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## RF Radiation Exposure Evaluation

*In accordance with:*

FCC KDB 447498 D01 v06

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Gallagher Group Ltd

eS1

eShepherd Neckband

FCC ID: M5V-G040804

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REPORT: E2401-1734-2  
DATE: February, 2024



## RF Radiation Exposure Evaluation Report

EMC Bayswater Test Report: E2401-1734-2  
Issue Date: February, 2024

**Product:** eShepherd Neckband  
**Model No:** eS1  
**Serial No:** 2619268061, 2587181265  
**FCC ID:** M5V-G040804

**Customer Details:** Mr Hayden Goble  
Gallagher Group Ltd  
181 Kahikatea Drive, Melville,  
Hamilton 3206, New Zealand  
Phone No: +64 800 731 500  
e-mail: Hayden.goble@gallagher.com

**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):** 29<sup>th</sup> January, 2024

**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

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The Gallagher Group Ltd, eS1, eShepherd Neckband, measured EIRP is below the SAR exception threshold (15mm 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 Gallagher Group Ltd, eS1, eShepherd Neckband, has been tested in accordance with requirements contained in the appropriate commission regulations.

Prepared by:

Approved by:



28/02/2024 17:21

Adnan Zaman  
(EMC Test Engineer)

Neville Liyanapatabendige  
(Manager)

Date

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## RF Radiation Exposure Evaluation *for* Gallagher Group Ltd

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## 1. Introduction

RF Radiation Exposure evaluation was performed on a Gallagher Group Ltd, eS1, eShepherd Neckband 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:	eShepherd Neckband	
Model No:	eS1	
Part No:	G040804	
Serial No:	2619268061, 2587181265	
Firmware:	8.x.xxx	
Power Specifications:	Battery Powered LiFePO4, 3.2V, 12000mAH	
Dimensions:	Not supplied	
Weight:	Not supplied	
EUT Type:	Tested as table top.	
Transmitter Details:	Description:	IC MODULE LORA TRANSCEIVER 915MHz RFM95CW-915S2R
	Type:	RFM95CW-915S2R
	Modulation:	LoRa – Semtech proprietary chirp spread-spectrum digital modulation
	Modulation Technology:	Hybrid System
	Frequency Range:	902.4MHz to 903.8MHz
	Max power:	+14dBm
	Antenna:	PCB type
	Antenna Gain:	0dBi
	FCC ID:	2ASE0RFM95C

*(Customer supplied product information)*

### 4.2. Product description

The device has been described by the customer as follows:

“Neckband is located around the neck of a farm animal, typically beef cattle. It determines its location by GPS/GNSS and compares it to programmed ‘virtual fences’. If the animal attempts to cross a virtual fence the product first issues an audible warning. If the animal continues moving in the wrong direction the product applies an aversive electrical stimulus (series of HV pulses). It periodically transmits status to a base station and receives an acknowledgement and optional additional information.

The product contains FCC certified Wi-Fi module (FCC ID: 2AC7Z - ESPC3MINI1) is used by Gallagher authorised personnel only for testing and troubleshooting purposes. The LoRa and Wi-Fi module are not operated concurrently and is out of scope for this report.”

*(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 $\leq 50$ 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 902.4MHz to 903.8MHz transmitter is 46.9mW for 15mm distance.

- The measured maximum conducted power is 38.0mW (+15.8dBm)\*  
(\*The measurement uncertainty was calculated at  $\pm 1.4$ dB. 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 0dBi
- Therefore the maximum EIRP is 38.0mW (Worst-case, Without Duty Cycle correction factor).

The measured EIRP/ customer declared maximum power is below the SAR exception threshold for 15mm distance.

*Note: The customer specified that distance between typical user and antenna is greater than 20cm.*

## 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 <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	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

Worst-case Limit for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields for 903MHz to 927MHz as per Table 1 of Section 15.1310 is 0.602 mW/cm<sup>2</sup> (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 Conducted Power @ Antenna (dBm)*	Antenna Gain (dBi)	Maximum EIRP (dBm)	Maximum EIRP (mW)	Distance (cm)	Calculated Power Density at 20cm (mW/cm <sup>2</sup> )	Power Density Limit** (mW/cm <sup>2</sup> )
902.4 to 903.8MHz	+15.8	+0.0	+15.8	38.0	20	0.00756	0.602

\*Worst-case, Without Duty Cycle correction factor

\*\* MPE limit for General Population/Un-controlled exposure  
Calculated minimum safe distance is 2.24cm

Table 1: Results for MPE Evaluation

## 6. Conclusion

The measured EIRP is below the SAR exception threshold (15mm distance) and the calculated power density level at a distance of 20cm are below the maximum levels allowed by regulations.