FireHUD Inc. DBA SlateSafety

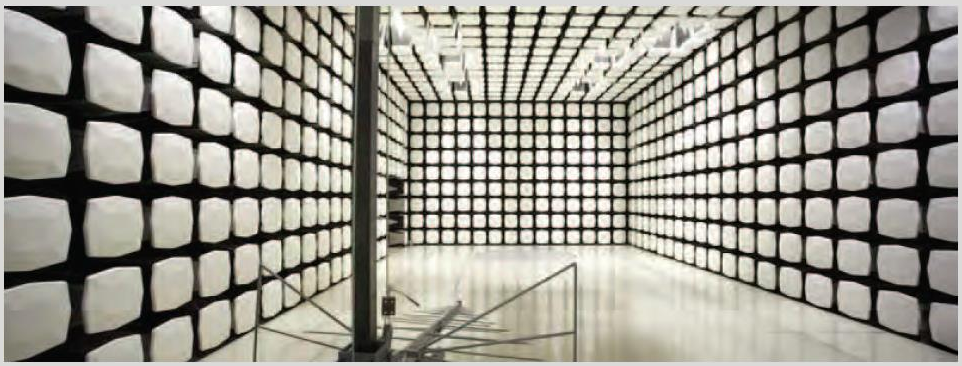
SLATESAFETY BAND V2

FCC 2.1093:2022

Bluetooth Low Energy

LTE

Report: FITY0001.2 Rev. 1, Issue Date: July 28, 2022



CERT #3310.05

CERTIFICATE OF EVALUATION

Last Date of Evaluation: July 21, 2022
FireHUD Inc. DBA SlateSafety
EUT: SLATESAFETY BAND V2

RF Exposure Evaluation

Standards

Specification	Method
FCC 2.1093:2022	FCC 447498 D01 General RF Exposure Guidance v06

Results

Method Clause	Description	Applied	Results	Comments
4.3.1	SAR Test Exclusion	Yes	Pass	None
4.3.2	Simultaneous Transmission SAR Test Exclusion	Yes	Pass	None

Deviations From Evaluation Standards

None

Approved By:

Donald Facteau, Process Architect

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
01	Updated standard on cover page and certificate of test to FCC 2.1093	2022-07-28	1, 2
	Updated the output power to Maximum Time Averaged Power.	2022-07-28	13

ACCREDITATIONS AND AUTHORIZATIONS

element
2021.09.01

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

European Commission – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIT / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

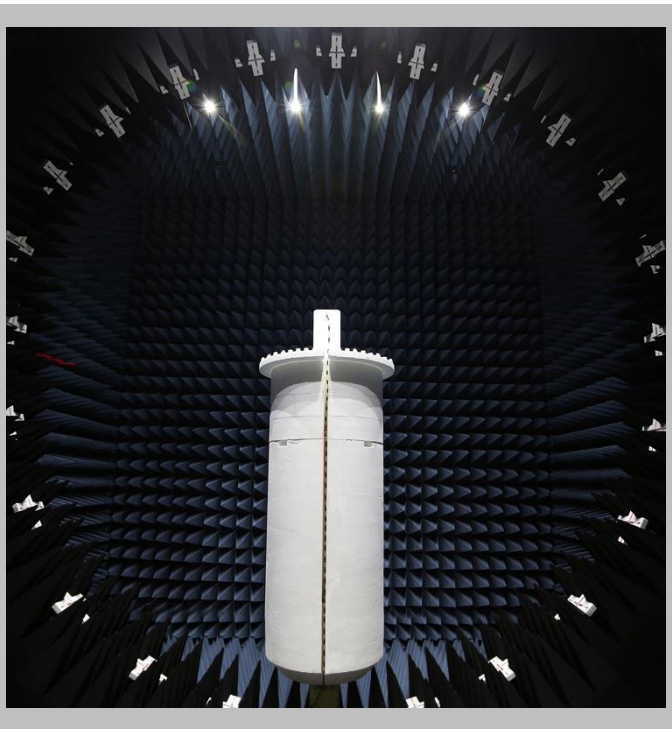
For details on the Scopes of our Accreditations, please visit:

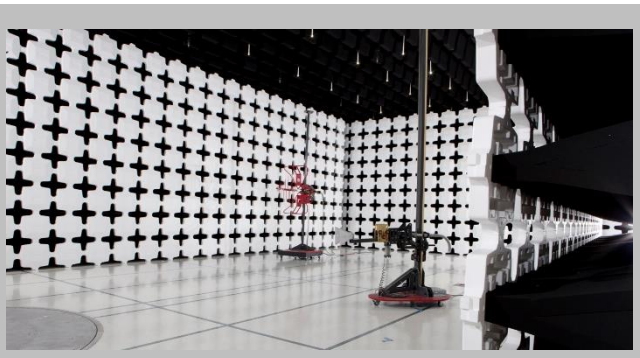
California Minnesota Oregon Texas Washington

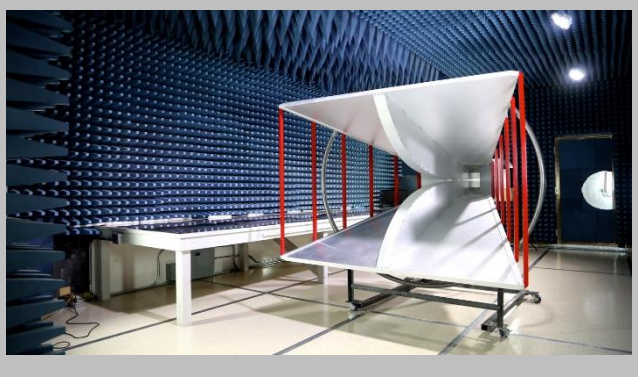
FACILITIES

element
2020.12.15

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







PRODUCT DESCRIPTION

Client and Equipment Under Evaluation Information

Company Name:	FireHUD Inc. DBA SlateSafety
Address:	1701 Oakbrook Dr.
City, State, Zip:	Norcross, GA 30093
Evaluation Requested By:	Tyler Sisk
EUT:	SLATESAFETY BAND V2
Date of Evaluation:	7/21/2022

Information Provided by the Party Requesting the Evaluation

Functional Description of the Equipment:

The SlateSafety BAND V2 is a wearable device intended for the industrial, military, and EMS markets intended to measure a user's physiology in real-time. It measures heart rate, estimated core body temperature, GPS location, user input, among other metrics, and reports back to a cloud-based web platform for data ingestion and decision making.

The cellular antenna is 11.3 mm from the body, the ground plane is 6.18 mm from the body (upper arm), and the BLE antenna is 7.84 mm from the body.

The following duty cycle information was provided by Tyler Sisk of FireHUD Inc. DBA SlateSafety.

The BAND V2 device sends data at a very low duty cycle. Most of the collected data is small and collected on slow intervals. As an example a heart rate value fits in a single byte and is only collected every 10 seconds. Data is collected over the course of 1 minute and sent together.

Below are the calculations for the worst case total transmit time for both the Cellular Radio as well as the BLE Radio in any given 30 minute time window while the device is operating while being worn.

Cellular Radio

Assumptions:

- Worst case total cellular data in 1 minute: 600 Bytes (eDRX interval = 3 min)
- 600 Bytes results in 133.22 ms of TX time from Cellular Radio
  (source: Nordic Online Power Profiler)
- 1 second worst case of TX time for LTE registration process in 30min window

Calculation:

$$\frac{600\ Bytes}{1\ Minute} \times \frac{133.22\ ms\ TX}{600\ Bytes} = 133.22\ ms\ TX\ /\ min$$

$$Transmit\ time\ in\ 30\ min\ window = 133.22\ ms\ TX\ /\ min \times 30\ min + 1s = 4.997\ seconds\ TX\ /\ 30\ min$$

$$Cellular\ Radio\ TX\ Duty\ Cycle = \frac{4.997\ s}{30\ min} \times \frac{30\ min}{1800\ s} \times 100\% = .278\%$$

BLE Radio

Assumptions:

- 7 Data Packets sent per minute
- 1 Data Packet opens a legacy advertising window of 2 seconds with interval of 100ms meaning a max of 20 legacy advertisements
- 1 Data Packet also opens a Coded Phy advertising window of 2 seconds with an interval of 100ms meaning max of 20 coded advertisements per Data Packet
- Each advertisement consists of a max of 31 bytes
- A 31 byte legacy advertisement results in 1.128ms of BLE Radio transmit time. A 31 byte coded phy advertisement results in 9.024ms of BLE Radio transmit time (Source: Nordic Online Power Profiler)

Calculations:

$$TX\ Time\ /\ min = \left(\frac{1.128\ ms}{Legacy\ Adv} \times \frac{20\ Legacy\ Adv}{1\ Packet} + \frac{9.024\ ms}{Coded\ Adv} \times \frac{20\ Coded\ Adv}{1\ Packet}\right) \times \frac{7\ Packets}{1\ min} = 1421.28\ ms\ /\ min$$

$$TX\ Time\ /\ 30\ min = \frac{1421.28ms}{1\ min} \times \frac{1\ min}{1000\ ms} \times 30\ min = 42.638\ seconds\ /\ 30\ min$$

$$BLE\ Radio\ TX\ Duty\ Cycle = \frac{42.638\ s}{30\ min} \times \frac{30\ min}{1800\ s} \times 100\% = 2.369\%$$

Antenna / Ground Plane Distances

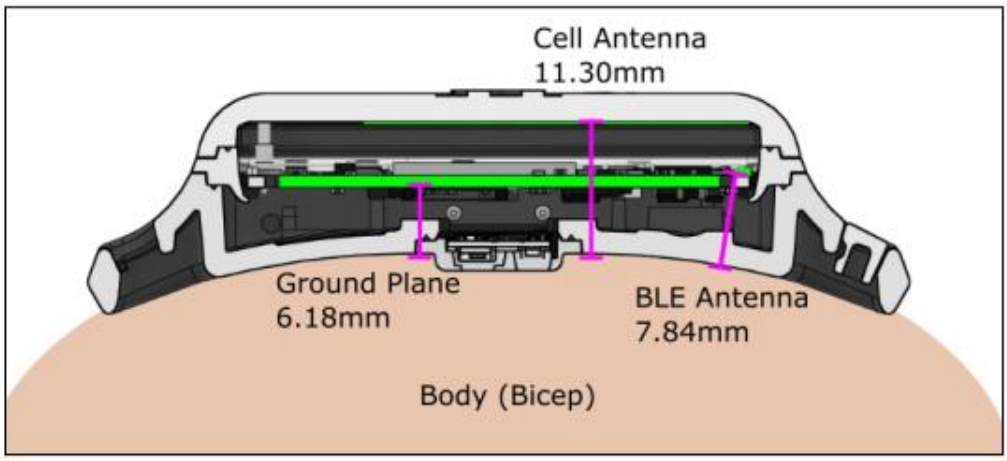


Figure 4: Cross Section of BAND V2 with Antenna Distances to Arm

As shown in Figure 4, the minimum distance between the body of the user and the antennas / RF ground plane is 6.18 mm. The ground plane distance is calculated from the bottom of the PCB to the closest place that skin can be touching the device when being worn according to the user manual.

Objective:
To demonstrate compliance with FCC RF exposure requirements for 2.1093 portable devices.

RF EXPOSURE CONDITION

The following RF Exposure conditions were used for the assessment documented in this report:	
Intended Use	Portable
Location on Body (if applicable)	Head/Torso
How is the Device Used	The equipment is used at a distance less than 20 cm from the user.
Radios Contained in the Same Host Device	Bluetooth Low Energy LTE
Simultaneous Transmitting Radios	Bluetooth Low Energy, LTE
Body Worn Accessories	NA
Environment	General Population/Uncontrolled Exposure

SAR TEST EXCLUSION

element
EXRPT.2022.02.09.0

OVERVIEW

Human exposure to RF emissions from portable devices (47 CFR §2.1093) used with the radiating antenna closer than 20 cm to the user requires Specific Absorption Rate (SAR) to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation.

COMPLIANCE WITH FCC 2.1093

47 CFR §1.1307
"(b)(1) Requirements. (i) With respect to the limits on human exposure to RF provided in §1.1310 of this chapter, applicants to the Commission for the grant or modification of construction permits, licenses or renewals thereof, temporary authorities, equipment authorizations, or any other authorizations for radiofrequency sources must either:

(A) Determine that they qualify for an exemption pursuant to §1.1307(b)(3);

(B) Prepare an evaluation of the human exposure to RF radiation pursuant to §1.1310 and include in the application a statement confirming compliance with the limits in §1.1310; or

(C) Prepare an Environmental Assessment if those RF sources would cause human exposure to levels of RF radiation in excess of the limits in §1.1310.

The EUT will be used with a separation distance of less than 20 centimeters between the radiating antenna and the body of the user or nearby persons and must therefore be considered a portable transmitter per 47 CFR 2.1093(b).

47 CFR §2.1093
"(*b) For purposes of this section, the definitions in §1.1307(b)(2) of this chapter shall apply. A portable device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that the RF source's radiating structure(s) is/are within 20 centimeters of the body of the user."*

COMPLIANCE WITH FCC KDB 447498 D01 General RF Exposure Guidance v06

"KDB 447498 D01 General RF Exposure Guidance v06" provides the procedures, requirements, and authorization policies for mobile and portable devices.

Standalone radio SAR test exclusion is covered under section 4.3.1. Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Thresholds are met as shown in the Limits section below.

Simultaneous transmission SAR test exclusion is covered under section 4.3.2. SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneously transmitting antenna. When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration.

SAR TEST EXCLUSION

element
EXRPT.2022.02.09.0

LIMITS

Limits for General Population /Uncontrolled Exposure: 47 CFR 1.1310 (c)

The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

For 100 kHz to 6 GHz and test separation distances ≤ 50 mm, the SAR test exclusion thresholds are 1-g for head and body SAR and 10-g SAR for extremity SAR.

ASSESSMENT (KDB 447498 D01 GENERAL RF EXPOSURE GUIDANCE V06)

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$$\left[\frac{(\text{max. power of channel, including tune-up tolerance, mW})}{(\text{min. test separation distance, mm})}\right] \cdot \left[\sqrt{f(GHz)}\right] = \begin{matrix}3.0 \text{ for 1-g SAR} \\ 7.5 \text{ for 10-g extremity SAR}\end{matrix}$$

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
- 3.0 and 7.5 are referred to as the numeric thresholds

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1f) is applied to determine SAR test exclusion.

The SAR Test Exclusion Threshold is summarized in the following table(s):

Radio	Transmit Frequency (MHz)	Conducted Output Power	Power Tolerance (dB)	Duty Cycle	Minimum Separation Distance (mm)	Exclusion Threshold	Limit	Compliant
Bluetooth Low Energy	2442	19 dBm	1.0	2.4%	5	0.7	3.0	Yes

The information in the table above was obtained from:

The rated value was used in these calculations. From client supplied information.

Radio	Transmit Frequency (MHz)	Conducted Output Power	Power Tolerance (dB)	Duty Cycle	Minimum Separation Distance (mm)	Exclusion Threshold	Limit	Compliant
LTE: B4	1755	24 dBm	1.0	0.3%	5	0.2	3.0	Yes
LTE: B13	787	24 dBm	1.0	0.3%	5	0.2	3.0	Yes

The information in the table above was obtained from:

The rated value was used in these calculations. From client supplied information. FCC ID: 2ANPO00NRF9160.

Evaluator: Brian Fahey

ESTIMATED SAR

element
EXRPT.2022.02.09.0

METHOD OF EVALUATION – SIMULTANEOUS TRANSMISSION CONFIGURATION

KDB 447498 D01 General RF Exposure Guidance v06, Section 4.3.2(b)

"When an antenna qualifies for the standalone SAR test exclusion of 4.3.1 and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria:

1) *[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [$\sqrt{f(GHz)}/x$], for test separation distances ≤ 50mm;*

   where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.

2) *0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distance is > 50 mm.*

This SAR estimation formula has been considered in conjunction with the SAR Test Exclusion Thresholds to result in substantially conservative SAR values of = 0.4 W/kg. When SAR is estimated, the peak SAR location is assumed to be at the feed-point or geometric center of the antenna, whichever provides a smaller antenna separation distance, and this location must be clearly identified in test reports. The estimated SAR is used only to determine simultaneous transmission SAR test exclusion; it should not be reported as the standalone SAR. When SAR is estimated, it must be applied to determine the sum of 1-g SAR test exclusion. When SAR to peak location separation ratio test exclusion is applied, the highest reported SAR for simultaneous transmission can be an estimated standalone SAR if the estimated SAR is the highest among the simultaneously transmitting antennas (see also KDB Publication 690783 D01). For situations where the estimated SAR is overly conservative for certain conditions, the test lab may choose to perform standalone SAR measurements, then use the measured SAR to determine simultaneous transmission SAR test exclusion. Estimated SAR values at selected frequencies, distances, and power levels are illustrated in Appendix D.

In the table below, the estimated stand-alone SAR for the radio(s) capable of simultaneous transmission is listed. The estimated values have been summed and compared to the SAR limit. The result of the calculation is well below the limit therefore the unit is excluded from simultaneous SAR evaluation and deemed compliant with FCC RF exposure requirements.

ESTIMATED SAR

element
EXRPT.2022.02.09.0

Radio	Transmit Frequency (GHz)	Test Separation (mm)	Maximum Time Averaged Power (mW)	Duty Cycle	Estimated SAR (W/kg)	Specification (W/kg)
LTE	1.755 (B4), 0.787 (B13)	5	0.9	0.00278	0	1.6
Bluetooth Low Energy	2.402 – 2.480	5	2.4	0.02369	0.1	1.6
				Estimated Summed SAR	0.1	1.6

The information in the table above was obtained from:
See standalone document above.

End of Test Report