# RF-EXPOSURE REPORT

**FCC 47 CFR Part 2.1093**
**ISED RSS-102**

**RF-Exposure evaluation of portable equipment**

| | |
|---|---|
| **Report Reference No** | G0M-1805-7401-TFC093PE-V01 |
| **Testing Laboratory** | Eurofins Product Service GmbH |
| Address | Storkower Str. 38c<br>15526 Reichenwalde<br>Germany |
| Accreditation | DAkkS - Registration number : D-PL-12092-01-03 (ISED)<br>ISED Testing Laboratory site: 3470A-2<br>DAkkS - Registration number : D-PL-12092-01-04 (FCC)<br>FCC Filed Test Laboratory, Reg.-No.: 96970 |
| **Applicant** | GWA Hygiene GmbH |
| **Address** | Heinrich-Mann-Str. 11<br>18435 Stralsund<br>GERMANY |
| **Test Specification** | According to FCC/ISED rules |
| Standard | FCC 47 CFR 2.1093<br>ISED RSS-102 Issue 5 |
| Non-Standard Test Method | None |
| **Equipment under Test (EUT):** | |
| Product Description | Hygiene-Monitoring-System |
| Model(s) | NosoEx Transponder |
| Additional Model(s) | None |
| Brand Name(s) | NosoEx |
| Hardware Version(s) | 1.5 |
| Software Version(s) | 1.17 |
| FCC-ID | 2AU27NOSOEX001 |
| IC | N/A |
| **Test Result** | **PASSED** |

| | | |
|---|---|---|
| **Possible test case verdicts:** | | |
| required by standard but not tested | N/T | |
| not required by standard | N/R | |
| test object does meet the requirement | P(PASS) | |
| test object does not meet the requirement | F(FAIL) | |
| **Testing:** | | |
| Test Lab Temperature | 15 - 35 °C | |
| Test Lab Humidity | 30 – 50 % | |
| Date of receipt of test item | 2019-05-29 | |
| **Report:** | | |
| Compiled by | Abdullah Al Jamal | |
| Tested by (+ signature)<br>(Responsible for Test) | Abdullah Al Jamal | ..... |
| Approved by (+ signature)<br>(Head of Lab) | Christian Weber | C. Weber<br>..... |
| Date of Issue | 2019-12-16 | |
| Total number of pages | 15 | |
| **General Remarks:** | | |
| **The test results presented in this report relate only to the object tested.**<br>**The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.**<br>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. | | |
| **Additional Comments:** | | |
| None. | | |

## VERSION HISTORY

| Version History | | | |
|---|---|---|---|
| Version | Issue Date | Remarks | Revised By |
| 01 | 2019-12-16 | Initial Release | |

## ABBREVIATIONS AND ACRONYMS

| Acronyms | |
|---|---|
| Acronym | Description |
| EIRP | Equivalent Isotropic Radiated Power |
| ERP | Effective Radiated Power |
| EUT | Equipment Under Test |
| LPE | Low Power Exclusion |

## REPORT INDEX

**1 Equipment (Test Item) Under Test ..... 6**
1.1 Reference Documents ..... 7
1.2 Standalone radiation sources ..... 8
1.3 Concurrent Sources ..... 8
**2 Result Summary ..... 9**
**3 RF-Exposure classification ..... 10**
**4 RF-Exposure limits and exclusion thresholds ..... 11**
4.1 SAR limits ..... 11
4.2 SAR standalone test exclusion threshold ..... 11
4.3 SAR concurrent test exclusion threshold ..... 12
**5 RF-Exposure Evaluation ..... 13**
**6 Single Source Evaluation Results - FCC ..... 14**
**7 Single Source Evaluation Results - ISED ..... 15**

# 1 Equipment (Test Item) Under Test

| | |
|---|---|
| Description | **Fehler! Verweisquelle konnte nicht gefunden werden.** |
| Model | NosoEx Transponder |
| Additional Model(s) | None |
| Brand Name(s) | NosoEx |
| Serial Number(s) | Not specified |
| Hardware Version(s) | 1.5 |
| Software Version(s) | 1.17 |
| PMN | N/A |
| HVIN | N/A |
| FVIN | N/A |
| HMN | N/A |
| FCC-ID | 2AU27NOSOEX001 |
| IC | N/A |
| Equipment type | End Product |
| Environment | General public |
| Use case | Body worn |

## 1.1 Reference Documents

| Document Type | Document No. | Issued by | Date |
|---|---|---|---|
| Test Report (Radio)<br>FCC 47 e-CFR §15.247<br>+<br>ISED RSS-247 Issue 2<br>(February 2017)<br>–<br>Bluetooth Low Energy | G0M-1805-7401-TFC247BL-V01 | Eurofins Product Service GmbH | 2019-12-05 |
| Information for Testing<br>G0M-1805-7401<br>ORD-1805-1824<br>–<br>Declarations by applicant | N/A | GWA Hygiene GmbH | 2018-05-28 |

## 1.2 Standalone radiation sources

| Standalone radiation sources | | | | | |
|---|---|---|---|---|---|
| **Mode** | **Operating Frequency [MHz]** | **Maximum conducted power [dBm]** | **Maximum radiated power [dBm EIRP]** | **Maximum duty cycle [%]** | **Antenna distance to body [mm]** |
| Bluetooth LE | 2402 | -1.602 | 3.698 | 100 | 5.0 |
| | 2440 | -1.949 | 3.351 | 100 | 5.0 |
| | 2480 | -2.527 | 2.773 | 100 | 5.0 |
| Comment: None. | | | | | |

## 1.3 Concurrent Sources

No concurrent radiation sources.

## 2 Result Summary

| Standalone sources - FCC KDB 447498 | | | | |
|---|---|---|---|---|
| **Product Standard Reference** | **Requirement** | **Reference Method** | **Mode** | **Verdict** |
| KDB 447498 | SAR Test Exclusion | KDB 447498 4.3.1 | Bluetooth LE | PASS |
| Comment: None. | | | | |

| Standalone sources - ISED RSS-102 | | | | |
|---|---|---|---|---|
| **Product Standard Reference** | **Requirement** | **Reference Method** | **Mode** | **Verdict** |
| ISED RSS-102 | SAR Test Exclusion | ISED RSS-102 2.5.1 | Bluetooth LE | PASS |
| Comment: None. | | | | |

# 3 RF-Exposure classification

| RF-Exposure Categories | |
|---|---|
| Fixed | A fixed device is defined as a device physically secured at one fixed location and cannot be easily re-located. |
| Mobile | A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. |
| Portable | A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. |

| RF-Exposure Categories | |
|---|---|
| Occupational / Controlled | Limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. |
| General population / Uncontrolled | Exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. |

# 4 RF-Exposure limits and exclusion thresholds

## 4.1 SAR limits

| SAR Limits | | |
|---|---|---|
| **Type** | **Occupational SAR values [W / kg]** | **General population SAR values [W / kg]** |
| Whole-body<br>SAR averaging mass = entire body | 0.4 | 0.08 |
| Partial-body<br>Localized Head, Neck and Trunk<br>SAR averaging mass = 1g | 8.0 | 1.6 |
| Hands, Wrists, Feet and Ankles<br>Localized Limbs<br>SAR averaging mass = 10g | 20.0 | 4 |

## 4.2 SAR standalone test exclusion threshold

**SAR test exclusion power acc. to FCC KDB 447498 D01 – Standalone operation**

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm

$$\frac{max.\ power\ of\ channel\ [mW]}{min.\ test\ separation\ distance\ [mm]} \cdot \sqrt{f[GHz]} \leq \begin{cases} 3.0 & 1g\ SAR \\ 7.5 & 10g\ SAR \end{cases}$$

b) For 100 MHz to 6 GHz and test separation distances > 50 mm

1) For 100 to 1500 MHz

$$\left\{Power\ allowed\ at\ numeric\ threshold\ for\ 50\ mm\ in\ step\ a + (\text{test separation distance} - 50\text{mm}) \cdot \frac{f(MHz)}{150}\right\}, mW$$

2) for > 1500 MHz and ≤ 6 GHz

$$\{Power\ allowed\ at\ numeric\ threshold\ for\ 50\ mm\ in\ step\ a + (\text{test separation distance} - 50\text{mm}) \cdot 10\}, mW$$

c) for frequencies below 100 MHz:

1) test separation distances > 50 mm and < 200 mm:

the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by

$$\left(1 + \log\left(\frac{100}{f(MHz)}\right)\right)$$

2) test separation distances ≤ 50 mm:

the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by ½

**SAR test exclusion power acc. to ISED RSS-102 – Standalone Operation**

SAR evaluation is required if the separation distance between the user and the radiating element of the device is less than or equal to 20 cm, except when the device operates at a power level below the following threshold limits:

| Frequency (MHz) | Exemption Limits (mW) | | | | |
|---|---|---|---|---|---|
| | At separation distance of ≤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 |
| ≤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 (MHz) | Exemption Limits (mW) | | | | |
|---|---|---|---|---|---|
| | 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 ≥50 mm |
| ≤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 are multiplied by a factor of 2.5.

For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in the Tables are multiplied by a factor of 5

## 4.3 SAR concurrent test exclusion threshold

**SAR test exclusion acc. to ISED RSS-102 + FCC KDB 447498 D01 – Concurrent operation**

When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration.

For the test exclusion to apply, the maximum output power, duty factor, and other applicable parameters used in the standalone SAR tests, must be the same or more conservative than those required for simultaneous transmission.

When an antenna qualifies for the standalone SAR test exclusion of 4.3.1 and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria:

1) $\frac{\text{max.power of channel,including tune-up tolerance,mW}}{\text{min.test separation distance,mm}} \cdot \frac{\sqrt{f(GHz)}}{x}$, for test separation distances ≤ 50 mm

   where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR

2) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distance is > 50 mm

# 5 RF-Exposure Evaluation

| Evaluation procedure acc. to FCC KDB 447498 |
|---|
| Standalone operational modes<br><br>1) For each standalone operational mode the associated frequencies, conducted output power values, duty cycles and antenna separation distances to the human body are specified<br><br>2) From the conducted power and the duty cycle the source-based time averaged conducted output power is calculated<br><br>3) The transmission frequency, average power and separation distance is used to determine the SAR test exclustion power threshold value acc. to FCC KDB 447498 D01<br><br>4) If the time averaged ouput power of the transmission mode is lower than the SAR test exclusion power threshold value, the mode califies for SAR test exclusion and no further SAR evaluation is needed<br><br>Concurrent operational modes<br><br>1) For each operational mode that participates in the concurrent operational mode, the estimated SAR is calculated from the source-based time average conducted ouput power and the separation distance to the human body for each transmission frequency of the operation mode<br><br>2) The maximum estimated SAR value for each operational is determined<br><br>3) The sum of SAR values of the maximum estimated SAR values for each operational mode is calculated<br><br>4) If the sum of SAR values is below the corresponding SAR limit, the concurrent operational mode califies for SAR test exclusion and no further evaluation is needed |

| Evaluation procedure acc. to ISED RSS-102 |
|---|
| Standalone operational modes<br><br>1) For each standalone operational mode the associated frequencies, conducted and radiated output power values, duty cycles and antenna separation distances to the human body are specified<br><br>2) From the higher of the conducted or radiated power and the duty cycle the source-based time averaged output power is calculated<br><br>3) The transmission frequency, average power and separation distance is used to determine the SAR test exclustion power threshold value acc. to ISED RSS-102<br><br>4) If the time averaged ouput power of the transmission mode is lower than the SAR test exclusion power threshold value, the mode califies for SAR test exclusion and no further SAR evaluation is needed<br><br>Concurrent operational modes<br><br>1) For each operational mode that participates in the concurrent operational mode, the estimated SAR is calculated from the source-based time average conducted ouput power and the separation distance to the human body for each transmission frequency of the operation mode<br><br>2) The maximum estimated SAR value for each operational is determined<br><br>3) The sum of SAR values of the maximum estimated SAR values for each operational mode is calculated<br><br>4) If the sum of SAR values is below the corresponding SAR limit, the concurrent operational mode califies for SAR test exclusion and no further evaluation is needed |

# 6 Single Source Evaluation Results - FCC

| Results – Standalone Operational Modes | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mode | Frequency [MHz] | Power [mW] | Duty Cycle | Average Power [mW] | Distance [mm] | Power Limit [mW] | Verdict |
| Bluetooth LE | 2402 | 0.69 | 1.00 | 0.69 | 5.0 | 10 | PASS |
| | 2440 | 0.64 | 1.00 | 0.64 | 5.0 | 10 | PASS |
| | 2480 | 0.56 | 1.00 | 0.56 | 5.0 | 10 | PASS |
| Comment: None. | | | | | | | |

# 7 Single Source Evaluation Results - ISED

| Results – Standalone Operational Modes | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mode | Frequency [MHz] | Power [mW] | Duty Cycle | Average Power [mW] | Distance [mm] | Power Limit [mW] | Verdict |
| Bluetooth LE | 2402 | 2.34 | 1.00 | 2.34 | 5.0 | 4.3 | PASS |
| | 2440 | 2.16 | 1.00 | 2.16 | 5.0 | 4.1 | PASS |
| | 2480 | 1.89 | 1.00 | 1.89 | 5.0 | 3.9 | PASS |
| Comment: None. | | | | | | | |