**AT4 wireless, S.A.U.**
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
www.at4wireless.com · C.I.F. A29 507 456

Nº 51/LE147

Assessment report No:

**NIE: 49158RAN.002**

# Assessment report
# RF EXPOSURE TEST REPORT ACCORDING TO FCC OET KDB 447498 D01 IC RSS -102 Issue 5:2015

| | |
|---|---|
| **Identification of item tested.....:** | Wireless hearing instrument |
| **Trade .....:** | ReSound / Beltone / Interton / GN Hearing |
| **Model and /or type reference .....:** | BE60 |
| **Other identification of the product .....:** | FCC ID: X26BE60<br>IC: 6941C-BE60 |
| **Final HW version .....:** | Berlin 60, V1.C, C4.5 |
| **Final SW version .....:** | Palpatine 6.3.3.8 |
| **IMEI TAC .....:** | Audio amplification and wireless functionality |
| **Features.....:** | GN HEARING A/S<br>Lautrupbjerg 7, 2750 Ballerup, Denmark |
| **Manufacturer.....:** | Wireless hearing instrument |
| **Test method requested, standard.....:** | FCC OET KDB 447498 D01 General RF Exposure Guidance v06<br>IC 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<br>  MIGUEL LACAVE GARCÍA 2016.06.13 14:34:52 +02'00' |
| **Date of issue .....:** | 2016-06-13 |
| **Report template No.....:** | FAN24_01 |

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# **Appendix A –** FCC RF Exposure

# FCC Exposure evaluation portable or mobile devices

Human exposure to RF emissions from portable devices (47 CFR §2.1093), as defined by the FCC, must be evaluated with respect to the FCC-adopted limits for SAR. Evaluation of mobile devices, as defined by the FCC, may also be performed with respect to SAR limits, but in such cases it is usually simpler and more cost-effective to evaluate compliance with respect to field strength or power density limits. For certain devices that are designed to be used in both mobile and portable configurations similar to those described in 47 CFR §2.1091(d)(4), such as certain desktop phones and wireless modem modules, compliance for mobile configurations is also satisfied when the same device is evaluated for SAR compliance in portable configurations.

# FCC SAR test exclusion considerations

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:

**[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [√f(GHz)]**

**≤ 3.0 for 1-g SAR and ≤ 7.5 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 Exclusion Threshold (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 1:** SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

**- For distances > 50 mm**

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

**[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**

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

# FCC Evaluation Results

The maximum conducted peak output power declared by the manufacturer, including tune-up tolerance, for the device is 0 dBm for both transmitting protocols.

The maximum time-averaged output power according to each duty cycle will be:

| Protocol | Frequency (GHz) | Maximum Peak Output Power (dBm) | Maximum Duty cycle (%) | Maximum Time Avg. Output Power (dBm) |
|---|---|---|---|---|
| Proximity Radio | 2.40-2.48 | 0 | 16.25 | -7.89 |
| Bluetooth LE | 2.40-2.48 | 0 | 66.40 | -1.78 |

**Table 3:** Maximum Time-Averaged output power

For a test separation distance of 5 mm:

**[(*max. power, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [√f(GHz)]≤ 3.0**

| Protocol | Maximum Time Avg. Output Power | | Min. Test Distance (mm) | Freq. (GHz) | Result | Test Exclusion |
|---|---|---|---|---|---|---|
| | (dBm) | (mW) | | | | |
| Proximity Radio | -7.89 | 0.163 | 5 | 2.48 | 0.05 | √ |
| Bluetooth LE | -1.78 | 0.664 | 5 | 2.48 | 0.21 | √ |

**Table 4:** FCC Evaluation Results

The computed value for both protocols is < 3.0, so according to KDB 447498 D01 – General RF Exposure Guidance, both modes qualifies for Standalone SAR test exclusion for 1-g SAR and 10-g SAR.

# **Appendix B –** IC RF Exposure

# IC SAR test exclusion considerations

According to "IC 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[4,5]**

| 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. If the operating frequency of the device is between two frequencies lotaced 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

# IC Evaluation Results

The maximum conducted peak output power declared by the manufacturer, including tune-up tolerance, for each technology is:

| Technology | Frequency (MHz) | Max. Declared Peak Output Power (dBm) |
|---|---|---|
| Proximity Protocol and Bluetooth LE | 2402 -2480 MHz | 0 |

**Table 5:** Maximum conducted output power

The maximum time-averaged output power according to each duty cycle will be:

| Protocol | Frequency (GHz) | Maximum Peak Output Power (dBm) | Maximum Duty cycle (%) | Maximum Time Avg. Output Power (dBm) |
|---|---|---|---|---|
| Proximity Radio | 2.40-2.48 | 0 | 16.25 | -7.89 |
| Bluetooth LE | 2.40-2.48 | 0 | 66.40 | -1.78 |

**Table 6:** Maximum Time-Averaged output power

The device has a radiating antenna with a declared gain of -10 dBi; therefore, the maximum conducted output power value will be higher than the total radiated power of the device.

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:** IC interpolated exemption Limits

The evaluation for the applicable output power levels and exemption limits for each operating frequency will be as follow:

| Technology | Frequency (MHz) | Maximum Time Avg. Power (dBm) | Maximum Time Avg. Power (mW) | IC Exemption Limits (mW) | Verdict |
|---|---|---|---|---|---|
| Proximity Protocol | 2402 | -7.89 | 0.163 | 4.26 | √ |
| | 2440 | -7.89 | 0.163 | 4.05 | √ |
| | 2480 | -7.89 | 0.163 | 3.95 | √ |
| Bluetooth LE | 2402 | -1.78 | 0.664 | 4.26 | √ |
| | 2440 | -1.78 | 0.664 | 4.05 | √ |
| | 2480 | -1.78 | 0.664 | 3.95 | √ |

**Table 8:** IC Evaluation Results

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