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47 CFR PART 2.1091

RADIOFREQUENCY RADIATION EXPOSURE EVALUATION: MOBILE DEVICES

REPORT NUMBER: M2210007-11

STANDARD: 47 CFR § 2.1091

CLIENT: REDARC TECHNOLOGIES PTY LTD

DEVICE: MPC ENGINE BAY DC CHARGER

MODEL: BCDCX12050

DATE OF ISSUE: 8 AUGUST 2023

REVISION TABLE

Version	Sec/Para Changed	Change Made	Date
1		Initial issue of document	8/08/2023

CONTENTS

RADIOFREQUENCY RADIATION EXPOSURE EVALUATION REPORT - MPE

Device:	MPC Engine Bay DC Charger
Model Number:	BCDCX12050
FCC ID:	FCC ID: 2BAH6-BCDCX01
Manufacturer:	REDARC Technologies Pty Ltd
Inspected for:	REDARC Technologies Pty Ltd
Address:	23 Brodie Road (North), Lonsdale, SA, 5160, Australia
Phone Number:	+61 (08) 8322 4848
Contact:	Aly Virani
Email:	avirani@redarc.com.au
Standards:	**447498 D01 General RF Exposure Guidance v06** RF exposure procedures and equipment authorization policies for mobile and portable devices. **47 CFR § 2.1091** Radiofrequency radiation exposure evaluation: mobile devices (Transmitter is more than 20 cm from human body).
Result:	Based on an assessment of the documentation provided and the declared separation distance from the human body under normal use, the MPC Engine Bay DC Charger model BCDCX12050 complies with the RF exposure requirements of 47 CFR Part 2.1091. Refer to Report M2210007-11 for full details.
Assessment Date:	1 February 2023
Issue Date:	8 August 2023
Assessment Engineer:	Ruel Badajos
Authorised Signatory:	Shabbir Ahmed Technical Director

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1 INTRODUCTION

This report is intended to demonstrate compliance of the MPC Engine Bay DC Charger, model BCDCX12050 with the RF exposure requirements of 47 CFR Part 2.1091. Evaluation was performed in accordance with FCC KDB 447498 D01 v06.

The product sample was provided by the Client. The conclusion herein is based on the information provided by the client.

1.1 Laboratory Overview

EMC Technologies Pty. Ltd. is an independently owned Australian company that is NATA accredited to ISO 17025 for both testing and calibration and ISO 17020 for Inspection. – **Accreditation Number 5292.**

1.2 Test Laboratory/Accreditations

Inspection was performed at EMC Technologies' laboratory in Keilor Park, Victoria Australia.

Table 1-1: Accreditations for Conformity Assessment

Country/Region	Body	
Australia/New Zealand	NATA	Accreditation Number: 5292
Europe	European Union	Notified Body Number: 0819
USA	FCC	Designation Number: AU0001 (Melb)
Canada	ISED Canada	Company Number: 3569B(Melb)
Japan	VCCI	Company Number: 785
Taiwan	BSMI	Lab Code SL2-IN-E-5001R

2 DEVICE DETAILS

(Information supplied by the Client)

The REDARC MPC Engine Bay DC Charger is a state-of-the-art battery management system designed to charge and maintain auxiliaries by incorporating DC and solar inputs in the engine bay. The system includes Temperature sensor, 1 x Alternator input, 1 x Solar input and 1 x DC output.

Manufacturer:	REDARC Technologies Pty Ltd
Inspected Sample:	MPC Engine Bay DC Charger
Model Number:	BCDCX12050
Distance from human body in normal use:	Greater than 20cm

Transmit parameters were provided by the customer and are shown below:

Table 2-1: Transmitter Parameters

Transmitter #1	
Wireless Interface:	Nordic Semiconductor nRF52833 (BLE)
Operating Frequency:	Lowest Channel: 2.402 GHz Mid Channel: 2.440 GHz Highest Channel: 2.480 GHz
Max. RF Output Power Level:	+8 dBm
Antenna Type:	Surface Mount Device Antenna
Max Antenna gain:	3.7 dBi

3 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE), §1.1310

TABLE 1 - LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ^{2})	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	* 100	6
3.0-30	1842/f	4.89/f	* 900/f ^{2}	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* 100	30
1.34-30	824/f	2.19/f	* 180/f ^{2}	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

4 UNCERTAINTY

EMC Technologies has evaluated the tools and methods used to perform Radiated Electromagnetic Field predictions.

The estimated measurement uncertainties for the calculation shown within this report are as follows:

Electromagnetic Modelling;

30 MHz to 100GHz ±2.8 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

5 ASSUMPTIONS IN THIS ASSESSMENT

This assessment does not include accumulated RF fields from nearby sites/antennas or possible radio signal reflections or attenuation due to buildings or the general environment.

Antenna Parameters and power settings were supplied by the customer.

A 100% duty cycle is assumed.

The aperture of the radiating element assumed to be a point source in free space and far field conditions.

6 RF EXPOSURE CALCULATIONS

The reference level was evaluated at 20 cm to show compliance with the power density listed in table 1 (Section3),

The following formula was used to calculate the power density at 20 cm:

$$S = \frac{P * G}{4\pi R^2}$$

$$S = \frac{EIRP}{4\pi R^2}$$

Where

(S): Power density (mW/cm^2)
(P): Output power at antenna terminal (mW)
(G): Gain (ratio)
(R): Minimum test separation distance (20 cm)

Table 6-1: Calculations

Technology	Frequency Band	Power	Gain	Duty Cycle	EIRP	EIRP	Flux Density at 20 cm	Flux Density limit	Percentage of the limit
	(MHz)	dBm	dBi	%	dBm	mW	mW/cm^2	mW/cm^2	%
Bluetooth	2402.0	8.0	3.7	100%	11.70	15.0	0.003	1.0	0.3%
Percentage of the limit at 20 cm									**0.3%**

7 APPENDIX A

Referenced Documents

Document	Comments
NRF52833 Datasheet	Bluetooth radio details

-- End of Report --