

RF Exposure Evaluation Report

Date of Report	29/11/2022	Client's Contact person:	Kevin McCandless
Number of pages:	6	Responsible Test engineer:	Jesper Varis
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Tested devices	Radio Module		
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:
For the contents:

29.11.2022

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Device under Test (DUT):

Product:	Radio Module (not sold separately, module is part of commercial products)
Manufacturer:	Treon Oy
Model:	EBIOTPCWM
Hardware Version:	Main_07
FCC ID:	DVE-EBIOTPCWM
FCC Test Firm Designation Number:	FI0005
Document ID:	FCC RF Exposure Evaluation Report_radio module_ID5927_29112022.docx
Document History/changes	This report replaces FCC SAR test report_radio module_ID5927_28112022. Title of the report changed.

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 5 mm separation [mW]	Maximum Power* [mW]	Result
FCC	Wirepas	2.7	0.41	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.

2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

The DUT is a stand-alone module that includes full 2.4GHz radio functionality including radio SOC (System on Chip), power supply, crystals, PCB antenna, and interface for variety of sensor modules. A Product family is created around the DUT. It not sold separately, only as a part of commercial products

According to measurement report "Antenna report for TR Module with Desk and IAQ sensors", maximum antenna gain is 4.8 dBm.

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

TX Frequency bands	Modes of Operation	Transmitter Frequency Range (MHz)
	Wirepas	2400 – 2483.5

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]
Wirepas	2.48 GHz	0.5	2.7

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.

According to the manufacturer maximum TX output power is 8mW and the duty cycle of the transmission is 2.8%: $8\text{mW} * 0.028 = 0.22\text{ mW}$.

Since the ERP is greater than the maximum output power, 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]
Wirepas	-6.5	0.22	4.8	-1.69	-3.84	0.41	2.7

The ERP of the DUT is below the test exclusion threshold.