

RF EXPOSURE REPORT FCC

APPLICANT

Tesla, Inc.

MODEL NAME

1776863

FCC ID

2AEIM-1776863

REPORT NUMBER

HA230130-TES-003-R04

TEST REPORT

Date of Issue
February 14, 2023

Test Site
Hyundai C-Tech, Inc. dba HCT America, Inc.
1726 Ringwood Ave, San Jose, CA 95131, USA

Applicant	Tesla, Inc.
Applicant Address	3500 Deer Creek Road, Palo Alto, CA 94304, USA
FCC ID	2AEIM-1776863
Model Name	1776863
EUT Type	Glovebox BT-USB Module
FCC Classification	Spread Spectrum Transmitter (DSS)
FCC Rule Part(s)	Part 1 (§1.1310 / §1.1307), Part 2 (§2.1091)
Test Procedure	KDB 447498 D01 v06

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was in accordance with the procedures specified in §2.947. The results in this report apply only to the product which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Hyundai C-Tech, Inc. dba HCT America, Inc. certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

Tested By

Yongsoo Park

Test Engineer

Reviewed By

Sunwoo Kim

Technical Manager

REVISION HISTORY

The revision history for this document is shown in table.

TEST REPORT NO.	DATE	DESCRIPTION
HA230130-TES-003-R04	February 14, 2023	Initial Issue

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1. EUT DESCRIPTION

Model	1776863	
EUT Type	Glovebox BT-USB Module	
Power Supply	5 V d.c.	
RF Specification	Bluetooth BR/EDR : GFSK, $\pi/4$ -DQPSK, 8DPSK	
Transmitter Chain	1	
Exemption Analysis	<input type="checkbox"/>	1-mW Test Exemptions
	<input type="checkbox"/>	SAR-Based Test Exemptions
	<input checked="" type="checkbox"/>	MPE-Based Test Exemptions
Antenna Specification ¹⁾	Antenna Type : PCB Trace Antenna Peak Gain : 3.87 dBi	
Operating Environment	Indoor and outdoor	
Operating Temperature	-40 °C ~ +85 °C	

2. INTRODUCTION

2.1. RF Exposure Exemptions for Single Source

(A) 1-mW Blanket Exemption

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz - 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

(B) SAR-Based Exemption

A more comprehensive exemption, considering a variable power threshold that depends on both the separation distance and power, is provided in § 1.1307(b)(3)(i)(B). This exemption is applicable to the frequency range between 300 MHz - 6 GHz, with test separation distances between 0.5 cm and 40 cm, and for all RF sources in fixed, mobile, and portable device exposure conditions. Accordingly, a RF source is considered an RF exempt device if its available maximum time-averaged (matched conducted) power or its effective radiated power (ERP), whichever is greater, are below a specified threshold (P_{th}).

$$P_{th}(mW) = ERP_{20cm} \left(\frac{d}{20} \right)^x, \text{ where } d \leq 20 \text{ cm}$$

$$P_{th}(mW) = ERP_{20cm}, \text{ where } 20 \text{ cm} < d \leq 40 \text{ cm}$$

$$x = -\log_{10} \left(\frac{60}{ERP_{20cm} \sqrt{f}} \right)$$

$$ERP_{20cm}(mW) = 2040 f, \text{ where } 0.3 \text{ GHz} \leq f(\text{GHz}) < 1.5 \text{ GHz}$$

$$ERP_{20cm}(mW) = 3060, \text{ where } 1.5 \text{ GHz} \leq f(\text{GHz}) \leq 6 \text{ GHz}$$

(C) MPE-Based Exemption

MPE-based exemption is provided in the table 1, § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz - 100 GHz. The table 1 applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power.

RF Source Frequency f_L (MHz) – f_H (MHz)	Minimum Distance $\lambda/2\pi (f_L) - \lambda/2\pi (f_H)$	Threshold ERP (ERP_{th})
0.3 – 1.34	150 m – 35.6 m	$1,920 R^2$
1.34 – 30	35.6 m – 1.6 m	$3,450 R^2 / f^2$
30 – 300	1.6 m – 159 mm	$3.83 R^2$
300 – 1,500	159 mm – 31.8 mm	$0.0128 R^2 f$
1,500 – 100,000	31.8 mm – 0.5 mm	$19.2 R^2$

Table 1. § 1.1307(b)(3)(i)(C) – Single RF Source Subject to Routine Environmental Evaluation

2.2. RF Exposure Exemptions for Simultaneous Transmission

(A) 1-mW Blanket Exemption

Per § 1.1307(b)(3)(ii)(A), the 1-mW exemption may be also applied to simultaneous transmission conditions, within the same host device, according one of the following criteria:

- When maximum available power each individual transmitting antenna within the same time averaging period is ≤ 1 mW, and the nearest parts of the antenna structures of the simultaneously operating transmitters are separated by at least 2 cm.
- When the aggregate maximum available power of all transmitting antennas is ≤ 1 mW in the same time-averaging period.

This exemption cannot be combined with other options (B) or (C).

(B) SAR-Based Exemptions and MPE-Based Exemptions

As described in § 1.1307(b)(3)(ii)(B) and covers the situations where both SAR-based and MPE-based exemption may be considered for test exemption in fixed, mobile, or portable device exposure conditions. For these cases, a device with multiple RF sources transmitting simultaneously will be considered an RF exempt device if the condition of the following formula is satisfied :

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

3. RESULT

3.1. MPE-Based Exemptions Calculation

Bluetooth Classic				
Frequency (MHz)	2402 – 2480	MHz		
Separation Distance (d)	0.2	m		
Threshold ERP (ERP _{th})	0.768	W		
Max Conducted Output Power	6.00	dBm	3.98	mW
Antenna Gain	3.87	dBi	2.44	-
EIRP	9.87	dBm	0.009705	W
ERP (P)	10.07	dBm	0.005916	W
P / ERP _{th} Ratio	0.0077	at 20 cm separation distance		

Note :

1. Maximum conducted output power including tune-up tolerance
2. The minimum separation distance has been indicated in the user manual.

3.2. SUMMARY OF RESULTS

Mode	Frequency Range (MHz)	Threshold ERP (ERP _{th}) (W)	ERP (P) (W)	ERP _{th} / P _{th} Ratio
Bluetooth Classic	2402 – 2480	0.768	0.005916	0.0077

Sample Calculation

RF Exposure at 20 cm distance = $ERP_{th} / P_{th} = 0.005916 / 0.768 = \mathbf{0.0077} < 1.0$

END OF TEST REPORT