



# FCC RF EXPOSURE ASSESSMENT REPORT

For

**Tesla, Inc.**

3500 Deer Creek Road,  
Palo Alto, CA 94304, USA

**FCC ID: 2AEIM-1783148**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Automotive Part
<b>Prepared By</b>	Christian McCaig RF Lead Engineer
<b>Report Number</b>	R2203281-04
<b>Report Date</b>	2022-06-22
<b>Reviewed By</b>	Simon Ma RF Supervisor
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162, Fax: (408) 732 9164	



Note: This test report was prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This test report shall not be used by the customer to claim product certification, approval, or endorsement by A2LA or any agency of the United States Government or any foreign government.

\* This test report may contain data and test methods that are not covered by BACL's scope of accreditation as of the test report date shown above. These items are marked within the test report text with an asterisk "\*\*\*"

TABLE OF CONTENTS

1 GENERAL DESCRIPTION .....4

1.1 PRODUCT DESCRIPTION FOR UNIT UNDER TEST (UUT) .....4

1.2 MECHANICAL DESCRIPTION OF UUT .....4

1.3 OBJECTIVE .....4

1.4 RELATED SUBMITTAL(S)/GRANT(S).....4

1.5 TEST FACILITY REGISTRATIONS .....4

1.6 TEST FACILITY ACCREDITATIONS.....5

2 EUT TEST CONFIGURATION.....7

2.1 JUSTIFICATION .....7

2.2 EUT EXERCISE SOFTWARE.....7

2.3 EQUIPMENT MODIFICATIONS .....8

2.4 SPECIAL EQUIPMENT .....8

2.5 REMOTE SUPPORT EQUIPMENT .....8

2.6 POWER SUPPLY AND LINE FILTERS.....8

2.7 INTERFACE PORTS AND CABLING .....8

3 RF EXPOSURE ASSESSMENT .....9

3.1 APPLICABLE STANDARDS .....9

3.2 MPE PREDICTION .....9

3.3 TEST RESULTS .....10

4 ANNEX A (NORMATIVE) - A2LA ELECTRICAL TESTING CERTIFICATE.....12

**DOCUMENT REVISION HISTORY**

<b>Revision Number</b>	<b>Report Number</b>	<b>Description of Revision</b>	<b>Date of Revision</b>
0	R2203281-04	Original Report	2022-06-22

## 1 General Description

---

### 1.1 Product Description for Unit Under Test (UUT)

This test report was prepared on behalf of *Tesla, Inc.*, and their product model: 1783148, *FCC ID: 2AEIM-1783148*; or the “EUT” as referred to in this report. The EUT is an automotive part (B Pillar Endpoint) with Ultra Wide-band (UWB) operating in 6489.6-7987.2 MHz, Bluetooth Low Energy, and NFC capabilities.

### 1.2 Mechanical Description of UUT

1783148 measures approximately 55 cm (Length) x 15.5 cm (Width) x 1 cm (High), and weighs approximately 0.6kg.

*The data gathered are from a typical production sample provided by the manufacturer with serial number: ED322025000037, assigned by Tesla, Inc.*

### 1.3 Objective

This report was prepared on behalf of *Tesla, Inc* in accordance with FCC §2.1091, Radiofrequency radiation exposure evaluation: mobile devices, and KDB 447498 D01 General RF Exposure Guidance v06.

The objective was to determine the compliance of EUT with the FCC exposure rules.

### 1.4 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart F, Equipment Class: UWB with FCC ID: 2AEIM-1783148; IC: 20098-1783148  
FCC Part 15, Subpart C, Equipment Class: DTS with FCC ID: 2AEIM-1783148; IC: 20098-1783148  
FCC Part 15, Subpart C, Equipment Class: DXX with FCC ID: 2AEIM-1783148; IC: 20098-1783148

### 1.5 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL’s test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL’s BSMI Lab Code Number is: SL2-IN-E-1002R

BACL’s test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

## 1.6 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

**A- An independent, 3<sup>rd</sup>-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2017 by A2LA (Test Laboratory Accreditation Certificate Number 3297.02),** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (\*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2017 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report.

BACL's ISO/IEC 17025:2017 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

**B- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.03) to certify**

- For the USA (Federal Communications Commission):
  - 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
  - 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
  - 3- All Telephone Terminal Equipment within FCC Scope C.
- For the Canada (Industry Canada):
  - 1- All Scope 1-Licence-Exempt Radio Frequency Devices;
  - 2- All Scope 2-Licensed Personal Mobile Radio Services;
  - 3- All Scope 3-Licensed General Mobile & Fixed Radio Services;
  - 4- All Scope 4-Licensed Maritime & Aviation Radio Services;
  - 5- All Scope 5-Licensed Fixed Microwave Radio Services
  - 6- All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.
- For Singapore (Info-Communications Development Authority (IDA)):
  - 1- All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
  - 2- All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2
- For the Hong Kong Special Administrative Region:
  - 1- All Radio Equipment, per KHCA 10XX-series Specifications;
  - 2- All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
  - 3- All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
  - 1- MIC Telecommunication Business Law (Terminal Equipment):
    - All Scope A1 - Terminal Equipment for the Purpose of Calls;
    - All Scope A2 - Other Terminal Equipment
  - 2- Radio Law (Radio Equipment):
    - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
    - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
    - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

**C- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.01) to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:**

- 1 Electronics and Office Equipment:
  - for Telephony (ver. 3.0)
  - for Audio/Video (ver. 3.0)
  - for Battery Charging Systems (ver. 1.1)
  - for Set-top Boxes & Cable Boxes (ver. 4.1)
  - for Televisions (ver. 6.1)
  - for Computers (ver. 6.0)
  - for Displays (ver. 6.0)
  - for Imaging Equipment (ver. 2.0)
  - for Computer Servers (ver. 2.0)
- 2 Commercial Food Service Equipment
  - for Commercial Dishwashers (ver. 2.0)
  - for Commercial Ice Machines (ver. 2.0)
  - for Commercial Ovens (ver. 2.1)
  - for Commercial Refrigerators and Freezers
- 3 Lighting Products
  - For Decorative Light Strings (ver. 1.5)
  - For Luminaires (including sub-components) and Lamps (ver. 1.2)
  - For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
  - For Integral LED Lamps (ver. 1.4)
- 4 Heating, Ventilation, and AC Products
  - for Residential Ceiling Fans (ver. 3.0)
  - for Residential Ventilating Fans (ver. 3.2)
- 5 Other
  - For Water Coolers (ver. 3.0)

**D- A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:**

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Innovation, Science and Economic development Canada - ISED) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - o BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - o NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - o EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
  - o Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
  - o Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Media Development Authority - IMDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - o ENERGY STAR Recognized Test Laboratory – US EPA
  - o Telecommunications Certification Body (TCB) – US FCC;
  - o Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;

## 2 EUT Test Configuration

### 2.1 Justification

The EUT was configured for testing according to FCC §1.1310, §2.1091, and KDB 447498 D01.

### 2.2 EUT Exercise Software

#### BLE

The test software used was BTool – Bluetooth Low Energy PC Application v1.42.5. The software is compliant with the standard requirements being tested against. The following channels and power settings were selected for testing:

Channel Frequency (MHz)	Power Setting
2402	0xE
2440	0xE
2480	0xE

#### UWB

Python scripts were provided by *Tesla, Inc.* and was verified to be compliant with the standard requirements being tested against. The following channel frequencies were selected for testing. All the modes were measured for fundamental field strength, and the corresponding power settings used are listed below.

Radio	Frequency (MHz)	Mode	Power Setting
UWB	6489.6 MHz (Channel 5)	0	2.75
		4	0.75
		13	1.25
	6988.8 MHz (Channel 6)	0	4.5
		4	3
		13	3.25
	7987.2 MHz (Channel 9)	0	4.5
		4	2.25
		13	2.5

#### NFC

The test software used was *python scripts* provided by *Tesla, Inc* and verified by *Christian McCaig* to comply with the standard requirements being tested against.

Radio	Frequency (MHz)	Power Setting
NFC	13.56	0x00

## 2.3 Equipment Modifications

N/A

## 2.4 Special Equipment

N/A

## 2.5 Remote Support Equipment

Manufacturer	Description	Model
HP	Laptop	ZBook Studio G3
Teensy	Microcontroller	-

## 2.6 Power Supply and Line Filters

Manufacturer	Description	Model
Volteq	DC Power Supply	HY5003D

## 2.7 Interface Ports and Cabling

Cable Descriptions	Length (m)	From	To
USB Type A to Micro USB Type B	< 1 m	Microcontroller	Laptop
Power cables	< 1 m	UUT	Power Supply
RS-232	< 1 m	UUT	Microcontroller

### 3 RF EXPOSURE ASSESSMENT

#### 3.1 Applicable Standards

According to FCC §2.1091 (Mobile Devices and RSS-102 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minute)
<b>Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note: f = frequency in MHz

\* = Plane-wave equivalent power density

#### 3.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to 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

### 3.3 Test Results

#### NFC Standalone

<u>Maximum Peak E.I.R.P. (dBm):</u>	<u>-5.59<sup>1</sup></u>
<u>Maximum Peak E.I.R.P. (mW):</u>	<u>0.28</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>13.56</u>
<u>Power density of prediction frequency at 20 cm (mW/cm<sup>2</sup>):</u>	<u>0.00006</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	<u>0.979</u>

*Note<sup>1</sup>: measurement result referenced from test report R2203281-01.*

The device is compliant with the FCC requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.00006 mW/cm<sup>2</sup>. Limit is 0.979 mW/cm<sup>2</sup>.

#### BLE Standalone

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>2.86<sup>2</sup></u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>1.932</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>2402</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>2.14</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>1.64</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>	<u>0.00063</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	<u>1.0</u>

*Note<sup>2</sup>: measurement result referenced from test report R2203281-02.*

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.00063 mW/cm<sup>2</sup>. Limit is 1.0 mW/cm<sup>2</sup>.

#### UWB Standalone

<u>Maximum average e.i.r.p. (dBm):</u>	<u>-41.41<sup>3</sup></u>
<u>Maximum average e.i.r.p. (mW):</u>	<u>0.000072</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>6489.6</u>
<u>Power density of prediction frequency at 20 cm (mW/cm<sup>2</sup>):</u>	<u>0.0000000143</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	<u>1.0</u>

*Note<sup>3</sup>: measurement result referenced from test report R2203281-03.*

The device is compliant with the FCC requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0000000143 mW/cm<sup>2</sup>. Limit is 1.0 mW/cm<sup>2</sup>.

**Worst Case Co-location MPE Calculation: UWB, BLE and NFC**

Radio	Max e.i.r.p. (dBm)	Evaluated Distance (cm)	Worst-Case Exposure Level	Limit	Worst-Case Ratios	Sum of Ratios	Limit
Worst Case							
BLE	5.00	20	0.00063 mW/cm <sup>2</sup>	1.0 mW/cm <sup>2</sup>	0.063%	0.0636%	100%
UWB	-41.41	20	0.0000000143 mW/cm <sup>2</sup>	1.0 mW/cm <sup>2</sup>	0.00000143%		
NFC	-5.59	20	0.00006 mW/cm <sup>2</sup>	0.979 mW/cm <sup>2</sup>	0.0006%		

**4 Annex A (Normative) - A2LA Electrical Testing Certificate****Accredited Laboratory**

A2LA has accredited

**BAY AREA COMPLIANCE LABORATORIES CORP.**

Sunnyvale, CA

for technical competence in the field of

**Electrical Testing**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This laboratory also meets A2LA R222 - Specific Requirements EPA ENERGY STAR Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

Presented this 10<sup>th</sup> day of March 2021.

A blue ink signature of Trace McInturff.

Trace McInturff, Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 3297.02  
Valid to September 30, 2022

*For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.*

Please follow the web link below for a full ISO 17025 scope

<https://www.a2la.org/scopepdf/3297-02.pdf>

**--- END OF REPORT ---**