



element

Paragon Innovations, Inc.

LT3A

FCC 2.1093:2021

802.11 b/g/n

Bluetooth LE

Cellular

Report: PAON0005.2



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CERTIFICATE OF EVALUATION

Last Date of Evaluation: Monday, June 28, 2021
Paragon Innovations, Inc.
EUT: LT3A

RF Exposure Evaluation

Standards

Specification	Method
FCC 2.1093:2021	FCC 447498 D01 General RF Exposure Guidance v06

Results

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

Deviations From Evaluation Standards

None

Approved By:

Donald Facteau, Process Architect

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing

REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS



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 - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

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.

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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

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Japan

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

Taiwan

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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.

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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.

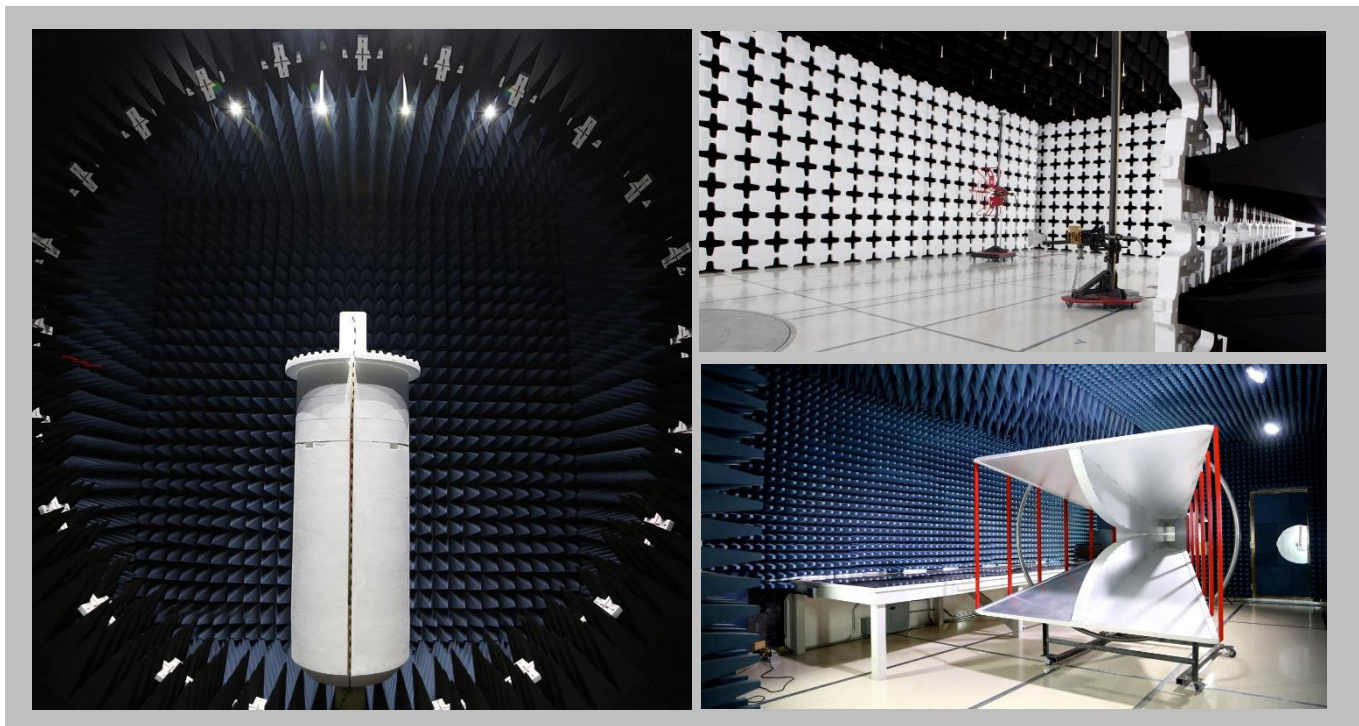
SCOPE

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



California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP				
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
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:	Paragon Innovations, Inc.
Address:	3305 Matrix Drive
City, State, Zip:	Richardson, TX 75082
Evaluation Requested By:	Doug Hanz
EUT:	LT3A
Date of Evaluation:	Monday, June 28, 2021

Information Provided by the Party Requesting the Evaluation

Functional Description of the Equipment:

The LT3A (FCC ID: 2AXHH-LT3A) Smart Tracking Collar is a pet tracker device. It contains a cellular radio (FCC ID: 2AXHHNRF9160), an 802.11 b/g/n radio (FCC ID: 2ABPY-5B9198) and a Bluetooth LE radio. It uses LTE-M1 to communicate with a server and relay information about the trackers location. Bluetooth LE is used for determining home location and when the pet's owner wishes to interact with the tracker for configuration and collecting information about the pet's activity. The Wifi component is used only to identify Wifi access points in proximity to tracker. No data connections are established on Wifi.

Largest dimension of the product is 58mm.

Objective:

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

The following duty cycle information was provided by Alan Hasty, Engineer at Paragon Innovations, Inc.:

The LTE M1 radio has a duty cycle that is control in part by the use of LTE eDRX mode in the application code. This mode and the application messaging over a 30-minute period results in a duty cycle (worst case operation) for the device of 3.235%.

The Wi-Fi operation is defined in the host code. The active scanning of Wi-Fi channels is at maximum of once per minute. The Wi-Fi transmitter is active for 120ms for each channel scanned during this active scan. There are 11 Wi-Fi channels scanned. The Wi-Fi transmitter on time in 30 minutes = $30 * (0.12 * 11) = 39.6$ seconds = 0.022% of a 30-minute period. Wi-Fi operation is only used for the purpose of scanning and not for data transmissions.

The maximum number of Bluetooth packets sent in a 100 ms period is 2x, 0.296 ms Bluetooth transmissions, resulting in a 0.592% duty cycle.

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 LT3A is used at a distance of less than 20 cm from the user.
Radios Contained in the Same Host Device	802.11 b/g/n Bluetooth LE Cellular
Simultaneous Transmitting Radios	802.11 b/g/n, Bluetooth LE, Cellular
Body Worn Accessories	None
Environment	General Population/Uncontrolled Exposure

SAR TEST EXCLUSION



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



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:

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

Where:

- $f(\text{GHz})$ 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)	Rated Output Power (dBm)	Tune-up Tolerance (dB)	Duty Cycle	Minimum Separation Distance (mm)	Exclusion Threshold	Limit	Compliant
BTLE	2480	8	4	0.6%	5	0.000	3.0	Yes

The information in the table above was obtained from:

Customer supplied information

Radio	Transmit Frequency (MHz)	Rated Output Power (dBm)	Tune-up Tolerance (dB)	Duty Cycle	Minimum Separation Distance (mm)	Exclusion Threshold	Limit	Compliant
802.11	2473	14	1	0.022%	5	0.000	3.0	Yes

The information in the table above was obtained from:

Customer supplied information

SAR TEST EXCLUSION



Radio	Transmit Frequency (MHz)	Rated Output Power (dBm)	Tune-up Tolerance (dB)	Duty Cycle	Minimum Separation Distance (mm)	Exclusion Threshold	Limit	Compliant
Cellular: LTE B4	1755	23	2	3.2%	5	2.7	3.0	Yes
Cellular: LTE B13	787	23	2	3.2%	5	1.8	3.0	Yes

The information in the table above was obtained from:

Customer supplied information

ESTIMATED SAR



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:

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

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

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

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.

Radio	Band	Transmit Frequency (GHz)	Test Separation (mm)	Output Power (mW)	Duty Cycle	Estimated SAR (W/kg)	Specification (W/kg)
Cellular	LTE B13	0.787	5	10.2	0.03235	0.2	1.6
Cellular	LTE B4	1.755	5	10.2	0.03235	0.4	1.6
802.11	N/A	2.473	5	0.01	0.0002	0.0	1.6
BTLE	N/A	2.48	5	0.1	0.0059	0.0	1.6
Estimated Summed SAR						0.4	1.6

The information in the table above was obtained from:
Customer supplied information

End of Test Report