



Waterman Business Centre
PD 393, 44 Lakeview Drive
Scoresby, Vic, 3179, AU

PH: +61 3 9887 4963
Email: global_admin@globalapprovals.com.au
Website: www.globalapprovals.com.au

MPE ASSESSMENT REPORT

COUNTRY: USA

STANDARD: CFR Title 47 Part 2.1091

REPORT NUMBER: R220602-3 REV1

CUSTOMER: Cooltrax Asia Pacific Pty Ltd

PRODUCT NAME: Cooltrax Wireless Sensor

MODEL NO: WT-V4

FCC ID WSB-WT-V4



DATE OF ISSUE: 15 JUNE 2023



TABLE OF CONTENTS

1	Introduction	4
2	Revision History	4
3	Summary.....	4
4	Disclaimer	4
5	Company Overview.....	4
6	Quality System.....	4
7	Abbreviations	5
8	Referenced Legislation and Standards.....	5
9	Referenced Documents	6
10	Product Details	6
10.1	Overview	6
10.2	Radio module specifications	6
10.3	Antenna RF specifications	6
11	Background Information	7
12	MPE Limits	8
13	Essential Parameters and Assumptions	8
14	Results	9
15	Conclusion.....	9



MPE ASSESSMENT CERTIFICATE

Prepared for: Cooltrax Asia Pacific Pty Ltd

Address: 138b Thistlethwaite Street
South Melbourne, VIC, 3205

Contact Name: Tim Miller
Phone Number: 0414 181 845.
Email: tim.miller@cooltrax.com

Product Name: Cooltrax Wireless Sensor
Model Number: WT-V4
FCC ID: WSB-WT-V4

Transmitter: Bluetooth 5 BLE (2.4GHz) at 8dBm maximum

Antennas: Integral, Chip, +1.5dBi peak gain

Standard: **FCC CFR Title 47: Telecommunication PART 2—FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS Subpart J—Equipment Authorization Procedures**


Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.


Summary: The Cooltrax Asia Pacific Pty Ltd Cooltrax Wireless Sensor, model WT-V4, complies with CFR Title 47 Part 2.1091 General Population Maximum Permissible Exposure (MPE) limits at a minimum separation distance of 20cm.

Refer to Global Approvals report R220602-3 Rev1 for details.

Assessment date(s): 07 Feb 2023 – 28 Apr 2023

Issue Date: 15 June 2023

Prepared by: 
Hans Koch
(Technical Officer)

Assessed and authorised by: 
Andrew Whiteford
(Principal Engineer)

Issued by:**Global Approvals**

ABN: 25 497 357 455

Waterman Business Centre
PD 393, 44 Lakeview Drive
Scoresby, Vic, 3179, AU**PH:** +61 3 9887 4963
Email: global_admin@globalapprovals.com.au
Website: www.globalapprovals.com.au



MPE ASSESSMENT REPORT

1 Introduction

Global Approvals assessed the Cooltrax Asia Pacific Pty Ltd Cooltrax Wireless Sensor, model WT-V4, against FCC MPE requirements of CFR Title 47 Part 2.1091 per the methodology of FCC KDB 447498 D01.

Relevant product and subcomponent documentation were used as part of the assessment to determine compliance.

2 Revision History

Version	Section Changed	Details	Date
-	-	Initial Release	11/05/2023
REV1	Cover page, certificate, 10.1	Added FCC ID Number	15/06/2023

Table 1.

3 Summary

The Cooltrax Asia Pacific Pty Ltd Cooltrax Wireless Sensor, model WT-V4, complies with CFR Title 47 Part 2.1091 General Population MPE limits at a minimum separation distance of 20cm.

A separation distance of at least 20cm from the antenna and radiating structure must be maintained.

The worst-case result was **0.22%** of the limit.

4 Disclaimer

This assessment report is based on the information supplied by the customer, subcomponent suppliers and regulatory requirements in force on the date of issue. The report is only valid for the product sample assessed. The responsible supplier must ensure all production samples are electrically, electronically and mechanically identical to the sample assessed as our service does not include a detailed sample inspection or cross reference.

This report is valid for the life of the product unless it has been modified or a higher gain antenna used. If changes have been made the impact on compliance shall be assessed.

5 Company Overview

Global Approvals is an independently owned Australian business that specialises in approvals of electrical and electronic equipment that is sold all around the world. Key team members have over 20 years' experience in the product compliance industry as Compliance Engineers and managers of various prominent ISO 17025 NATA accredited compliance laboratories. We have held NATA signatory status for a range of commercial, consumer, defence, railway, automotive and aerospace standards.

[About Global Approvals](#)

6 Quality System

Global Approvals operates under an ISO 17020 Quality System (requirements for the competence of bodies performing inspection and for the impartiality and consistency of their inspection activities).

[Global Approvals Quality](#)



7 Abbreviations

Cat M1	Category M1
dB	Decibel
dBi	Gain of an antenna system in decibels relative to an isotropic radiator
EMR	Electromagnetic Radiation
E-UTRA	Evolved UTRA (also referred to as LTE)
EM	Electromagnetic
EIRP	Effective Isotropic Radiated Power
FCC	Federal Communications Commission
IoT	Internet of Things
KDB	Knowledge Data Base
LTE	Long Term Evolution
mW	Power in milliwatts
MPE	Maximum Permissible Exposure
NB1	Narrow Band 1
NB-IoT	NarrowBand Internet of Things
OH&S	Occupational Health and Safety
PTT	Push to Talk
PFD	Power Flux Density
RF	Radio Frequency
SAR	Specific Absorption Rate
UHF	Ultra High Frequency
UTRA	Universal Terrestrial Radio Access (also referred to as UMTS)
UMTS	Universal Mobile Telecommunications Service
Wi-Fi	Wireless Fidelity

8 Referenced Legislation and Standards

FCC CFR Title 47: Telecommunication PART 2—FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS Subpart J—Equipment Authorization Procedures

- *Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.*

CFR Title 47 Part 1.1310 Radiofrequency radiation exposure limits.

FCC OET Bulletin 65 *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields August 1997*

FCC KDB 447498 D01 General RF Exposure Guidance v06 *RF Exposure Procedures and Equipment Authorisation Policies for Mobile and Portable Devices October 23, 2015*

Unless otherwise stated, the latest editions have been applied.



9 Referenced Documents

The following documents were supplied by the customer for assessment:

Description	Reference	Type
Data/Spec Sheet (<i>BT Module</i>)	nRF52840pbv20	File name
Schematic Diagram	Sensor Tag – Top Level SchDoc	File name
Project Premise (<i>Overview</i>)	Project Premise	File name
Data/Spec Sheet (<i>Antenna</i>)	Ant 2450AT18D0100	File name

Table 2.

10 Product Details

The product is a battery-operated **wireless environmental monitoring sensor**. It may assume any of three key variants – Tag, Wedge or Probe to suit the given application. The variants are physically & sensor different (to suit the intended application) but all use the same 2.4GHz Bluetooth LE (BLE) technology to communicate with the system Gateway. The Sensor can monitor temperature, humidity, pressure, light, magnetics and acceleration/deceleration and would find typical (but not limited to) application in commercial and transport scenarios.

10.1 Overview

Product Name: Cooltrax Wireless Sensor
 Trade Name: Not given
 Model No: WT-V4
 FCC ID: WSB-WT-V4
 Part Number: Not given
 Serial Number: Not given
 Firmware Version: 0.0.09
 Software Version: Not given
 Hardware version: COO-2118-001-02

- **Power:** Lithium battery, 3.7V, internal
 - **RF details:** Bluetooth BLE (2.4GHz)
 - **Tx Power:** 8dBm (6.31mW) maximum (adjustable from -20dBm to +8dBm)
 - **Antenna:** Integral, Chip, +1.5dBi peak gain.
- The normal position of use is more than 20 cm from the user's ear or body.

10.2 Radio module specifications

Manufacturer	Model #	Type	Frequency (MHz)	Power (dBm)	Tolerance (dB)
Nordic Semiconductor	nRF52840	Bluetooth LE	2400	-20 to +8 <i>max</i>	Not known

Table 3.

10.3 Antenna RF specifications

Manufacturer	Part #	Type	Usage	Frequency (MHz)	Gain/Loss (dBi)
Johanson Technology Inc	2450AT18D0100E	Integral Chip	Bluetooth LE	2400 to 2500	+1.5 <i>peak</i>

Table 4.



11 Background Information

The following discourse should help in the understanding and interpretation of the referenced Standards and the assessment results. The discourse includes a summary of pertinent information taken from the referenced Standard.

Exposure limits are divided into two classifications: ***Occupational/Controlled Exposure*** and ***General Population/Uncontrolled Exposure***.

Occupational/Controlled Exposure

Typically (but *not* limited to) Occupationally exposed persons:

- who are trained in the use of radio/RF devices,
- who have knowledge of RF installations/equipment and would be aware of the presence of RF fields from such installations/equipment,
- who typically operate in a controlled environment or duty shift,
- who would be aware that such exposure may exceed General Public exposure limits.
- NOTE: *Occupationally exposed women who are pregnant must not be exposed to RF fields exceeding the General Public limits.*

General Population/Uncontrolled Exposure

All exposure to RF fields received by members of the General Public who may be of any age and health status (including pregnancy) and considered to be unaware/uninformed of RF sources and are not in a controlled environment.

The exposure limits detailed in FCC Part 1.1310 are known as the Time-averaged Reference Levels and are derived from measured and mathematical data known as the Basic Restrictions and assume maximum bodily coupling of the RF field. The Basic Restrictions are based on established health effects. For protection against known adverse health effects, the Basic Restrictions cannot be exceeded.

The metrics of the Basic Restrictions are Current Density (J), Power Flux Density (S) and Specific Absorption Rate (SAR).

Exposure compliance is automatically achieved when the Reference Levels are satisfied. If the measured/calculated parameter exceeds the exposure limit then compliance may not be automatically met and further analysis may be necessary.

The exposure limits currently promulgated are based on the best accumulated knowledge gained from decades of rigorous research conducted by many respected institutions and individuals ranging from scientists, physicists, biologists, doctors and other qualified and dedicated professional people. The wealth of knowledge is certainly great and continues to evolve in both scope and detail.

In the interests of erring on the side of conservative caution and to provide full protection against all established adverse health effects, the allowable exposure expressed in the referenced Standard has been deliberately set with a large safety margin.



12 MPE Limits

The device must not exceed the FCC General Population exposure limits when used as intended, as members of the General Population may be exposed.

General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

The radiating structure of the device must not be within 20 cm of the body of the user otherwise SAR may be required per CFR 47 Part 2.1093.

The normal separation distance from the radiating structure of the device is more than 20 cm from the body of the user or nearby persons and the available maximum time-averaged power is more than 1 mW. An assessment of the Power Density levels in accordance with CFR 47 FCC Part 2.1091 and FCC KDB 447498 D01 is required.

The General Population exposure limits are defined in CFR 47 Part 1.1310:

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)
General Population/Uncontrolled Exposure				
30 – 300	27.5	0.073	0.2	<30
300 – 1500	-	-	$f/1500$	<30
1500 – 100,000	-	-	1	<30

Table 5.

f = frequency in MHz

13 Essential Parameters and Assumptions

- RF parameters (frequency, conducted output power, tolerance and antenna gain where applicable) were obtained from the documents referenced in section 9.
- The information obtained from these documents is assumed to be valid and accurate.
- Unless otherwise stated, maximum specified or measured conducted output power was considered with worst-case tolerance (if available).
- In the absence of a specified output power tolerance or output power measurement uncertainty, a nominal (and reasonable) 1dB tolerance value is included in this assessment.
- All other tolerance values are either taken from manufacturer specifications or test reports.
- Calculations were made with a duty cycle of 100% (worst-case).
- Calculations were made at the lower and upper frequencies of each band or maximum power of the applicable frequency band(s).
- Where a frequency occupies a band with a varying (frequency-dependent) exposure limit, the lowest frequency of the band is used to determine the exposure margin if other band power/frequency data is not available (worst-case).
- Devices with multiple transmitters assume all transmitters operate simultaneously (unless otherwise stated).



- Only one protocol and band operate at a time for each technology in multi-technology devices.
- The aperture of the radiating elements is assumed to be a point source in free space.
- The assessment is based on Far Field conditions (per normative formulae pertaining to this discipline).
- The assessment assumes zero cable loss (worst-case).
- This assessment does not take into account EM fields from external sources, reflections or attenuation from the operating environment.

14 Results

The following formula was used to calculate the power flux density (S) and minimum separation distance (R):

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

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

- S: Power density ($\frac{mW}{cm^2}$)
P: Output power at antenna terminal (mW)
G: Gain
R: Minimum separation distance (cm)
EIRP: Effective Isotropic Radiated Power (mW)

Calculations are presented in the following table and are based on worst-case General Public limits.

Device	Band	Frequency (MHz)	Power (dBm)	Tolerance (dB)	Gain (dBi)	Duty cycle (%)	EIRP (dBm)	EIRP (mW)	PD @ 20cm (mW/cm ²)	PD limit (mW/cm ²)	% of limit (%)
2.4GHz BLE	N/A	2402	8.0	1.0	1.5	100%	10.50	11.22	0.002	1.00	0.22%
	N/A	2484	8.0	1.0	1.5	100%	10.50	11.22	0.002	1.00	0.22%
NOTE 1: in the absence of a documented Tolerance, a nominal 1dB tolerance is used in these calculations											
Worst-case transmission of 2.4GHz Bluetooth LE:											
0.22%											

Table 6.

15 Conclusion

The Cooltrax Asia Pacific Pty Ltd Cooltrax Wireless Sensor, model WT-V4, **complies** with the CFR Title 47 Part 2.1091 General Population Maximum Permissible Exposure (MPE) limits at a minimum separation distance of 20cm.

The worst-case result was **0.22%** of the limit.

Use of higher gain antennas will require recalculation/reassessment.

The user manual shall include an RF exposure statement such as below:

Warning - a separation distance of at least 20cm from the radiating structure and the body of the user or nearby persons must be maintained to comply with MPE (Maximum Permissible Exposure) requirements.

The user manual shall also include a list of approved antennas.