

SAR Compliance Test Report

Date of Report	14/06/2022	Client's Contact person:	Imad Hjije
Number of pages:	6	Responsible Test engineer:	Jesper Varis
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Tested devices	Cowboy E-bike C4, C4 ST		
Related reports:	-		
Testing has been carried out in accordance with:	47CFR §2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices FCC published RF exposure KDB procedures		
Documentation:	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory		
Test Results:	The DUT complies with the requirements in respect of all parameters subject to the test. The test results relate only to devices specified in this document		
Date and signatures:	14.06.2022		
For the contents:			

Laboratory Manager

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Device under Test (DUT):

Product:	E-bike C4
Manufacturer:	Cowboy
Model:	C4, C4 ST
Hardware Version:	A4-7100-XX
FCC ID:	The DUT contains XPYUBX18ZO01, XPNINAB30
Document ID:	FCC SAR test report_Cowboy_ID5025_19052022.docx

1.2 Evaluation Results

The device conforms to the requirements of the standards when the maximum output power is less than or equal to the Test Exclusion Threshold Limit.

Regulator	System	Test Exclusion Threshold Limit at 71 mm separation [mW]	Maximum Power* [mW]	Result
FCC	LTE-M1 2	451.3	384.6	PASS
FCC	LTE-M1 4	460.0	384.6	PASS
FCC	LTE-M1 5	396.0	316.2	PASS
FCC	LTE-M1 12	374.6	316.2	PASS
FCC	Bluetooth	425.6	12.16	PASS

* According to Appendix A at 447498D04 Interim General RF Exposure Guidance, the equation (B.2.) defines the thresholds for available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

1.2.1 Simultaneous transmission

Highest Simultaneous Transmission Combination	Highest Estimated Simultaneous Transmission SAR _{1g} (W/kg)	Simultaneous Transmission SAR _{1g} Limit (W/kg)	Result
LTE-M1 2 + Bluetooth	1.41	1.6	PASS

2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

The DUT is a communication module in an electric bike. It is located so that the minimum separation distance to user is 71mm while pedalling.

Exposure Environment	General population, uncontrolled
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2.1 Supported Frequency Bands and Operational Modes

	Modes of Operation	Transmitter Frequency Range (MHz)
TX Frequency bands	LTE-M1 2	1850-1910
	LTE-M1 4	1710-1755
	LTE-M1 5	824-849
	LTE-M1 12	699-716
	Bluetooth	2402-2480

3. TEST EXCLUSIONS

FCC SAR test exclusion threshold is calculated according to 447498D04 Interim General RF Exposure Guidance, equation B.2 and B.1:

$$P_{th} (mW) = \begin{cases} ERP_{20\text{ cm}} (d / 20\text{ cm})^x & d \leq 20\text{ cm} \\ ERP_{20\text{ cm}} & 20\text{ cm} < d \leq 40\text{ cm} \end{cases} \quad (\text{Equation 1})$$

where

$$x = -\log_{10} \left(\frac{60}{ERP_{20\text{ cm}} \sqrt{f}} \right) \quad (\text{Equation 2})$$

and f is in GHz, d is the separation distance (cm), and ERP20cm is per Equation 3 (B.1) below.

$$ERP_{20\text{ cm}} (mW) = \begin{cases} 2040f & 0.3 \leq f < 1.5\text{ GHz} \\ 3060 & 1.5\text{ GHz} \leq f \leq 6\text{ GHz} \end{cases} \quad (\text{Equation 3})$$

Transmission mode	Frequency (f)	Separation distance (d)	P _{th} [mW]
LTE-M1 2	1.91 GHz	7.1cm	451.3
LTE-M1 4	1.755 GHz	7.1cm	460.0
LTE-M1 5	0.849 GHz	7.1cm	396.0
LTE-M1 12	0.716 GHz	7.1cm	374.6
Bluetooth	2.48 GHz	7.1cm	425.6

4. RESULTS

4.1 Maximum defined Output Power and ERP

According to Appendix A at 447498D04 Interim General RF Exposure Guidance, the equation (B.2.) defines the thresholds for available maximum time-averaged power or maximum time-averaged ERP, whichever is greater. Since the ERP is greater than the maximum output power of the DUT for bands LTE-M1 B2, B4 and Bluetooth, it is used for SAR test exclusion. For Bands LTE-M1 B5 and B12 the maximum output power of the DUT is greater than ERP, thus it is used for SAR test exclusion.

Transmission mode	Output power [dBm]	Output power [mW]	Power Gain of Antenna, G [dBi]	EIRP Output power [dBm]	ERP Output power [dBm]	ERP Output power [mW]	P _{th} [mW]
LTE-M1 2	25	316.2	3.0	28	25.85	384.6	451.3
LTE-M1 4	25	316.2	3.0	28	25.85	384.6	460.0
LTE-M1 5	25	316.2	1.9	26.9	24.75	298.5	396.0
LTE-M1 12	25	316.2	1.9	26.9	24.75	298.5	374.6
Bluetooth	8	6.3	5	13	10.85	12.16	425.6

The maximum output power/ERP of the DUT is below the test exclusion threshold.

4.1 Simultaneous transmission analysis

For simultaneous transmission evaluation the estimated standalone SAR values are calculated according to the following equation 4.

$$SAR_{estimated} = 1.6 * \frac{P_{ant}}{P_{th}} \text{ [w/kg]} \quad \text{(Equation 4)}$$

Estimated BT SAR = 1.6*(12.16/425.6) = 0.05 W/kg

Estimated maximum cellular SAR = 1.6*(384.6/451.3) = 1.36 W/kg

Estimated BT SAR + Estimated maximum cellular SAR = 1.41 W/kg < 1.6 W/kg

Sum of the estimated BT SAR and maximum cellular SAR is within the SAR limit thus simultaneous transmission SAR evaluation is exempt.