

Applicant:

AiSight GmbH
Gertraudenstraße 10-12
10178 Berlin
Tel.: +49 30 40363399

Test report no.:

220480-AU01+W06

for:

AiSight GmbH
Vibration sensor node for industrial
machineries
V4PRO

according to:

47 CFR Part 2
RSS-102



Deutsche
Akkreditierungsstelle
D-PL-12155-01-04



Deutsche
Akkreditierungsstelle
D-PL-12155-01-03

Accreditation:

Deutsche
Akkreditierungsstelle
D-PL-12155-01-04

FCC test firm accreditation expiration date: 2024-05-17
MRA US-EU, FCC designation number: DE0010
Test firm registration number: 997268
FCC Registration Number (FRN): 0032245045
BnetzA-CAB-02/21-02/6 Valid until 2023-11-26



Deutsche
Akkreditierungsstelle
D-PL-12155-01-03

Recognized until 2025-03-16 by the
Department of Innovation, Science and Economic Development Canada (ISED)
as a recognized testing laboratory
CAB identifier: DE0011
Company number: 3472A

Location of Testing:

Element Materials Technology Straubing GmbH

Tel.: +49 9421 56868-0

Fax: +49 9421 56868-100

Email: info.straubing@element.com

Gustav-Hertz-Straße 35

94315 Straubing, Germany

The technical accuracy is guaranteed through the quality management of
Element Materials Technology Straubing GmbH.

Table of contents

1	Summary of test results	4
1.1	FCC standard	4
1.2	IC standard	4
2	Test regulations	5
2.1	FCC standards	5
2.2	IC standards	6
3	Equipment under Test	7
3.1	General information	7
3.2	Photographs of EUT	7
4	Test results	8
4.1	FCC	8
4.2	Canada	12
5	Revision history	15

List of tables

Table 1:	Table 1 to §1.1307(b)(3)(i)(C)—Single RF Sources Subject to Routine Environmental Evaluation	9
Table 2:	Result of evaluation of compliance	10
Table 3:	Result of evaluation of compliance	11
Table 4:	Result of exemption for routine evaluation of RF exposure	13
Table 5:	Result of exemption for routine evaluation of RF exposure	14

1 Summary of test results

1.1 FCC standard

<i>FCC standard</i>	<i>Requirement</i>	<i>Page</i>	<i>Result</i>
47 CFR Part 2, § 2.1091	Maximum permissible exposure, except WPT	8	Passed

1.2 IC standard

<i>IC standard</i>	<i>Requirement</i>	<i>Page</i>	<i>Result</i>
RSS-102 Issue 5, section 2.5.2	Evaluation for separation distance > 20 cm, except 3 kHz – 10 MHz	12	Passed

Straubing, July 18, 2023



Tested by
Konrad Graßl
Department Manager Radio



Approved by
Christian Kiermeier
Reviewer

2 Test regulations

2.1 FCC standards

Standard	Title
OET Bulletin 65, 65A, 65B Edition 97-01, August 1997	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields
Part 1, Subpart I, Section 1.1310 October 2021	Radiofrequency radiation exposure limits
Part 2, Subpart J, Section 2.1091 October 2021	Radiofrequency radiation exposure evaluation: mobile devices.
KDB 447498 D04 v01 November 29, 2021	RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices
KDB 865664 D01 v01r04 August 7, 2015	SAR Measurement requirements for 100 MHz to 6 GHz
ANSI C96.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

2.2 IC standards

<i>Standard</i>	<i>Title</i>
RSS-102 Issue 5 (March 19, 2015) Amendment 1 (February 2, 2021)	Spectrum Management and Telecommunications Radio Standards Specification Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)

3 Equipment under Test

3.1 General information

Product type:	Vibration sensor node for industrial machineries		
Model name:	V4PRO		
Serial number:	DC4A9ECERT01		
Manufacturer:	AiSight GmbH		
Version:	Hardware:	V4ProR4.2	
	Software:	v4pro-ab-1.0	
Short description:	EUT is a vibration sensor node for industrial machineries with a WLAN module operating in the 2.4 GHz band. The EUT also employs Bluetooth Low Energy.		
FCC ID:	2A34W-V4PRO		
IC certification number:	28248-V4PRO		
Technology 1:	WLAN		
Application frequency band:	2400 MHz to 2483.5 MHz		
Antenna types:	PCB antenna		
	☐ detachable	☒ not detachable	
Technology 2:	Bluetooth low energy		
Application frequency band:	2400 MHz to 2483.5 MHz		
Antenna types:	PCB antenna		
	☐ detachable	☒ not detachable	
Power supply:	DC supply		
	Nominal voltage: 24 V		
Exposure tier:	☐	Head	
	☐	Body	
	☐	Limbs	
	☐	other	
	☒	See appropriate results	
Separation distance:	☐	≤ 20 cm	
	☒	> 20 cm	
	☐	See appropriate results	
Evaluated against exposure limits:	☒	General public use	
	☐	Controlled use	

3.2 Photographs of EUT

See Annex B of test report 220480-AU01+W04 of test laboratory Element Materials Technology Straubing GmbH.

4 Test results

This clause gives details about the test results as collected in the summary of test results on page 4.

4.1 FCC

4.1.1 Maximum permissible exposure, except WPT

Requirement: Part 2, §2.1091
Reference: KDB 447498 D04 v01

Performed by:	Konrad Graßl	Date of test:	July 18, 2023
Result:	☒ Limits kept	☐ Limits not kept	

4.1.1.1 Requirements and limits maximum permissible exposure

According to §2.1091(b):

A mobile device is defined as “a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter’s radiating structure(s) and the body of the user or nearby persons.”

According to §2.1091(c)(1):

Evaluation of compliance with the exposure limits in §1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for mobile devices with single RF sources having either more than an available maximum time-averaged power of 1 mW or more than the ERP listed in Table 1 to §1.1307(b)(3)(i)(C), whichever is greater. For mobile devices not exempt by §1.1307(b)(3)(i)(C) at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 of this chapter is necessary if the ERP of the device is greater than ERP_{20cm} in the formula below. If the ERP of a single RF source at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP) in comparison with the following formula only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

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

According to §1.1307(b)(3)(i)(C):

Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2/f$.
1,500-100,000	$19.2 R^2$.

Table 1: Table 1 to §1.1307(b)(3)(i)(C)—Single RF Sources Subject to Routine Environmental Evaluation

4.1.1.2 Process to Determine RF Exposure Compliance

According to Appendix A of KDB 447498 D04 Interim General RF Exposure Guidance V01: Generally, the sequence to apply for single portable RF sources includes the following steps:

- 1) Determination of 1 mW blanket exemption under § 1.1307(b)(3)(i)(A)
- 2) Determination of exemption under the MPE-based § 1.1307(b)(3)(i)(C) if 1) is not met
- 3) Determination of exemption under the SAR-based § 1.1307(b)(3)(i)(B) if both 1) and 2) are not met

4.1.1.3 Results

Note(s): The determination according to point 2 in clause 4.1.1.2 was used for evaluation.

RF technology 1:

The following data are based on applicants document: Test report 220480-AU01+W04 of the test laboratory Element Materials Technology Straubing GmbH

Application:	WLAN
Operation frequency range:	2400 MHz – 2483.5 MHz
Antenna model	PCB antenna
Antenna connector:	permanent
Antenna type:	internal not detachable
Antenna gain:	1.1 dBi
Maximum conducted output power:	21.83 dBm at 2412 MHz in modulation IEEE 802.11 g 22.02 dBm at 2442 MHz in modulation IEEE 802.11 g 22.05 dBm at 2462 MHz in modulation IEEE 802.11 g

Information related to Exposure:

Tune-up tolerance (according to the manufacturer):	2 dB
Separation distance:	20 cm
Exposure:	general public
Power averaging over time:	not applied

<i>Channel Frequency (MHz)</i>	<i>ERP + tune-up tolerance (dBm)</i>	<i>P (W)</i>	<i>Limit Threshold ERP (W)</i>	<i>Ratio of limit</i>	<i>Result</i>
2412	22.78	0.190	0.768	0.25	Passed
2442	22.97	0.198	0.768	0.26	Passed
2462	23.00	0.200	0.768	0.26	Passed

Table 2: Result of evaluation of compliance

Relationship between ERP and EIRP

According to clause G.4 of ANSI C63.10-2013: $ERP = EIRP - 2.15 \text{ dB}$

RF technology 2:

The following data are based on applicants document: Test report 220480-AU01+W05 of the test laboratory Element Materials Technology Straubing GmbH

Application:	Bluetooth low energy
Operation frequency range:	2400 MHz – 2483.5 MHz
Antenna model	PCB antenna
Antenna connector:	permanent
Antenna type:	internal not detachable
Antenna gain:	1.1 dBi
Maximum conducted output power:	7.07 dBm at 2402 MHz (2 Mbps) 7.82 dBm at 2440 MHz (2 Mbps) 7.79 dBm at 2480 MHz (2 Mbps)

Information related to Exposure:

Tune-up tolerance (according to the manufacturer):	2 dB
Separation distance:	20 cm
Exposure:	general public
Power averaging over time:	not applied

<i>Channel Frequency (MHz)</i>	<i>ERP + tune-up tolerance (dBm)</i>	<i>P (W)</i>	<i>Limit Threshold ERP (W)</i>	<i>Ratio of limit</i>	<i>Result</i>
2402	8.02	0.006	0.768	0.008	Passed
2440	8.77	0.008	0.768	0.010	Passed
2480	8.74	0.007	0.768	0.010	Passed

Table 3: Result of evaluation of compliance

Relationship between ERP and EIRP

According to clause G.4 of ANSI C63.10-2013: $ERP = EIRP - 2.15 \text{ dB}$

4.2 Canada

4.2.1 Evaluation for separation distance > 20 cm, except 3 kHz – 10 MHz

Requirement: RSS-102 Issue 5, section 2.5.2

Reference: n/a

Performed by:	Konrad Graßl	Date of test:	July 18, 2023
Result:	☒ Limits kept	☐ Limits not kept	

4.2.1.1 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

According to RSS 102 Clause 2.5.2:

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

4.2.1.2 Results

RF technology 1:

The following data are based on applicants document: Test report 220480-AU01+W04 of the test laboratory Element Materials Technology Straubing GmbH

Application:	WLAN
Operation frequency range:	2400 MHz – 2483.5 MHz
Antenna model	PCB antenna
Antenna connector:	permanent
Antenna type:	internal not detachable
Antenna gain:	1.1 dBi
Maximum conducted output power:	21.83 dBm at 2412 MHz in modulation IEEE 802.11 g 22.02 dBm at 2442 MHz in modulation IEEE 802.11 g 22.05 dBm at 2462 MHz in modulation IEEE 802.11 g

Information related to Exposure:

Tune-up tolerance (according to the manufacturer):	2 dB
Separation distance:	20 cm
Exposure:	general public
Power averaging over time:	not applied

<i>Channel Frequency (MHz)</i>	<i>EIRP + tuneup tolerance (dBm)</i>	<i>P (W)</i>	<i>Limit (W)</i>	<i>Ratio of limit</i>	<i>Result</i>
2412	24.93	0.311	2.684	0.116	Passed
2442	25.12	0.325	2.707	0.120	Passed
2462	25.15	0.327	2.722	0.120	Passed

Table 4: Result of exemption for routine evaluation of RF exposure

RF technology 2:

The following data are based on applicants document: Test report 220480-AU01+W05 of the test laboratory Element Materials Technology Straubing GmbH

Application:	Bluetooth low energy
Operation frequency range:	2400 MHz – 2483.5 MHz
Antenna model	PCB antenna
Antenna connector:	permanent
Antenna type:	internal not detachable
Antenna gain:	1.1 dBi
Maximum conducted output power:	7.07 dBm at 2402 MHz (2 Mbps) 7.82 dBm at 2440 MHz (2 Mbps) 7.79 dBm at 2480 MHz (2 Mbps)

Information related to Exposure:

Tune-up tolerance (according to the manufacturer):	2 dB
Separation distance:	20 cm
Exposure:	general public
Power averaging over time:	not applied

<i>Channel Frequency (MHz)</i>	<i>EIRP + tuneup tolerance (dBm)</i>	<i>P (W)</i>	<i>Limit (W)</i>	<i>Ratio of limit</i>	<i>Result</i>
2402	10.17	0.010	2.676	0.004	Passed
2440	10.92	0.012	2.705	0.005	Passed
2480	10.89	0.012	2.736	0.004	Passed

Table 5: Result of exemption for routine evaluation of RF exposure

5 Revision history

<i>Revision</i>	<i>Date</i>	<i>Issued by</i>	<i>Description of modifications</i>
0	2023-07-18	Konrad Graßl	First edition

Template: RF_FCC_IC_Human Exposure_V1.6