

Test report No:  
NIE: 59569RAN.001

## Assessment report

### RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1093 ISED RSS -102 Issue 5:2015

|   |   |
|---|---|
| Identification of item tested             | Wireless hearing instrument.  |
| Trademark                                 | ReSound, Beltone, Interton, GN Hearing.   |
| Model and /or type reference              | CSX10   |
| Other identification of the product       | FCC ID: X26CSX10<br>IC: 6941C-CSX10   |
| Features                                  | Audio amplification, proprietary 2.4 GHz wireless functionality (Proximity) and Bluetooth 5.0.  |
| Applicant                                 | GN HEARING A/S<br>Lautrupbjerg 7, 2750 Ballerup, Denmark  |
| Test method requested, standard           | FCC 47 CFR Part 2.1093. Radiofrequency radiation exposure evaluation: portable devices.<br>ISED RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) |
| Summary                                   | IN COMPLIANCE   |
| Approved by (name / position & signature) | Miguel Lacave<br>Antennas Lab Manager   |
| Date of issue                             | 2019-02-13  |
| Report template No                        | FAN24_01  |

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## Data provided by the client

The samples consists of a wireless hearing aid.

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

## Identification of the client

GN HEARING A/S

Lautrupbjerg 7, 2750 Ballerup, Denmark

## Document history

| Report number | Date       | Description   |
|---------------|------------|---------------|
| 59569RAN.001  | 2019-02-13 | First release |

## General description of the device under evaluation

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The device under evaluation consists of a wireless hearing instrument.

The equipment specifications declared by the manufacturer for the Bluetooth Low Energy and Proximity 2.4 GHz features are:

| Mode                     | Frequency (MHz) | Max. declared output power (dBm) | Max. antenna gain (dBi) | Max. E.I.R.P (dBm) | Max. E.I.R.P (mW) |
|--------------------------|-----------------|----------------------------------|-------------------------|--------------------|-------------------|
| Bluetooth LE / Proximity | 2402            | 2.5                              | -1.42                   | 1.08               | 1.28              |
|                          | 2440            | 2.5                              | -1.42                   | 1.08               | 1.28              |
|                          | 2480            | 2.5                              | -1.42                   | 1.08               | 1.28              |

**Table 1:** Declared output power and antenna gain values

## Assessment summary

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| Radiofrequency radiation exposure limits             |                          |      |                     |
|--|--------------------------|------|---------------------|
| FCC 47 CFR § 2.1093 & ISED RSS-102 Issue 5 (2015-03) |                          |      |                     |
| Band (MHz)   | Technology               | Band | VERDICT (Pass/Fail) |
| 2450   | Bluetooth LE / Proximity | ISM  | Pass                |

**Table 2:** Assessment summary

## Appendix A: FCC RF Exposure

## FCC SAR test exclusion considerations for portable devices

As stated by the FCC (47 CFR §2.1093), human exposure to RF emissions from portable devices, which are defined as transmitting devices to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user, must be evaluated with respect to the FCC-adopted limits for SAR.

According to FCC OET KDB 447498 D01 General RF Exposure Guidance:

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 Test Exclusion Threshold condition is satisfied.

### - For distances ≤ 50 mm

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:

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

Where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table:

| MHz  | 5  | 10 | 15  | 20  | 25  | 30  | 35  | 40  | 45  | 50  | mm   |
|------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 150  | 39 | 77 | 116 | 155 | 194 | 232 | 271 | 310 | 349 | 387 | SAR Test<br>Exclusion<br>Threshold<br>(mW) |
| 300  | 27 | 55 | 82  | 110 | 137 | 164 | 192 | 219 | 246 | 274 |  |
| 450  | 22 | 45 | 67  | 89  | 112 | 134 | 157 | 179 | 201 | 224 |  |
| 835  | 16 | 33 | 49  | 66  | 82  | 98  | 115 | 131 | 148 | 164 |  |
| 900  | 16 | 32 | 47  | 63  | 79  | 95  | 111 | 126 | 142 | 158 |  |
| 1500 | 12 | 24 | 37  | 49  | 61  | 73  | 86  | 98  | 110 | 122 |  |
| 1900 | 11 | 22 | 33  | 44  | 54  | 65  | 76  | 87  | 98  | 109 |  |
| 2450 | 10 | 19 | 29  | 38  | 48  | 57  | 67  | 77  | 86  | 96  |  |
| 3600 | 8  | 16 | 24  | 32  | 40  | 47  | 55  | 63  | 71  | 79  |  |
| 5200 | 7  | 13 | 20  | 26  | 33  | 39  | 46  | 53  | 59  | 66  |  |
| 5400 | 6  | 13 | 19  | 26  | 32  | 39  | 45  | 52  | 58  | 65  |  |
| 5800 | 6  | 12 | 19  | 25  | 31  | 37  | 44  | 50  | 56  | 62  |  |

**Table 3:** SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

**- For distances > 50 mm**

For 100 MHz to 6 GHz frequencies and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:

- 1) [Power allowed at numeric threshold for 50 mm in table 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
- 2) [Power allowed at numeric threshold for 50 mm in table 1) + (test separation distance - 50 mm)·10] mW, at > 1500 MHz and ≤ 6 GHz

Approximate SAR test exclusion power thresholds at selected frequencies and test separation distances are illustrated in the following table

| MHz  | 50  | 60  | 70  | 80  | 90  | 100 | 110 | 120 | 130 | 140  | 150  | 160  | 170  | 180  | 190  | mm                                |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|-----------------------------------|
| 100  | 474 | 481 | 487 | 494 | 501 | 507 | 514 | 521 | 527 | 534  | 541  | 547  | 554  | 561  | 567  | SAR Test Exclusion Threshold (mW) |
| 150  | 387 | 397 | 407 | 417 | 427 | 437 | 447 | 457 | 467 | 477  | 487  | 497  | 507  | 517  | 527  |                                   |
| 300  | 274 | 294 | 314 | 334 | 354 | 374 | 394 | 414 | 434 | 454  | 474  | 494  | 514  | 534  | 554  |                                   |
| 450  | 224 | 254 | 284 | 314 | 344 | 374 | 404 | 434 | 464 | 494  | 524  | 554  | 584  | 614  | 644  |                                   |
| 835  | 164 | 220 | 275 | 331 | 387 | 442 | 498 | 554 | 609 | 665  | 721  | 776  | 832  | 888  | 943  |                                   |
| 900  | 158 | 218 | 278 | 338 | 398 | 458 | 518 | 578 | 638 | 698  | 758  | 818  | 878  | 938  | 998  |                                   |
| 1500 | 122 | 222 | 322 | 422 | 522 | 622 | 722 | 822 | 922 | 1022 | 1122 | 1222 | 1322 | 1422 | 1522 |                                   |
| 1900 | 109 | 209 | 309 | 409 | 509 | 609 | 709 | 809 | 909 | 1009 | 1109 | 1209 | 1309 | 1409 | 1509 |                                   |
| 2450 | 96  | 196 | 296 | 396 | 496 | 596 | 696 | 796 | 896 | 996  | 1096 | 1196 | 1296 | 1396 | 1496 |                                   |
| 3600 | 79  | 179 | 279 | 379 | 479 | 579 | 679 | 779 | 879 | 979  | 1079 | 1179 | 1279 | 1379 | 1479 |                                   |
| 5200 | 66  | 166 | 266 | 366 | 466 | 566 | 666 | 766 | 866 | 966  | 1066 | 1166 | 1266 | 1366 | 1466 |                                   |
| 5400 | 65  | 165 | 265 | 365 | 465 | 565 | 665 | 765 | 865 | 965  | 1065 | 1165 | 1265 | 1365 | 1465 |                                   |
| 5800 | 62  | 162 | 262 | 362 | 462 | 562 | 662 | 762 | 862 | 962  | 1062 | 1162 | 1262 | 1362 | 1462 |                                   |

**Table 4:** SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and > 50 mm

**- For frequencies below 100 MHz**

The following may be considered for SAR test exclusion:

- 1) For 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 [1 + log(100/f(MHz))]
- 2) For 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

Approximate SAR test exclusion power thresholds at selected frequencies and test separation distances are illustrated in the following table

| MHz  | < 50 | 50   | 60   | 70   | 80   | 90   | 100  | 110  | 120  | 130  | 140  | 150  | 160  | 170  | 180  | 190  | mm |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----|
| 100  | 237  | 474  | 481  | 487  | 494  | 501  | 507  | 514  | 521  | 527  | 534  | 541  | 547  | 554  | 561  | 567  | mW |
| 50   | 308  | 617  | 625  | 634  | 643  | 651  | 660  | 669  | 677  | 686  | 695  | 703  | 712  | 721  | 729  | 738  |    |
| 10   | 474  | 948  | 961  | 975  | 988  | 1001 | 1015 | 1028 | 1041 | 1055 | 1068 | 1081 | 1095 | 1108 | 1121 | 1135 |    |
| 1    | 711  | 1422 | 1442 | 1462 | 1482 | 1502 | 1522 | 1542 | 1562 | 1582 | 1602 | 1622 | 1642 | 1662 | 1682 | 1702 |    |
| 0.1  | 948  | 1896 | 1923 | 1949 | 1976 | 2003 | 2029 | 2056 | 2083 | 2109 | 2136 | 2163 | 2189 | 2216 | 2243 | 2269 |    |
| 0.05 | 1019 | 2039 | 2067 | 2096 | 2125 | 2153 | 2182 | 2211 | 2239 | 2268 | 2297 | 2325 | 2354 | 2383 | 2411 | 2440 |    |
| 0.01 | 1185 | 2370 | 2403 | 2437 | 2470 | 2503 | 2537 | 2570 | 2603 | 2637 | 2670 | 2703 | 2737 | 2770 | 2803 | 2837 |    |

**Table 5:** SAR Test Exclusion Thresholds for frequencies < 100 MHz



## FCC Evaluation Results

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The maximum output power of the device is 2.5 dBm for Bluetooth LE and Proximity technologies, which corresponds to 1.778 mW.

The evaluation according to the minimum intended use distance of 0 mm (5mm applied for the evaluation according to KDB 447498 D01 General RF Exposure Guidance) will be as follow:

| Technology               | Max Declared Conducted Output Power (dBm) |       | Min. Test Distance (mm) | Freq. (GHz) | Result | Test Exclusion |
|--------------------------|---|-------|-------------------------|-------------|--------|----------------|
|                          | (dBm)                                     | (mW)  |                         |             |        |                |
| Bluetooth LE / Proximity | 2.5                                       | 1.778 | 5                       | 2.48        | 0.56   | Pass           |

**Table 6:** FCC Evaluation Result

Both computed values are < 3.0, so according to KDB 447498 D01 – General RF Exposure Guidance, these modes qualify for Standalone SAR test exclusion for 1-g SAR and 10-g Extremity SAR.

## Appendix B: ISED RF Exposure

## ISED SAR test exclusion considerations

According to “RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)”, paragraph “2.5.1 Exemption Limits for Routine Evaluation – SAR Evaluation”, the device operates below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1:

**Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance<sup>4,5</sup>**

| 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                           |

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. 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. If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

## ISED Evaluation Results

According to paragraph “2.5.1 Exemption Limits for Routine Evaluation – SAR Evaluation”, the exemption limits for the applicable separation distance have been calculated by linear interpolation for the following operating frequencies:

| Frequency (MHz) | Distance (mm) | Exemption Limits (mW) |
|-----------------|---------------|-----------------------|
| 2402            | 5             | 4.26                  |
| 2440            | 5             | 4.05                  |
| 2480            | 5             | 3.95                  |

**Table 7:** ISED Exemption Limits

The device has a transmitting antenna with a negative gain; therefore, the maximum output power has been used for the evaluation as a worst case condition. For an intended use distance of 5 mm, the evaluation for the applicable output power levels and exemption limits for each operating frequency will be as follow:

| Technology               | Frequency (MHz) | Max. Declared Output Power (dBm) | Max. Declared Output Power (mW) | ISED Exemption Limits (mW) | Verdict |
|--------------------------|-----------------|----------------------------------|---------------------------------|----------------------------|---------|
| Bluetooth LE / Proximity | 2402            | 2.5                              | 1.78                            | 4.26                       | Pass    |
|                          | 2440            | 2.5                              | 1.78                            | 4.05                       | Pass    |
|                          | 2480            | 2.5                              | 1.78                            | 3.95                       | Pass    |

**Table 8:** ISED Evaluation Result

As all operating frequencies comply with SAR Test Exclusion Thresholds, according to the standard “ISED RSS-102 Issue 5 (2015-03)”, SAR testing is not required.