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RF Exposure Compliance Report

Report No.: M2310030-3v2

TESTED FOR:	**ISSUED BY:**
Metso Australia Pty Ltd	EMC Technologies Pty. Ltd.
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Product Name:	Wireless Wear Sensor
Model:	WearSense Hugger Sensor (MM1774190)
FCC ID:	2BFPRMM1774190
Assessment Date:	1 February 2024
Issue Date:	28 June 2024
Specification(s):	• **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).*
Based on an assessment of the documentation provided and the declared separation distance from the human body under normal use, the Wireless Wear Sensor, model: WearSense Hugger Sensor (MM1774190) is exempted from SAR evaluation.	
Test Engineers:	Razin Ahmed
Authorized Signatory:	Digitally signed by Shabbir Ahmed Date: 2024.06.28 15:42:50 +10'00' Shabbir Ahmed

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Revision History

Version	Issue Date	Reason / Comments
1	26 March 2024	Initial issue
2	28 June 2024	Updated antenna details

General Remarks

EMC Technologies Pty Ltd hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.

EMC Technologies Pty Ltd reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. EMC Technologies Pty Ltd shall have no liability for any deductions, inferences or generalisations drawn by the customer or others from EMC Technologies Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Technologies Pty Ltd.

Content

1 Project Overview

1.1 Introduction

The transmitter was assessed against FCC KDB 447498 D01 General RF Exposure Guidance v6.

This report shows the SAR exclusion in accordance with FCC KDB 447498 D01 clause 4.3.1,

The product sample and device information were provided by the customer

1.2 Test Facility

Measurements were performed at the following location:

☒ Melbourne Laboratory 176 Harrick Road, Keilor Park, Vic 3042

☐ Sydney Laboratory Unit 3/87 Station Road, Seven Hills, NSW 2147

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**.

Country	Assessment Body	Lab Code / Member No.
Australia	NATA	Accreditation Number: 5292
Europe	European Union	Notified Body Number: 0819
USA	FCC	Designation Number: AU0001/AU0002
Canada	ISED Canada	CAB Identifier Number: AU0001/AU0002
Japan	VCCI	Company Number: 785
Taiwan	BSMI	Lab Code SL2-IN-E-5001R

1.3 Standards Applied

Unless otherwise noted, only the cited edition applies.

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).

*Latest version of the standard applied.

1.4 Device Details

(Information supplied by the Client)

Wireless Wear Sensor

Manufacturer:	Metso Australia Pty Ltd
Test Sample:	Wireless Wear Sensor
Model Number:	WearSense Hugger Sensor (MM1774190)
Distance From human body in normal use:	Greater than 20cm

1.5 Transmitters Details

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

RF Evaluation by Calculation: above 30MHz transmitting frequency

Transmitter #1	
Wireless Interface 1:	STMicroelectronics (STM32WB)
Operating Frequency:	2400MHz – 2483.5MHz
Max RF Output Power (EIRP)	-8.25 dBm*
Antenna Type:	Internal Ceramic chip antenna
Max Antenna gain:	0.5 dBi

Note: *EIRP value taken from Radio Report M2310030-7v2 Report.

2 SAR TEST EXCLUSION THRESHOLD FOR 100 MHz to 6 GHz

2.1 Test Separation Distance Test Separation Distance ≤50mm

Table1: SAR test exclusion threshold 100 MHz- 6GHz (≤50mm)

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	
MHz	30	35	40	45	50	mm
150	232	271	310	349	387	*SAR Test Exclusion Threshold* (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

Note: 10-g Extremity SAR Test Exclusion Power Thresholds are 2.5 times higher than the 1-g *SAR Test Exclusion Thresholds* indicated above. These thresholds do not apply, by extrapolation or other means, to occupational exposure limits.

Step A:

The 1-g Body SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$\frac{\text{max. power of channel, including tuneup tolerance (mW)}}{\text{min. test separation distance (mm)}} * \sqrt{f(GHz)} \leq 3.0$$

Where:

- f(GHz) is the RF channel transmit frequency in GHz.
- Power and distance are rounded to the nearest mW and mm before calculation.
- The result is rounded to one decimal place for comparison.
- The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz.
- The values 3.0 and 7.5 are referred to as *numeric thresholds* in step B below

2.2 Test Separation Distance >50mm

Table1: SAR test exclusion threshold 100 MHz- 6GHz (>50mm)

MHz	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	mm
100	474	481	487	494	501	507	514	521	527	534	541	547	554	561	567	
150	387	397	407	417	427	437	447	457	467	477	487	497	507	517	527	
300	274	294	314	334	354	374	394	414	434	454	474	494	514	534	554	
450	224	254	284	314	344	374	404	434	464	494	524	554	584	614	644	
835	164	220	275	331	387	442	498	554	609	665	721	776	832	888	943	
900	158	218	278	338	398	458	518	578	638	698	758	818	878	938	998	
1500	122	222	322	422	522	622	722	822	922	1022	1122	1222	1322	1422	1522	mW
1900	109	209	309	409	509	609	709	809	909	1009	1109	1209	1309	1409	1509	
2450	96	196	296	396	496	596	696	796	896	996	1096	1196	1296	1396	1496	
3600	79	179	279	379	479	579	679	779	879	979	1079	1179	1279	1379	1479	
5200	66	166	266	366	466	566	666	766	866	966	1066	1166	1266	1366	1466	
5400	65	165	265	365	465	565	665	765	865	965	1065	1165	1265	1365	1465	
5800	62	162	262	362	462	562	662	762	862	962	1062	1162	1262	1362	1462	

Step B:

For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following.

1) {[Power allowed at *numeric threshold* for 50 mm in step A)] + [(test separation distance – 50 mm)·(f(MHz)/150)]} mW, for 100 MHz to 1500 MHz

2) {[Power allowed at *numeric threshold* for 50 mm in step A)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

3 Uncertainty

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

The estimated measurement uncertainties 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%.

4 Assumptions in the 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.

5 Evaluation Result

The standalone transmitter is exempted from SAR if the below condition satisfied in conjunction with threshold power condition in Table 2 for separation distance of >50mm.

$$\frac{\{(\text{Power allowed at } numeric\ threshold\ ) + (\text{test separation distance} - 50\text{mm}).10\}\text{mW}}{\text{min. test separation distance (mm)}}$$

Where

Minimum test separation distance (mm): 200 (worst case), EUT distance from human body in normal operation is more than 20cm

The minimum test separation distance is determined by the smallest distance from the antenna (radiating structures) to the outer surface of the device.

Power allowed at numeric Theshold (mW): 96mW (1-g Body SAR)

$$\frac{\text{Power allowed at } numeric\ threshold}{\text{min. test separation distance (mm)}} * \sqrt{f(GHz)} = \frac{\text{Power allowed at } numeric\ threshold}{50mm} * \sqrt{2.45(GHz)} \leq 3.0$$

$\underline{\text{Power allowed at } numeric\ threshold\ = 96\text{mW}}$

$$\frac{\{(96\text{mW}) + (\text{test separation distance} - 50\text{mm}).10\}\text{mW}}{\text{min.test separation distance (mm)}} = \frac{\{(96\text{mW}) + (200\text{mm} - 50\text{mm}).10\}\text{mW}}{200\ (\text{mm})} = \mathbf{7.98mW}$$

As the transmitted power is **0.15 mW** (-8.25 dBm), less than 1496 mW indicated in table (2) and lower than the SAR test exclusion threshold condition above[1] which is **7.98 mW**, this transmitter exempted from SAR evaluation for FCC compliance purposes.

[1] As per KDB 447498, section 4.3 General SAR test exclusion guidance.

Appendix A

Referenced Documents

Document	Comments
M2310030-5v2 RDO EN 300 328	Transmitter details
M2310030-7v2 RDO FCC Part 15C	
Johanson Technology_2.4GHz chip antenna SMT_2450AT18A100	Antenna Gain