

# EMC TEST REPORT – 369522-1TRFEMC

Applicant:

**Swift Labs Inc.**

Product name:

**Ambush IQ**

Model:

**Ambush IQ**

Specifications:

- ◆ FCC 47 CFR Part 15, Subpart B – Verification
- ◆ ICES-003 Issue 6 January 2016

Date of issue: April 29, 2019

Test engineer(s):

Signature:



Kevin Rose, Wireless/EMC Specialist

Reviewed by:

Signature:

Andrey Adelberg, Senior Wireless/EMC Specialist



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The tests included in this report are within the scope of this accreditation

[www.nemko.com](http://www.nemko.com)

## Lab and test locations

Company name	Nemko Canada Inc.			
Facilities	Ottawa site:	Montréal site:	Cambridge site:	Almonte site:
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Test site registration	Organization	Recognition numbers and location		
	FCC/ISED	CA2040 (Ottawa/Almonte); CA2041 (Montreal); CA0101 (Toronto)		
Website	<a href="http://www.nemko.com">www.nemko.com</a>			

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Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

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## Section 1 Report summary

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### 1.1 Test specifications

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FCC 47 CFR Part 15, Subpart B – Verification	Title 47: Telecommunication; Part 15—Radio Frequency Devices
ICES-003 Issue 6 January 2016	Information Technology Equipment (ITE) – Limits and methods of measurement

### 1.2 Exclusions

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None

### 1.3 Statement of compliance

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In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

### 1.4 Test report revision history

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**Table 1.4-1:** Test report revision history

Revision #	Date of issue	Details of changes made to test report
TRF	April 29, 2019	Original report issued

## Section 2 Summary of test results

### 2.1 Testing period

Test start date	March 20, 2019
Test end date	March 20, 2019

### 2.2 Test results

**Table 2.2-1:** Result summary for emissions

Standard	Clause	Test description	Verdict
FCC 47 CFR Part 15, Subpart B	§15.109	Radiated emissions limits <sup>1</sup>	Pass
ICES-003 Issue 6	6.2	Radiated Emissions Limits <sup>1</sup>	Pass

Notes: <sup>1</sup> Product classification B

## Section 3 Equipment under test (EUT) details

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### 3.1 Applicant

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Company name	Swift Labs Inc.
Address	137 Glasgow Street, Suite 490, Kitchener, Ontario, Canada N2G 4X8

### 3.2 Manufacture

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Company name	SmartWave Technologies Inc.
Address	1 Marmac Drive, Toronto, ON, M9W 1E7, Canada

### 3.3 Sample information

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Receipt date	March 20, 2019
Nemko sample ID number	# 1

### 3.4 EUT information

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Product name	Ambush IQ
Model	Ambush IQ
Serial number	None
Power requirements	3 V <sub>DC</sub> (via two batteries)
Description/theory of operation	The unit is powered on continuously and run production firmware.
Operational frequencies	38.4 MHz
Software details	V1.18

### 3.5 EUT setup details

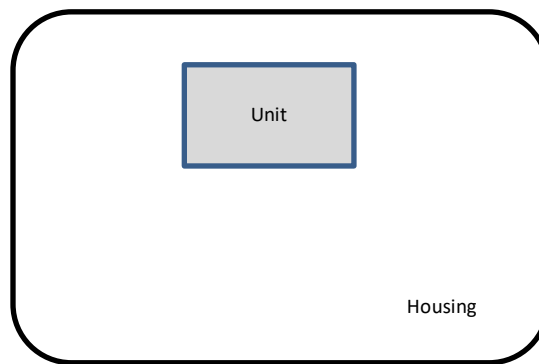
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**EUT description of the methods used to exercise the EUT and all relevant ports:**

- The unit is settled in a plastic housing.
- The unit is powered on continuously and run production firmware.

**EUT setup/configuration rationale:**

- The EUT setup in a configuration that was expected to produce the highest amplitude emissions relative to the limit and that satisfy normal operation/installation practice by the end user.
- The type and construction of cables used in the measurement set-up were consistent with normal or typical use. Cables with mitigation features (for example, screening, tighter/more twists per length, ferrite beads) have been noted below:
  - None
- The EUT was setup in a manner that was consistent with its typical arrangement and use. The measurement arrangement of the EUT, local AE and associated cabling was representative of normal practice. Any deviations from typical arrangements have been noted below:
  - None



**Figure 3.5-1: block diagram**

## Section 4 Engineering considerations

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### 4.1 Modifications incorporated in the EUT for compliance

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There were no modifications performed to the EUT during this assessment.

### 4.2 Technical judgment

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None

### 4.3 Deviations from laboratory tests procedures

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No deviations were made from laboratory procedures.



## Section 5 Test conditions

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### 5.1 Atmospheric conditions

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Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

### 5.2 Power supply range

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The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages  $\pm 5\%$ , for which the equipment was designed.

## Section 6 Measurement uncertainty

### 6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4-2 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Measurement instrumentation uncertainty. The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of  $K=2$  with 95% certainty.

**Table 6.1-1: Measurement uncertainty calculations**

Measurement		$U_{\text{cispr}}$ dB	$U_{\text{lab}}$ dB			
			Ottawa	Montreal	Toronto	Almonte
Conducted disturbance at AC mains and other port power using a V-AMN	(150 kHz to 30 MHz)	3.4	2.3	2.2	2.2	N/A
Radiated disturbance (electric field strength at an OATS or in a SAC)	(30 MHz to 1 GHz)	6.3	5.7	5.5	5.5	5.5
Radiated disturbance (electric field strength in a FAR)	(1 GHz to 6 GHz)	5.2	4.8	5.1	4.8	N/A
Radiated disturbance (electric field strength in a FAR)	(6 GHz to 18 GHz)	5.5	5.1	5.0	4.7	N/A

Notes: Compliance assessment:

If  $U_{\text{lab}}$  is less than or equal to  $U_{\text{cispr}}$  then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit

If  $U_{\text{lab}}$  is greater than  $U_{\text{cispr}}$  then:

- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{\text{lab}} - U_{\text{cispr}})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{\text{lab}} - U_{\text{cispr}})$ , exceeds the disturbance limit

## Section 7 Terms and definitions

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### 7.1 Product classifications definitions

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#### 7.1.1 Title 47: Telecommunication – Part 15-Radio Frequency devices, Subpart A – General – Equipment classification

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Class B digital device	<p>A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public.</p> <p>Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.</p>
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#### 7.1.2 ICES-003 – Equipment classification

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Class B ITE	limits of radio noise for ITE for residential operation
Conditions	<p>Only ITE intended strictly for non-residential use in commercial, industrial or business environments, and whose design or other characteristics strongly preclude the possibility of its use in a residential environment, shall be permitted to comply with the less stringent Class A limits.</p> <p>All ITE that cannot meet the conditions for Class A operation shall comply with the Class B limits.</p> <p>The ITE shall comply with both the power line – conducted and the radiated emissions limits within the same Class, with no intermixing.</p>

## 7.2 General definitions

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### 7.2.1 Title 47: Telecommunication – Part 15-Radio Frequency devices, Subpart A – General – Digital device definitions

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Digital device (Previously defined as a computing device)

An unintentional radiator (device or system) that generates and uses timing signals or pulses at a rate in excess of 9,000 pulses (cycles) per second and uses digital techniques; inclusive of telephone equipment that uses digital techniques or any device or system that generates and uses radio frequency energy for the purpose of performing data processing functions, such as electronic computations, operations, transformations, recording, filing, sorting, storage, retrieval, or transfer. A radio frequency device that is specifically subject to an emanation requirement in any other FCC Rule part or an intentional radiator subject to subpart C of this part that contains a digital device is not subject to the standards for digital devices, provided the digital device is used only to enable operation of the radio frequency device and the digital device does not control additional functions or capabilities.

Note: Computer terminals and peripherals that are intended to be connected to a computer are digital devices.

### 7.2.2 ICES-003 – Definitions

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Information technology equipment (ITE)

Information Technology Equipment (ITE) is defined as devices or systems that use digital techniques for purposes such as data processing and computation. ITE is any unintentional radiator (device or system) that generates and/or uses timing signals or pulses having a rate of at least 9 kHz and employs digital techniques for purposes such as computation, display, data processing and storage, and control.

## Section 8 Testing data

### 8.1 Radiated emissions

#### 8.1.1 References and limits

- FCC 47 CFR Part 15, Subpart B: Clause §15.109 (Test method ANSI C63.4:2014)
- ICES-003: Section 6.2

**Table 8.1-1:** Requirements as per FCC Part 15 Subpart B and ICES-003 for radiated emissions for Class B

Frequency range [MHz]	Distance [m]	Measurement	limits
		Detector type/ bandwidth	[dBμV/m]
30–88	3	Quasi Peak/120 kHz	40.0
88–216			43.5
216–960			46.0
960–1000			54.0
>1000	3	Linear average/1 MHz	54.0
		Peak/1 MHz	74.0

Notes: Where there is a step in the relevant limit, the lower value was applied at the transition frequency.

#### 8.1.2 Test summary

Verdict	Pass		
Test date	March 20, 2019	Temperature	21.2 °C
Test engineer	Kevin Rose	Air pressure	982.8 mbar
Test location	Cambridge	Relative humidity	27.1 %

#### 8.1.3 Notes

- The spectral plots are a summation of a vertical and horizontal scan. The spectral scans have been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators).
- Where tabular data has not been provided, no emissions were observed within 10 dB of the specified limit when measured with the appropriate detector.
- Where less than 6 measurements per detector has been provided, fewer than 6 emissions were observed within 10 dB of the specified limit when measured with the appropriate detector.
- The spectrum was scanned to 1 GHz according to the EUT highest digital operating frequency.

**Table 8.1-2:** Maximum frequency test range based on highest digital operating frequency

Highest internal frequency [F <sub>x</sub> ]	Highest measured frequency
F <sub>x</sub> ≤ 108 MHz	1 GHz
108 MHz < F <sub>x</sub> ≤ 500 MHz	2 GHz
500 MHz < F <sub>x</sub> ≤ 1 GHz	5 GHz
F <sub>x</sub> > 1 GHz	5 × F <sub>x</sub> up to a maximum of 40 GHz (ANSI C63.4)

Notes: Highest internal frequency [F<sub>x</sub>] – highest fundamental frequency generated or used within the EUT or highest frequency at which it operates. This includes frequencies which are solely used within an integrated circuit.  
 For FM and TV broadcast receivers F<sub>x</sub> is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.

#### 8.1.4 Setup details

Port under test	Enclosure Port
EUT power input during test	3 V <sub>DC</sub> (via two batteries)
EUT setup configuration	Table top
Test facility	Semi anechoic chamber
Measuring distance	3 m
Antenna height variation	1–4 m
Turn table position	0–360°
Measurement details	A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated and antenna adjusted to maximize radiated emission. Emissions detected within 10 dB or above the limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver/spectrum analyzer settings for frequencies below 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Peak (Preview measurement), Quasi-peak (Final measurement)
Trace mode	Max Hold
Measurement time	100 ms (Peak preview measurement), 100 ms (Quasi-peak final measurement)

**Table 8.1-3: Radiated emissions equipment list**

Equipment	Manufacturer	Model no.	Asset no.	Cal./Ver. cycle	Next cal./ver.
3 m EMI test chamber	TDK	SAC-3	FA003012	1 year	Aug. 22/19
Flush mount turntable	SUNAR	FM2022	FA003006	—	NCR
Controller	SUNAR	SC110V	FA002976	—	NCR
Antenna mast	SUNAR	TLT2	FA003007	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESR26	FA002969	1 year	June 1/19
Bilog antenna (30–2000 MHz)	SUNAR	JB1	FA003009	1 year	Sept. 6/19
50 Ω coax cable	Huber + Suhner	None	FA003047	1 year	Nov 12/19
50 Ω coax cable	Huber + Suhner	None	FA003044	1 year	Nov 12/19

Notes: NCR - no calibration required,

**Table 8.1-4: Radiated emissions test software details**

Manufacturer of Software	Details
Rohde & Schwarz	EMC32, Software for EMC Measurements, Version 10.40.10

## 8.1.5 Test data

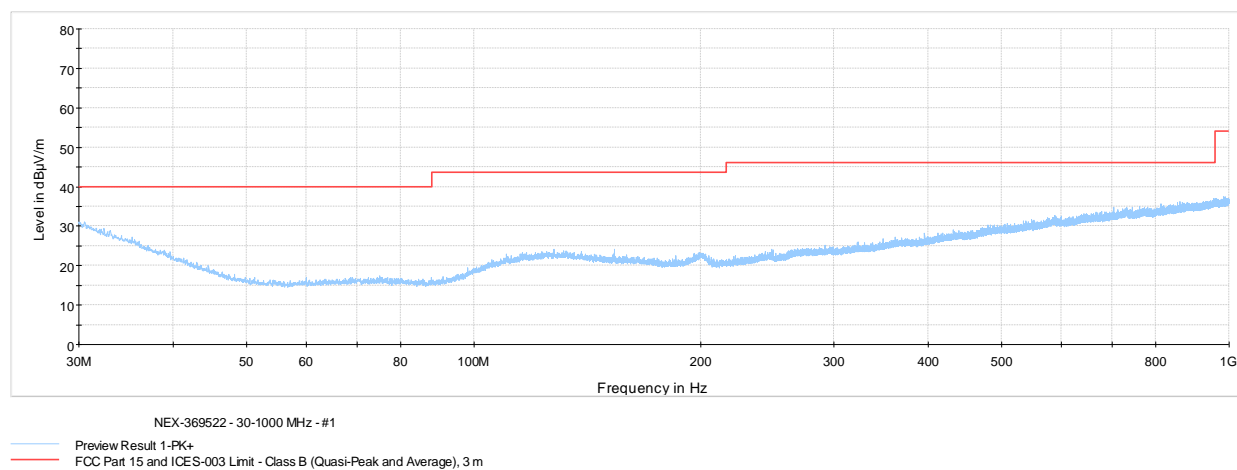


Figure 8.1-1: Radiated emissions spectral plot

8.1.6 Setup photos

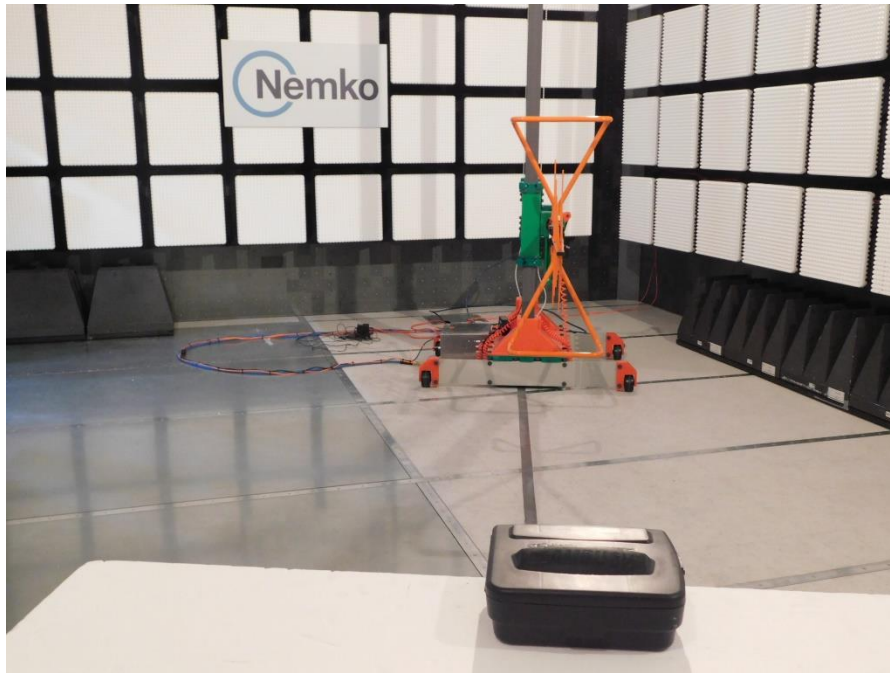


Figure 8.1-2: Radiated emissions setup photo



Figure 8.1-3: Radiated emissions setup photo

End of the test report