TEST REPORT

Application No.:	HKEM2308000690PF
Applicant:	ORTechnologies Pty Ltd
Address of Applicant:	Level 1, 70 Trenerry Cres, Abbotsford, Vic 3067
Equipment Under Test (EUT):	
EUT Name:	Sensor Node 3
Model No.:	448-000304 SENSOR NODE 3 WHITE, 448-000374 SENSOR NODE 3 BLACK
Additional Model:	Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.
FCC ID:	2BCWQSN3
IC:	31225-SN3
HVIN:	448-000304, 448-000374
Standard(s) :	47 CFR Part 1.1307; 47 CFR Part 2.1093 KDB447498D04 General RF Exposure Guidance v01 RSS102 Issue 5 March 2015
Date of Receipt:	2023-10-18
Date of Test:	2023-10-18 to 2023-10-25
Date of Issue:	2023-10-25
Test Result:	The submitted sample was found to comply with the test requirement

Law Man Kit
EMC Manager

Revision Record			
Revision No.	**Date**	**Report superseded**	**Remark**

Authorized for issue by:				
				
		Chan Chun Lok /Project Engineer		Date: 2023-10-25
				
		Law Man Kit /Reviewer		Date: 2023-10-25

2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
RF Exposure	47 CFR Part 1.1307, 47 CFR Part 2.1093, KDB 447498 D01	KDB447498D04	KDB447498D04	PASS
RF Exposure	RSS102 Issue 5	RSS-102 Section 2.5.2	RSS102 Issue 5	PASS

Declaration of EUT Family Grouping:

Item no.: 448-000304 SENSOR NODE 3 WHITE, 448-000374 SENSOR NODE 3 BLACK

According to the confirmation from the applicant, the above models are identical in all electrical aspects in relating to the circuitry design, PCB layout, electrical components used, internal wiring and functions. The differences are only the color and enclosure material.

Therefore, only the model 448-000304 SENSOR NODE 3 WHITE was tested in this report.

Abbreviation:

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

RF: In this whole report RF means Radiated Frequency.

CH: In this whole report CH means channel.

Volt: In this whole report Volt means Voltage.

Temp: In this whole report Temp means Temperature.

Humid: In this whole report Humid means humidity.

Press: In this whole report Press means Pressure.

N/A: In this whole report not application.

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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 11.5 V – 22.5 V
Test voltage:	AC 120 V (driver)
Cable:	N/A
Antenna Gain:	0.68 dBi
Antenna Type:	MIFA Antenna
Bluetooth Version:	V5.4 LE
Channel Separation:	2MHz
Modulation Type:	GFSK
Number of Channels:	40
Operation Frequency:	2402MHz to 2480MHz
Series No.:	A1
Firmware Version:	5.1
Hardware Version:	448-000304, 448-00374

Frequency List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2402	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2480
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	**2440**	**39**	**2480**

The frequencies under test are bolded.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	DELL	P75F	475LXQ2
PuTTY.exe	C-MER RainsOptics Limited	N/A	N/A

Note: The laptop and the software PuTTY.exe were for the control of the engineering mode.

4.3 Modulation Configuration

RF software:	PuTTY.exe			
Modulation	**Packet**	**Packet Type**	**Packet Size**	**Power**
GFSK	Default	Default	Default	Pos4dBm
Remark: 1. Pos4dBm value was set in test software as maximum output power setting.				

4.4 Test Location

All tests were performed at:

SGS Hong Kong Limited

Unit 2 and 3, G/F, Block A, Po Lung Centre,

11 Wang Chiu Road, Kowloon Bay, Kowloon, Hong Kong

Tel: +852 2305 2570 Fax: +852 2756 4480

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **IAS Accreditation (Lab Code: TL-817)**

SGS Hong Kong Limited has met the requirements of AC89, IAS Accreditation Criteria for Testing Laboratories, and has demonstrated compliance with ISO/IEC Standard 17025:2017, General requirements for the competence of testing and calibration laboratories. This organization is accredited to provide the services specified in the scope of accreditation maintained on the IAS website (www.iasonline.org).

The report must not be used by the client to claim product certification, approval, or endorsement by IAS, NIST, or any agency of the Federal Government.

- **FCC Recognized Accredited Test Firm(CAB Registration No.: 514599)**

SGS Hong Kong Limited has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: HK0015, Test Firm Registration Number: 514599.

- **Industry Canada (Site Registration No.: 26103; CAB Identifier No.: HK0015)**

SGS Hong Kong Limited has been recognized by Department of Innovation, Science and Economic Development (ISED) Canada as a wireless testing laboratory. The acceptance letter from the ISED is maintained in our files. CAB Identifier No: HK0015, Site Registration Number: 26103.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Radio Spectrum Technical Requirement

5.1 RF Exposure

5.1.1 Test Requirement:

CFR 47 Part 1.1310

Limit:

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in Part1.1307(b)

TABLE 1—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)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f^2	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f^2	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

According to IEEE C95.3:2002 section 5.5.1.1, The power density S at a point on the axis at a distance d from a transmitting antenna is given by the Friis free-space transmission formula

$$S = \frac{PG}{4\pi d^2}$$

S = power density (mW/cm^2)

P = the net power delivered to the antenna (mW)

G = gain of the antenna in linear scale

d = distance between observation point and center of the radiator (cm)

5.1.1 EUT RF Exposure Evaluation

According to RSS-102 Issue 5, section 2.5.2 Exemption.

RF exposure evaluation is required if the separation distance between the user 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 22.48/f0.5W (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 x 10-2 f0.6834 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).

5.1.2 EUT RF Exposure Evaluation

Antenna Gain: 0.68 dBi for BLE.

The maximum Gain measured in fully anechoic chamber is 1.16 (BLE) in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

For FCC;

BLE:

Operation mode	Channel	Frequency (MHz)	Conduct power (including Tune-up tolerance) (dBm)	Conduct power (mW)	Power Density at R = 20 cm (mW/cm2)	Limit	Result
GFSK	Low	2402	-3.0	0.501	0.00012	1	Pass
GFSK	Middle	2442	-3.7	0.427	0.00010	1	Pass
GFSK	High	2480	-2.9	0.513	0.00012	1	Pass

For IC;

BLE:

Operation mode	Channel	Frequency (MHz)	Conduct power (including Tune-up tolerance) (dBm)	E.I.R.P (dBm)	E.I.R.P (W)	Limit	Conduct power (including Tune-up tolerance) (dBm)
GFSK	Low	2402	-3.0	-2.32	0.0006	2.6764	Pass
GFSK	Middle	2442	-3.7	-3.02	0.0005	2.7068	Pass
GFSK	High	2480	-2.9	-2.22	0.0006	2.7355	Pass

6 Photographs

6.1 EUT Constructional Details (EUT Photos)

Refer to the appendices external, internal and setup photos.

- End of the Report -