

ISED CABid: ES1909
Lab. Company Number: 4621A

Test report No:
NIE: 78153RAN.002

Assessment report

RF EXPOSURE REPORT ACCORDING TO ISED RSS - 102 Issue 5 (2015-03) AMD 1 (2021-02)

(*) Identification of item under evaluation	Square Tracker Xtreme
(*) Trademark	Sensitive AB
(*) Model and /or type reference	3307002
(*) Derived model not evaluated	3302002, 3303002, 3306002, 3310002, 3311002, 3312002, 3313002
(*) Other identification of the product	FCC ID : 2AHIR-005 IC ID : 21254-005 HW version : R5 SW Version : R12
(*) Features	LoRaWAN 902 - 928 MHz
(*) Manufacturer	Sensitive AB Mobilvägen 10, 223 62 LUND, SWEDEN
Test method requested, standard	ISED RSS-102 Issue 5 (2015-03) Amendment 1 (February 2, 2021) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager
Date of issue	2024-02-29
Report template No	FAN36_02 (*) "Data provided by the client"

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Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item under evaluation", "Trademark", "Model and/or type reference", "Derived model not evaluated", "General description of the device", "Other identification of the product").
2. Maximum output power, maximum antenna gain and use distance information.
3. The device under evaluation consists of a compact indoor/outdoor asset tracker, air pressure sensor (enabling 3D positioning) and motion controlled.
4. Derived model not evaluated. These models have been declared by the supplier of the sample as being the same as the model under evaluation.

		Sensitive Confidential	Page 1(1)
Prepared by: Dhiraj Paryani	Document number:	Revision: A	
Approved by:	Date: 2024-01-18	Remarks:	

Sensitive AB
Mobilvägen 10, 223 62 Lund, Sweden

Product Similarity Declaration

Date: January 12th, 2024
FCC ID: 2AHIR-005
Model Numbers: 3302002, 3303002, 3306002, 3307002, 3310002, 3311002, 3312002, 3313002

To Whom It May Concern,

We, Sensitive AB, hereby declare that our product (Square LoRa Sensors) Model Number: 3302002, 3303002, 3306002, 3307002, 3310002, 3311002, 3312002, 3313002 board, Schematic, Hardware version, Software version, structure and internal photos are same, named differently due to marketing purposes.

Should you have any questions or comments regarding this matter, please have my best attention.

Sincerely,



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DEKRA
Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Identification of the client

Sensitive AB
Mobilvägen 10, 223 62 LUND, SWEDEN

Document history

Report number	Date	Description
78153RAN.002	2024-02-29	First release

Appendix A: ISED RF Exposure assessment result

General description of the device under evaluation

Table 1 shows information used for the RF Evaluation, considering the following declared specifications for the device:

Description and technologies: the device under evaluation consists of a compact indoor/outdoor asset tracker, air pressure sensor (enabling 3D positioning) and motion controlled with the following features: LoRaWAN. For RF Exposure evaluation, only transmission technologies: LoRaWAN are considered.

Evaluation Distance: according to the manufacturer, during its normal use, the separation distance between the radiating structures of the device and nearby users will be greater than 20 cm. In order to perform the assessment a conservative evaluation distance of 20 cm has been used.

Maximum output power:

- Values corresponding to maximum output power have been declared by the device manufacturer (maximum output power values stated in manufacturer's technical description document).

Antennas: the device supports one antenna for the LoRaWAN transmitting technology:

- "Omnidirectional" antenna for LoRaWAN transmissions.
- Values corresponding to antenna gain have been declared by the device manufacturer (maximum peak gain stated in antenna manufacturer's technical description document).

The following table shows the information provided above:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Maximum Conducted Output Power (Incl. Tune-Up) (dBm)	Antenna peak gain (dBi)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (mW)
LoRa	ISM (USA)	902 - 928	12.00	1.70	13.70	23.44

Table 1: Equipment specifications

RF Exposure Assessment result and verdict

RF Exposure Exemption evaluation:

According to RSS-102 Issue 5, paragraph “2.5.2.Exemption Limits for Routine Evaluation – RF Exposure Evaluation”, each transmitting technology must be assessed against specific exemption limits.

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Distance (cm)	Time-averaged maximum e.i.r.p (mW)	RF Exposure Exclusion Limit (mW)	Verdict
LoRa	ISM (USA)	902 - 928	20.00	23.44	1370.44	Pass

Table 2: Exemption Evaluation verdict

The device under evaluation is exempt of RF Exposure evaluation as maximum E.I.R.P. for each supported technology meets these limit exemptions.

Appendix B: ISED RF Exposure information

RF Exposure evaluation for mobile devices

According to RSS-102 Issue 5, Paragraph “2.5.2. Exemption Limits for Routine Evaluation – RF Exposure Evaluation”:

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device’s radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz⁶ 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 $22.48/f^{0.5}$ W (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 $1.31 \times 10^{-2} f^{0.6834}$ 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).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

According to RSS-102 Issue 5, Paragraph “4. Exposure Limits”, Industry of Canada has adopted the RF field strength limits established in Health Canada’s RF exposure guideline, Safety code 6:

**Table 4: RF Field Strength Limits for Devices Used by the General Public
(Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

Table 6: RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²³	170	180	-	Instantaneous*
0.1-10	-	1.6/ <i>f</i>	-	6**
1.29-10	193/ <i>f</i> ^{0.5}	-	-	6**
10-20	61.4	0.163	10	6
20-48	129.8/ <i>f</i> ^{0.25}	0.3444/ <i>f</i> ^{0.25}	44.72/ <i>f</i> ^{0.5}	6
48-100	49.33	0.1309	6.455	6
100-6000	15.60 <i>f</i> ^{0.25}	0.04138 <i>f</i> ^{0.25}	0.6455 <i>f</i> ^{0.5}	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	616000/ <i>f</i> ^{1.2}
150000-300000	0.354 <i>f</i> ^{0.5}	9.40 x 10 ⁻⁴ <i>f</i> ^{0.5}	3.33 x 10 ⁻⁴ <i>f</i>	616000/ <i>f</i> ^{1.2}
Note: <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

Evaluation Method

When the device is exempt from RF Exposure evaluation because its operation matches any of the cases indicated in RSS-102 Issue 5, clause 2.5.2 ("Exemption Limits for Routine Evaluation – RF Exposure Evaluation"), the maximum E.I.R.P. can be calculated using the following formula to assess compliance with the Exemption Limits:

$$P_{E.I.R.P.} = P_T + G_T - L_C$$

Where:

P_T = transmitter output power (including tune-up tolerance)

G_T = gain of the transmitting antenna

L_C = signal attenuation in the connecting cable between the transmitter and the antenna, if applicable

When RF Exposure evaluation is needed to determine compliance with RSS-102 Issue 5, RF Field Strength Limits, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst-case" or conservative prediction:

$$\text{Power density: } S[W / m^2] = \frac{P_{E.I.R.P.}[W]}{4\pi R[m]^2}$$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

$$P_{E.I.R.P.} = P_T + G_T - L_C$$

Where:

P_T = transmitter output power (including tune-up tolerance)

G_T = gain of the transmitting antenna

L_C = signal attenuation in the connecting cable between the transmitter and the antenna if applicable

Multiple frequencies assessment

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure towards the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less or equal than unity:

$$\sum_{i=1}^n \frac{\text{Evaluated}_i}{\text{Exposure limit}_i} \leq 1$$

Where:

Evaluated_i = RF source evaluated at the minimum use distance

Exposure limit_i = Applicable exposure limit for the evaluation of the RF source