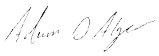
Test Report # 3432 B

Equipment Under Test:	LaceClips
Requirement(s):	RSS-102, FCC 1.1310, KDB 447498
Test Date(s):	July 27th, 2021
Prepared for:	LaceClips, LLC Attn: Jonathan Nussbaum 100 South Pointe Drive Apartment 1903 Miami Beach, FL 33139

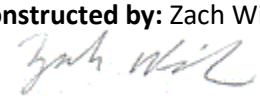
Report Issued by: Adam Alger, Laboratory Manager

Signature:  Date: 8/11/2022

Report Reviewed by: Adam Alger, Laboratory Manager

Signature:  Date: 8/17/2021

Report Constructed by: Zach Wilson, EMC Engineer

Signature:  Date: 8/17/2021

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Laird Connectivity Test Services in Review

The Laird Connectivity, Inc. laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

Scope of accreditation includes all test methods listed herein unless otherwise noted

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Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers

Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

1 TEST REPORT SUMMARY

On **July 30th, 2021** the Equipment Under Test (EUT), **LaceClips**, as provided by **LaceClips, LLC** was tested to the following requirements of the **Federal Communications Commission** and **Innovation, Science and Economic Development Canada**:

Portable Device

Requirement	Description	Specification	Result
FCC: 1.1310 IC: RSS-102	Radiofrequency Radiation Exposure Limits	Distance ≤ 5mm 1g-SAR	Reported

Notice:

The results relate only to the item tested as configured and described in this report. Any additional configurations, modes of operation, or modifications made to the equipment under test after the specified test date(s) are at the decision of the client and may not apply to the data seen in this test report.

The decision rule for Pass / Fail assessment to the specification or standard listed in this test report has been agreed upon by the client and laboratory to be as follows:

Measurement Type	Rule
Emissions – Amplitude	1 dB below specified limit
Emissions – Frequency	1% less than the specification
Immunity	Tested at specified level

2 CLIENT INFORMATION

Company Name	LaceClips, LLC
Contact Person	Jonathan Nussbaum
Address	100 South Pointe Drive Apartment 1903 Miami Beach, FL 33139

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	BLE Wearable
Product Name	LaceClips
Model Number	LACECLIPS-F
Serial Number	Engineering Sample
FCC ID	2A534-LACECLIPSF

2.2 Product Description

The EUT is a module containing a STMicro radio with a chip down design. The radio is BLE only. The device is powered by a 3.7VDC internal battery.

The EUT can be within 5mm of the user's extremities.

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 Radio Programming

Radio was programmed using STSW-BLUENRG-DK1, v 3.2.1. Power setting "6" was used for all transmitter testing.

2.6 Antenna Information

The EUT has the ceramic SMD loop antenna with a maximum peak gain of -1.45 dBi @ 2.4 GHz.

2.7 Data Rates and Channels

Radio	Channel	Data Rate
BLE	0	GFSK 1Mbps
BLE	19	GFSK 1Mbps
BLE	39	GFSK 1Mbps

3 REFERENCES

Publication	Edition	Date	AMD 1
FCC eCFR	-	2021	-
RSS-102	5	2015	2021
KDB 447498	-	2015	-

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k = 2.

References	Version / Date
CISPR 16-4-1	Ed. 2 (2009-02)
CISPR 16-4-2	Ed. 2 (2011-06)
CISPR 32	Ed. 1 (2012-01)
ANSI C63.23	2012
A2LA P103	February 4, 2016
A2LA P103c	August 10, 2015
ETSI TR 100-028	V1.3.1 (2001-03)

Measurement Type	Configuration	Uncertainty ±
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

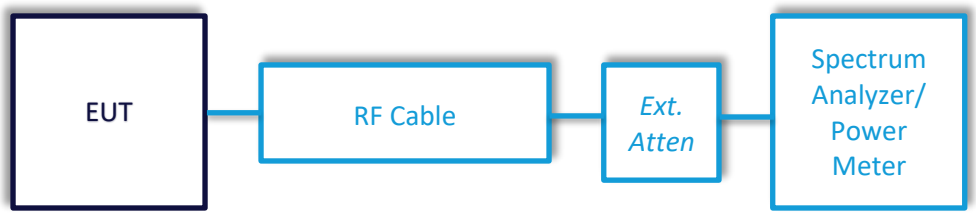
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	$1x10^{-7}$	$0.55x10^{-7}$
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter. The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.
Example Calculations	Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm) Margin (dB) = Limit (dBm) – Corrected Reading (dBm)

Block Diagram



5.1.1 Peak Output Power

Operator	Braden Smith	**QA**	Zach Wilson
Temperature	21.6° C	**R.H. %**	43.30%
Test Date	7/27/2021	**Location**	Conducted Bench
Requirement	FCC 15.247, RSS-247	**Method**	ANSI C63.10 §11.9.1.1

Limits: 30 dBm

Test Parameters

Frequency	2402, 2440, 2480 MHz	**Setup**	Conducted
RBW	1 MHz	**VBW**	3 MHz
Detector(s)	Max peak hold	**Sweep Time**	Auto

Instrumentation

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	4/21/2021	4/21/2022	Active Calibration
2	AA 960143	Cable	Gore	EKD01D01048.0	5546519	2/3/2021	2/3/2022	Active Calibration

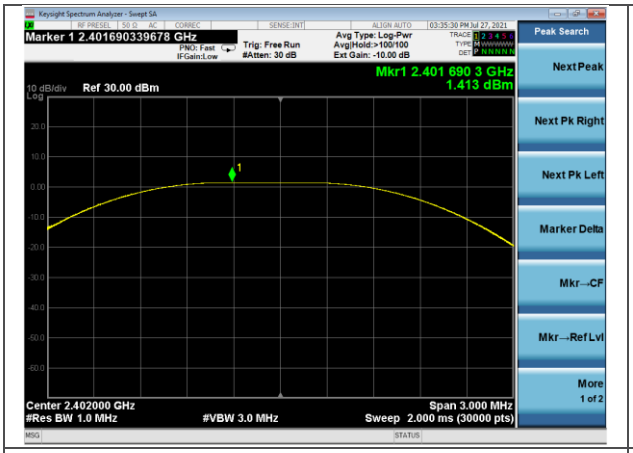
EUT Parameters

Input Power	5VDC via USB	**Mode**	BLE Transmit
Frequency	2402, 2440, 2480 MHz	**Channel**	0, 19, 39
Data Rate/Modulation	GFSK 1 Mbps	**Power Setting**	6

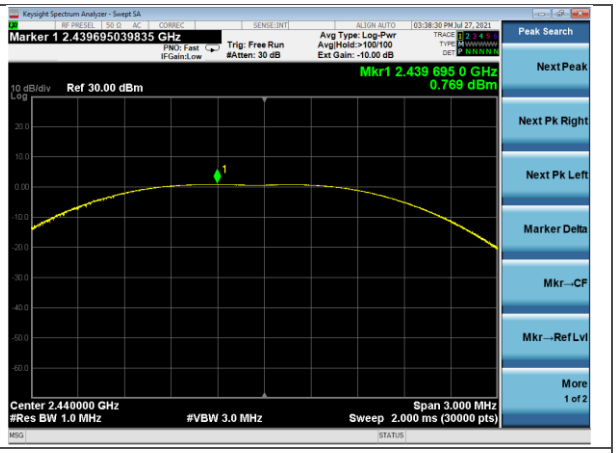
Data Table

Channel	Power (dBm)	Limit (dBm)	Margin (dBm)
0	1.413	30.0	28.6
19	0.769	30.0	29.2
39	-0.271	30.0	30.3

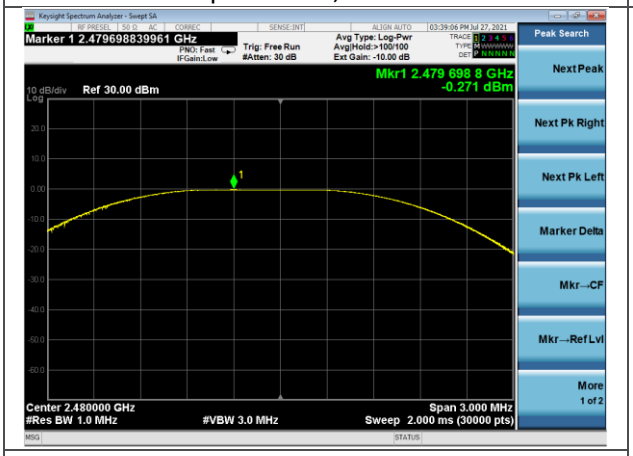
Plots



Output Power, Channel 0



Output Power, Channel 19



Output Power, Channel 39

6 FCC 1-G SAR TEST EXCLUSION CALCULATIONS

6.1 Power Calculations

Max Power of Channel = 1.413 dBm

Tune up Tolerance = 3 dBm

Total Channel Power = 4.413 dBm = **2.762 mW = 3mW**

6.2 Distance

≤5 mm

6.3 SAR Test Exclusion Calculation

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3 for 1-g SAR

Where:

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The value 3.0 is referred to as numeric thresholds

$$\left(\frac{3\ mW}{5\ mm}\right) \times \left(\sqrt{2.48}\right) \leq 3.0$$

$$0.6 \times 1.575 \leq 3.0$$

$$0.9 \leq 3.0$$

6.4 Result

The EUT is excluded from routine SAR testing as 0.865 is less than 3.0.

7 IC Exemption Calculation for Routine SAR Evaluation

7.1 Power Calculations

Max Power of Channel = 1.413 dBm

Tune up Tolerance = 3 dBm

Total Channel Power = 4.413 dBm = **2.762 mW**

7.2 Distance

≤5 mm

7.3 Exemption Limits

Table 1: SAR evaluation — Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

At 2480 MHz and ≤5mm the exemption limit is 3.9 mW

7.4 SAR Test Exclusion Calculation

2.7 mW ≤ 3.9 mW

7.5 Result

The EUT is excluded from routine SAR testing as 2.7 mW is less than 3.9 mW.

Revision History

Version	Date	Notes	Person
0	8/16/2021	Initial Draft	Zach Wilson
1	8/17/2021	Revised per internal review	Zach Wilson
2	8/1/2022	Revised to correct antenna gain and power measurements	Adam Alger
3	8/11/2022	Revised to correct rounding and frequency	Adam Alger

END OF REPORT