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ENGINEERING TEST REPORT # 315001
LSR Job #: C-2140

RF Exposure Compliance of:

BLE-Beacon ID Card

Test Date(s):

February 6-18, 2015

Prepared For:

Danlaw

Attn: Gheorghe Galben

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Novi, MI 48375

This Test Report is issued under the Authority of: Peter Feilen, EMC Engineer

Signature:

Date: 8-18-15

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Prepared For: Nelson Irrigation	Name: VRS(TWIG)
Report: TR 314035	Model: NIC-11543-01
LSR: C-1898	Serial: See Section 2.1

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LS Research, LLC in Review

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:



TESTING CERT #1255.01

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation

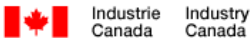
A2LA Certificate Number: 1255.01



Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948

FCC Registration Number: 90756



Canada

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1

File Number: IC 3088-A

On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1

File Number: IC 3088



U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility – Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2).

Date of Validation: January 16, 2001

Validated by the European Commission as a U.S. Notified Body operating under the U.S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.

Date of Validation: November 20, 2002

Notified Body Identification Number: 1243

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Name: VRS(TWIG)

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Serial: See Section 2.1

1.0 Conformance Summary

The EUT was found to MEET the MPE threshold for FCC (portable) using methods of FCC KDB 447498 D01 General RF Exposure Guidance v05r02 as a standalone device.

2.0 Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	BLE-Beacon ID Card
Model Number:	DL-BLE-10
Serial Number:	Engineering Sample
FCC ID	2AD9I-BEACON
IC Number	20087-BEACON

2.1 Product Description

The Danlaw Low-profile BLE Beacon is a small credit card sized device that is meant to be carried by a user in a wallet, in a purse or on a keychain. The Danlaw Low-profile BLE Beacon communicates with the Danlaw OBDII Wireless Datalogger products via Bluetooth Low Energy (Bluetooth Smart) to pass the vehicle driver or occupant information.

2.2 Additional Information

Programmed for continuous transmit or receive on low (2402 MHz), middle (2440 MHz), and high channel (2480 MHz) using a cell phone application utilizing BLE.

Continuous transmit modulated mode at all channels is available via test tool.

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3.0 RF Conducted Measurement Data

Modulation	Channel	Maximum Peak Conducted Power (dBm)	Power Limit (dBm)	Power margin (dB)
GFSK	2402	-4.8	30.0	34.8
	2440	-4.3	30.0	34.3
	2480	-4.4	30.0	34.4

4.0 MPE Calculation

2440 MHz

Type: RF Evaluation

Evaluated Against: General Population/Uncontrolled Exposure

Duty Cycle: 100 %

Document Used for Evaluation: KDB 447498 / OET 65

Measurement Distance: <5 cm

Power Density Limit: 1.0 mW/cm²

Calculated Value:

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	<u> -4.30 </u> (dBm)
Maximum peak output power at antenna input terminal:	<u> 0.372 </u> (mW)
Antenna gain(typical):	<u> 0 </u> (dBi)
Maximum antenna gain:	<u> 1.000 </u> (numeric)
Prediction distance:	<u> 1 </u> (cm)
Prediction frequency:	<u> 2440 </u> (MHz)
MPE limit for uncontrolled exposure at prediction frequency:	<u> 1 </u> (mW/cm ²)
Power density at prediction frequency:	0.029566 (mW/cm ²)
Maximum allowable antenna gain:	15.3 (dBi)
Margin of Compliance at 1 cm =	15.3 dB

5.0 Portable RF Exposure Evaluation

2440 MHz

Type: SAR Test Exclusion

Evaluated Against: General Population/Uncontrolled Exposure

Duty Cycle: 100 %

Document Used for Evaluation: KDB 447498

Measurement Distance: <5 cm

Limit: 3.0 (for 1-g SAR)

Calculated Value:

$$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})]*[\sqrt{f(\text{GHz})}]$$

SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm

1-g SAR test exclusion threshold equation:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 3.0$$

10-g SAR test exclusion threshold equation:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 7.5$$

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5.1 FCC SAR Test Exclusion Calculation

$$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})]*[\sqrt{f(\text{GHz})}]$$

$$[(0.3 \text{ mW})/(5 \text{ mm})]*[\sqrt{2.44}] = 0.1$$

Numerical tolerance limit is ≤ 3.0

5.2 FCC Conformance Summary

The EUT was found to MEET the 5mm minimum test separation distance threshold for SAR test exclusion per FCC §2.1091(mobile) and §2.1093(portable) using methods of FCC KDB 447498 D01 General RF Exposure Guidance v05r02 as a standalone device.

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6.0 Industry Canada Low Power Exemption

RSS 102 Issue 5 Section 2.5 states that all transmitters that meet the output power requirements as stated in section 2.5.1 and 2.5.2 of RSS 102 are exempt from routine SAR and RF exposure evaluation.

6.1 Output Power Evaluation

Evaluation Frequency = 2440 MHz

Device Operation separation distance: $\leq 20\text{cm}$

Maximum Effective Isotropic Radiated Power (dBm) = -4.3 dBm = -4.3 dBm

Maximum Effective Isotropic Radiated Power (mW) = $\log^{-1}(\text{EIRP (dBm)}/10)$ = .327 mW

Section 2.5.2 general public use limit at for devices operating less than or equal to 5 cm:

Frequency	Limit
2450 MHz	4 mW

6.2 IC Conformance Summary

Since the maximum effective radiated power (EIRP) is less than the applicable section limit, the Product is exempt from SAR/RF Evaluation

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END OF REPORT

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