

# REPORT ON EXPOSURE TO ELECTROMAGNETIC FIELDS

No. 1912340STO-003, Ed. 1

## EQUIPMENT

Equipment: Bluetooth low energy radio module  
Type/Model: BLEM  
Manufacturer: Husqvarna AB  
Tested by request of: Husqvarna AB

## SUMMARY

Based on the assessment in this statement, the equipment is determined to **comply** with the requirements according to the following standards:

EN 50663:2017  
CFR 47 §1.1307, §1.1310  
RSS-102 Issue 5  
Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2014  
NZS 2772.1:1999

Date of issue: 2019-10-14

Tested by:

  
Robert Hietala

Approved by:

  
Matti Virkki

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**Revision History**

Edition	Date	Description	Changes
1	2018-04-26	First release	--
2	2019-10-14	Second release	Added external antenna calculations and information

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## 1. Client information

This assessment has been done by request of:

Company	Husqvarna AB Jons väg 19 433 75 Jonsered Sweden
Name of contact	Tero Borg

## 2. Equipment

### 2.1 Identification of the equipment

Equipment:	Bluetooth low energy radio module
Type/Model:	BLEM
Brand name:	Husqvarna
Manufacturer:	Husqvarna AB
Transmitter frequency range:	2402 – 2480 MHz
Measured output power to antenna <sup>1</sup> :	+2.4 dB
Declared output power to antenna:	+2.4 dB
Antenna gain, internal antenna:	0.0 dBi
Antenna gain, external antenna:	+2.1 dBi
Separation distance:	< 5 mm
Handheld or portable:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Exposure conditions:	<input type="checkbox"/> Controlled environment (occupational) <input checked="" type="checkbox"/> Uncontrolled environment (general population)
Region of body:	<input checked="" type="checkbox"/> Head or trunk <input type="checkbox"/> Limbs

<sup>1</sup>Reference report: Intertek Test Report No. 1713337STO-002 Ed. 1

### 2.2 Antenna information

Antenna	Manufacturer	Type/model	Gain [dBi]	Nominal impedance [Ohm]	Connector
Antenna 1	MaxStream	AN-A1-XOC	2,1	50	SMA

### 3. Test Specifications

#### 3.1 Standards

EN 50663: 2017: Generic standard for assessment of low power electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (10 MHz - 300 GHz)

EN 62479:2010, Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)

CFR 47: Code of Federal Regulations Title 47: Telecommunications §1.1307, §1.1310  
KDB447498 D01 v06

RSS-102: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2014

NZS 2772.1:1999 Radiofrequency fields – Maximum exposure levels – 3 kHz to 300 GHz

#### 3.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards.

#### 4. Test Summary

The test has been carried out at the Intertek Semko AB premises in Kista, Sweden.  
 The results in this report apply only to sample tested:

Test	Result
RF Exposure, single transmitter, internal antenna	PASS
RF Exposure, single transmitter, external antenna	PASS
RF Exposure, multiple simultaneous transmitters	NA <sup>1</sup>

1. EUT only has a single transmitter

## 5. RF Exposure, single transmitter

<b>Result:</b>	PASS
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### 5.1 Calculations, internal antenna

$$\text{EIRP:} \quad +2.4 \text{ dBm} + 0.0 \text{ dBi} = +2.4 \text{ dBm}$$

#### Conversion dBm to W:

$$\text{Conducted:} \quad 1 \text{ mW} * 10^{\left(\frac{2.4 \text{ dBm}}{10}\right)} = 1.7 \text{ mW}$$

$$\text{EIRP:} \quad 1 \text{ mW} * 10^{\left(\frac{2.4 \text{ dBm}}{10}\right)} = 1.7 \text{ mW}$$

#### Low power exclusion limit:

$$\text{KDB447498 D01 v06:} \quad \frac{2 \text{ mW}}{5 \text{ mm}} * \sqrt{2.48 \text{ GHz}} = 0.6$$

### 5.2 Calculations, external antenna

$$\text{EIRP:} \quad +2.4 \text{ dBm} + 2.1 \text{ dBi} = +4.5 \text{ dBm}$$

#### Conversion dBm to W:

$$\text{Conducted:} \quad 1 \text{ mW} * 10^{\left(\frac{2.4 \text{ dBm}}{10}\right)} = 1.7 \text{ mW}$$

$$\text{EIRP:} \quad 1 \text{ mW} * 10^{\left(\frac{4.5 \text{ dBm}}{10}\right)} = 2.8 \text{ mW}$$

#### Low power exclusion limit:

$$\text{KDB447498 D01 v06:} \quad \frac{2.8 \text{ mW}}{5 \text{ mm}} * \sqrt{2.48 \text{ GHz}} = 0.9$$

**5.3 Results, internal antenna**

Standard	Reference for limit	Value	Unit	Limit	Result
EN 50663:2017	EN 62479:2010	1.7	mW	< 20	PASS
KDB 447498	47 CFR 15.247 (i)	0.6	NA	< 3	PASS
RSS-102	RSS-102	1.7	mW	< 4	PASS
Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2014	Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz	1.7	mW	< 20	PASS
NZS 2772.1:1999	NZS 2772.1:1999	1.7	mW	< 20	PASS

**5.4 Results, external antenna**

Standard	Reference for limit	Value	Unit	Limit	Result
EN 50663:2017	EN 62479:2010	2.8	mW	< 20	PASS
KDB 447498	47 CFR 15.247 (i)	0.9	NA	< 3	PASS
RSS-102	RSS-102	2.8	mW	< 4	PASS
Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2014	Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz	2.8	mW	< 20	PASS
NZS 2772.1:1999	NZS 2772.1:1999	2.8	mW	< 20	PASS



### 5.3 Limits

**Reference:** COUNCIL RECOMMENDATION of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) 1999/519/EC: Annex 2 Basic restrictions

Guideline / standard	SAR limit, SAR <sub>max</sub> W/kg	Averaging mass, m g	P <sub>max</sub> mW	Exposure tier	Region of body
199/519/EC	2	10	20	General public	Head and trunk
	4	10	40	General public	Limbs

**Reference:** Directive 2013/35/EU of the European Parliament and of the Council of 26 June 2013 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields): Annex III table A1

Guideline / standard	SAR limit, SAR <sub>max</sub> W/kg	Averaging mass, m g	P <sub>max</sub> mW	Exposure tier	Region of body
2013/35/EU	10	10	100	Occupational	Head and trunk
	20	10	200	Occupational	Limbs

**Reference: CFR 47 §1.1307, §1.1310**

KDB 447498 D01 General RF Exposure Guidance v06

Section 4.3.1, 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR}$$

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz.

**Reference:** RSS-102 – Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

Section 2.5.1, Table 1: SAR evaluation – Exemptions limits for routine evaluation based on frequency and separation distance

Frequency	Exemptions limits				
	At separation distance of $\leq 5$ mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
$\leq 300$	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency	Exemptions limits				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of $\geq 50$ mm
$\leq 300$	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5.

**Reference:** Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz, Table S1: Summary of compliance provisions for mobile or portable transmitting equipment.

Equipment parameters	Test exemption	Spatial peak SAR [Table 2 Occupational]	Spatial peak SAR [Table 2 General Public]
<b>Aware user exposure</b>			
Mean power < 100 mW	X		
Mean power < alternative low-power exclusion level of IEC 62479 for SAR <sub>max</sub> = 10 W/kg	X		
Mean power > 100 mW & separation > 20 cm			
Otherwise		X	
<b>General public exposure</b>			
Mean power < 20 mW	X		
Mean power < alternative low-power exclusion level of IEC 62479 for SAR <sub>max</sub> = 2 W/kg	X		
Mean power > 20 mW & separation > 20 cm			
Otherwise			X

**Reference:** NZS 2772.1:1999

Section 3.7.3: In some circumstances an RF exposure evaluation may not be required. This is the case with low-power devices whose nominal average RF radiated power does not exceed 20 mW and which do not produce exceptionally high instantaneous fields.