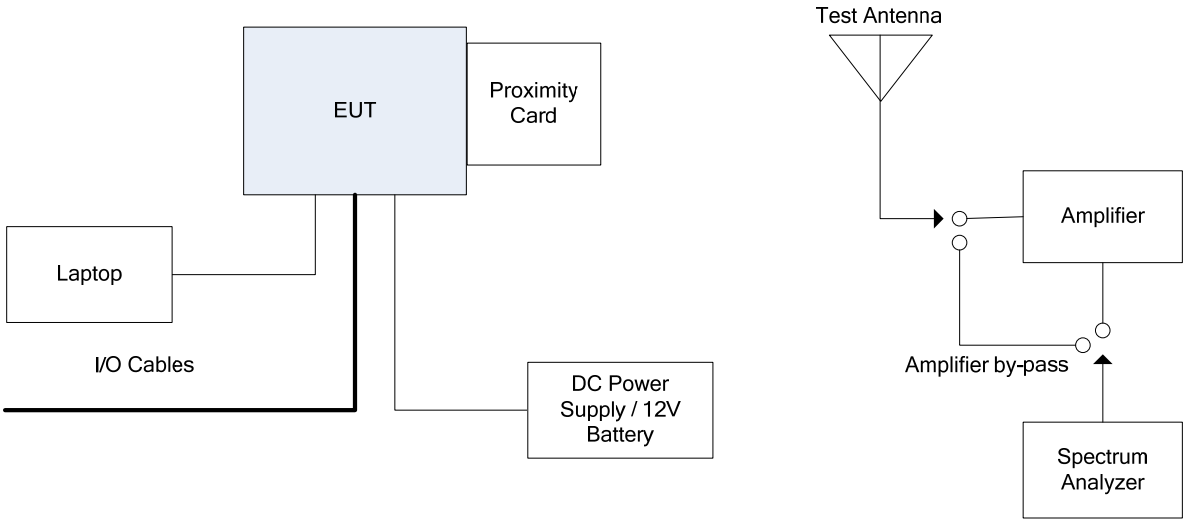

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

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. OPERATIONAL 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):	125 kHz
Test Frequency(ies):	125 kHz
RF Power Output:	53.85 dBµV/m peak at 3m distance
Normal Test Modulation:	Unmodulated carrier
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 Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna Requirement	Yes*
15.207(a)	Power Line Conducted Emissions	Yes**
15.209(a)	20 dB Bandwidth	Yes
15.209	Transmitter Radiated Emissions - Fundamental, Harmonic and Spurious Emissions	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 device shall be installed with 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.

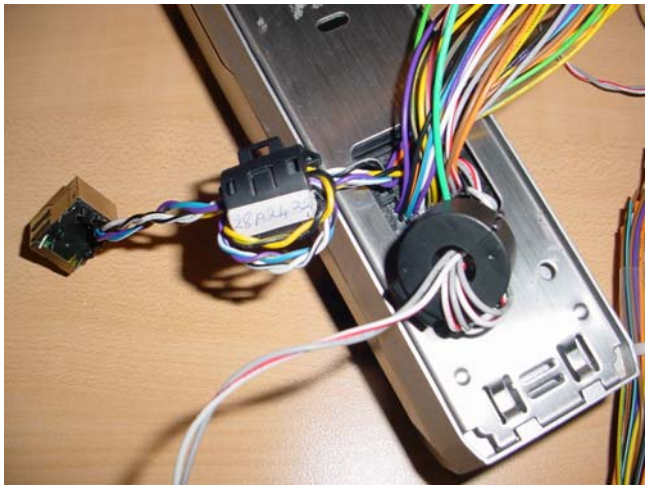

EXHIBIT 5. TEST DATA

5.1. TRANSMITTER RADIATED EMISSIONS [47 CFR §§ 15.209 & 15.205]

5.1.1. Limit(s)

§ 15.209 Radiated emission limits; general requirements.

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permItted under other sections of this part, e.g., §§ 15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

(f) In accordance with § 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in § 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in § 15.205, the limit

on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in § 15.109 that are applicable to the incorporated digital device.

(g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

5.1.2. Method of Measurements

ANSI C63.4 for measurement methods.

5.1.3. Test Data

Remarks:

- The measuring receiver shall be tuned over the frequency range 10 kHz to 1 GHz.
- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- EUT was initially tested at 3m and the value measured at 3m shall be extrapolated as applicable to compare with limit and measurement distance specified in section 15.209(a).
- Extrapolation factor of 40dB/decade shall be used for frequencies below 30 MHz.

5.1.3.1. Fundamental Emissions

Remarks:
- Field strength limit of the fundamental 125 kHz at 300m distance is 20*log(2400/125) = 25.7 dBµV/m
- For frequency band 0.009- 0.490 MHz, the measured E-Field at 3m (column 2) will be extrapolated to 300m E-Field Level (column 3) using the extrapolation factor of 40*log(3/300) = -80 dB

Frequency (MHz)	Peak E-Field @ 3m (dBµV/m)	Extrapolated E-Field Level @ 300m (dBµV/m)	Antenna Plane (H/V)	§ 15.209 (a) Limits @ 300m (dBµV/m)	Margin (dB)
0.125	53.85	-26.15	V	25.7	-51.9
0.125	51.23	-28.77	H	25.7	-54.5

5.1.3.2. Harmonic/Spurious Emissions

Remarks:

- For frequency band 0.009- 0.490 MHz, the measured E-Field at 3m (column 2) will be extrapolated to 300m E-Field Level (column 3) using the extrapolation factor of 40*log(3/300) = -80 dB
- For frequency bands 0.490-1.705 MHz and 1.705-30.0 MHz, the measured E-Field at 3m (column 2) will be extrapolated to 30m E-Field Level (column 3) using the extrapolation factor of 40*log(3/30) = -40 dB

Frequency (MHz)	Peak E-Field @ 3m (dBµV/m)	Extrapolated E-Field Level (dBµV/m)	Antenna Plane (H/V)	§ 15.209 (a) Limits (dBµV/m)	Margin (dB)
0.009 - 0.490	*	*	H / V	*	*
0.490 - 1.705	*	*	H / V	*	*
1.705 - 30.0	*	*	H / V	*	*

* No emissions or harmonics were detected within 20 dB of the limit.

5.2. 20 dB BANDWIDTH [47 CFR 15.209 (a)]

5.2.1. Limit(s)

Emission bandwidth shall not be located in the restricted bands in 15.205 and the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

5.2.2. Method of Measurements

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

5.2.3. Test Data

Channel Frequency	20 dB Bandwidth
125 kHz	1.21 kHz

See the following plot for details.

Plot 5.2.3.1. 20 dB Bandwidth, Fc: 125 kHz

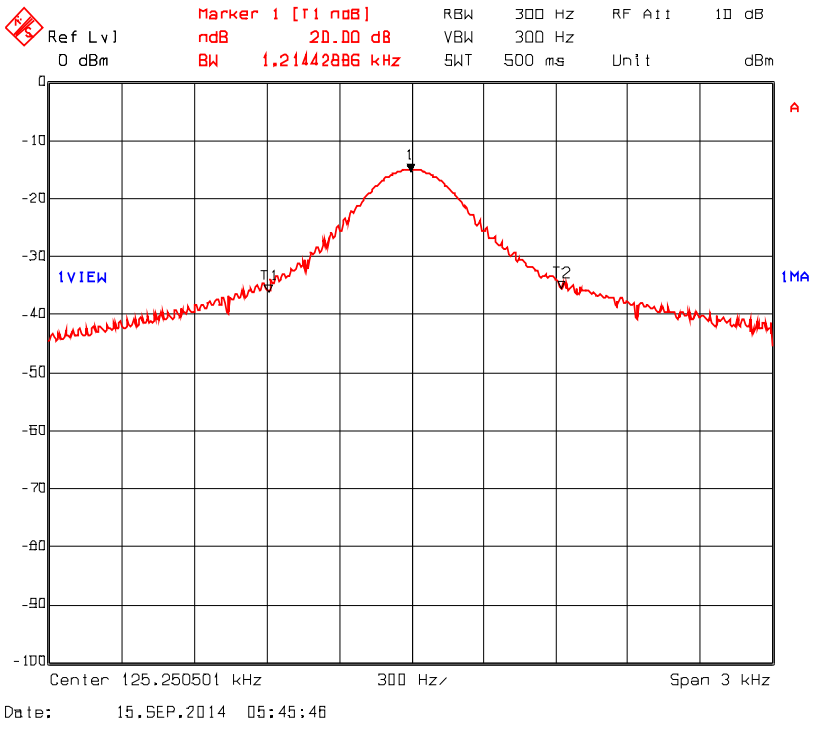

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
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
Loop Antenna	EMCO	6502	9104-2611	10 kHz – 30 MHz	27 Aug 2015
Biconi-Log Antenna	ETS Lindgren	3142C	26873	26 – 3000 MHz	14 Apr 2015
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz	08 Nov 2014

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**