EMC Bayswater Pty Ltd
18/88 Merrindale Drive Croydon South, Victoria, 3136, Australia
Telephone: +61 3 9761 5888
Facsimile: +61 3 8761 6547
Email: sales@emcbayswater.com.au
ABN: 49 112 221 333

RF Radiation Exposure Evaluation

In accordance with:

FCC KDB 447498 D01 v06

Setec BMPRO Pty Ltd

SONIC

Bluetooth Module

FCC ID: 2ASJH-SONIC

REPORT: E2304-1648-2
DATE: May, 2023

RF Radiation Exposure Evaluation Report

EMC Bayswater Test Report: E2304-1648-2
Issue Date: May, 2023

Product:	Bluetooth Module
Model No:	SONIC
Serial No:	Engineering sample
FCC ID:	2ASJH-SONIC
Customer Details:	Mr. Cecilio Dimasacat Setec BMPRO Pty Ltd 19 Henderson Road, Knoxfield, VIC 3180 Australia Phone No: +61 3 9763 0962 Fax No: +61 3 9763 8789 e-mail: cecilio.dimasacat@setec.com.au
Standard(s):	FCC KDB 447498 D01 v06 RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES CFR47 FCC Part 2, Subpart J, 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. CFR47 FCC Part 2, Subpart J, 2.1093 Radiofrequency radiation exposure evaluation: portable devices.
Results Summary:	RF Radiation exposure requirements ***Complied***
Test Date(s):	2nd of March, 2023
Test House (Issued By):	EMC Bayswater Pty Ltd 18/88 Merrindale Drive Croydon South Victoria, 3136 Australia FCC Accredited Test Firm Registration number: 527798 FCC Accredited Test Firm Designation number: AU0004 Phone No: +61 3 9761 5888 Email: sales@emcbayswater.com.au Fax: +61 3 8761 6547 Web: www.emcbayswater.com.au

The Setec BMPRO Pty Ltd, SONIC, Bluetooth Module, measured EIRP is below the SAR exception threshold (5mm distance) and the calculated power density level at a distance of 20cm are below the maximum levels allowed by regulations therefore complied with the requirements of CFR47 FCC Part 2, Subpart J, 2.1091.

This is to certify that the necessary evaluations were made by EMC Bayswater Pty Ltd, and that the Setec BMPRO Pty Ltd, SONIC, Bluetooth Module, has been tested in accordance with requirements contained in the appropriate commission regulations.

Prepared by:	Approved by:	
		30/05/2023 16:15
Adnan Zaman (EMC Test Engineer)	Neville Liyanapatabendige (Manager)	Date

RF Radiation Exposure Evaluation
for
Setec BMPRO Pty Ltd

Contents

1. Introduction

RF Radiation Exposure evaluation was performed on a Setec BMPRO Pty Ltd, SONIC, Bluetooth Module in accordance with FCC KDB 447498 D01 v06.

2. Test Report Revision History

None

3. Report Information

EMC Bayswater Pty Ltd reports apply only to the specific samples tested under the stated test conditions. All samples tested were in good operating condition throughout the entire test program unless otherwise stated. EMC Bayswater Pty Ltd does not in any way guarantees the later performance of the product/equipment. It is the manufacturer's responsibility to ensure that additional production units of the tested model are manufactured with identical electrical and mechanical components. EMC Bayswater Pty Ltd shall have no liability for any deductions, inference or generalisations drawn by the clients or others from EMC Bayswater Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Bayswater Pty Ltd. This report shall not be reproduced except in full, without the written approval of EMC Bayswater Pty Ltd. This document may be altered or revised by EMC Bayswater Pty Ltd personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by EMC Bayswater Pty Ltd will nullify the document.

4. Product Details

4.1. Product Sample Details

The device, as supplied by the client, is described as follows:

Product:	Bluetooth Module	
Model No:	SONIC	
Serial No:	Engineering sample	
Firmware:	Not supplied	
Software:	N/A	
Power Specifications:	1.7 - 3.3 Vdc, 15mA max.	
Dimensions:	20mm x 23mm x 3.8mm (Length x Width x Height)	
Weight:	< 1gram	
EUT Type:	Tested as table-top	
Transmitter details:	Description:	System-on-chip
	Type:	nRF52840
	Modulation:	GFSK
	Channels:	2.402 + k GHz, k= 0… 78
	Max power:	+8dBm
	Antenna:	External whip antenna (Mag Layers EDA-8709-2G4C1-B27)
	Antenna Gain:	2dBi

(Customer supplied product information)

4.2. Product description

The device has been described by the customer as follows:

"SONIC is a single mode Bluetooth Low Energy (BLE) v.5.3 module that is designed for integration in Setec BMPRO's power conversion, and RV features control and monitoring products. It requires power and software to implement BLE functionality. This module enables the products to connect to a wide range of external devices/sensors via configurable GPIO interfaces and preconfigured NFC, QSPI, I2C, and UART interfaces."

(Customer supplied product description information)

5. SAR and RF Exposure exception evaluation

5.1. SAR exception evaluation

As per Appendix A of KDB 447498 D01 General RF Exposure Guidance v06

***SAR Test Exclusion Thresholds* for 100 MHz – 6 GHz and ≤ 50 mm**

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table. The equation and threshold in 4.3.1 must be applied to determine SAR test exclusion.

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	

SAR test exclusion threshold for 2402MHz transmitter is 10.08mW for 5mm distance.
SAR test exclusion threshold for 2402MHz transmitter is 9.94mW for 5mm distance

- The measured maximum peak conducted power is 4.2mW (+6.3dBm)*

  *(*The measurement uncertainty was calculated at ±1.4dB. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of approximately k=2 which gives a level of confidence of approximately 95%)*
- Customer declared antenna gain is +2.0dBi
- Therefore the maximum EIRP is 6.8mW (+8.3dBm, Worst-case, Without Duty Cycle correction factor).

The measured EIRP is below the SAR exception threshold for 5mm distance.

5.2. RF Exposure Evaluation (MPE)

As per section 1.1310 of CFR 47 following Maximum Permissible Exposure (MPE) limits are applicable.

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

Limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields for 2402 to 2480MHz as per Table 1 of Section 15.1310 is 1 mW/cm^2 (General Population/Un-controlled).

Prediction Worst case:

Using equation

$$S = PG / 4\pi R^2$$

where: S = Power density
P = Power input to the antenna
G = Antenna gain
R = Distance to the center of radiation of the antenna

Band	Maximum Peak Conducted Power (dBm)	Antenna Gain (dBi)	Maximum* EIRP (dBm)	Maximum* EIRP (mW)	Distance (cm)	Calculated Power Density at 20cm (mW/cm^2)	Power Density Limit** (mW/cm^2)
2.4GHz BLE	+6.3	+2.0	+8.3	6.8	20	0.001345	1

**Worst-case, Without Duty Cycle correction factor*
*** MPE limit for General Population/Un-controlled exposure*

Table 1: Results for MPE Evaluation

6. Conclusion

The measured EIRP is below the SAR exception threshold (5mm distance) and the calculated power density level at a distance of 20cm are below the maximum levels allowed by regulations.