



Informe de evaluación nº:
Assessment report No:

NIE: 50647RAN.002

Assessment report RF EXPOSURE TEST REPORT ACCORDING TO FCC OET KDB 447498 D01

Identification of item tested.....:	Accessory to hearing instrument
Trade	ReSound / Beltone / Interton / GN Hearing
Model and /or type reference	CPD-1
Other identification of the product	FCC ID: X26CPD-1
Final HW version	AIRLINK-2, RevF
Final SW version	2.10
Features	Bluetooth LE and proprietary 2.4 GHz (Proximity)
Manufacturer	GN Hearing A/S Lautrupbjerg 7, 2750 Ballerup, Denmark
Test method requested, standard.....:	FCC OET KDB 447498 D01 General RF Exposure Guidance 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 Antennas Lab Manager  MIGUEL LACAVE GARCÍA 2016.08.31 11:08:56 +02'00'
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Remarks and comments

1: Used instrumentation:

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum analyser Rohde & Schwarz FSW50	2015/12	2017/12
2.	Spectrum analyser Agilent E4440A	2015/10	2017/10
3.	DC power supply R&S NGPE 40/40	2014/11	2017/11

General description of the device under test

The device under test is intended to enable a hearing instrument fitter to wirelessly adjust the settings of wireless hearing instruments. The primary function of the device is to transfer information signals between a PC installed with fitting software and wireless hearing instruments.

The device under test has two radiating antennas. The measured maximum peak conducted output power and maximum duty cycle values for each channel for each antenna and technology are:

Antenna	Mode	Frequency (MHz)	Max. peak conducted power (dBm)	Duty Cycle (%)
1	BT LE	2402	-1.01	85.4
		2440	-0.49	
		2480	-0.13	
	Proximity	2404	12.02	7.54
		2441	12.88	
		2478	12.42	
2	BT LE	2402	-0.58	85.4
		2440	-0.16	
		2480	0.11	
	Proximity	2404	12.21	7.54
		2441	12.22	
		2478	12.53	

Table 1: Measurement Results

The maximum time-averaged output power value for each transmitting channel according to its duty cycle is:

Antenna	Mode	Frequency (MHz)	Max. Average conducted power (dBm)
1	BT LE	2402	-1.70
		2440	-1.18
		2480	-0.82
	Proximity	2404	0.79
		2441	1.65
		2478	1.20
2	BT LE	2402	-1.27
		2440	-0.85
		2480	-0.58
	Proximity	2404	0.98
		2441	0.99
		2478	1.30

Table 2: Average conducted power values

The maximum antenna gain declared by the manufacturer for both antennas is 3dBi; therefore the maximum average total radiated power will be:

Ant.	Mode	Frequency (MHz)	Max. Avg. power (dBm)	Max. Antenna Gain (dBi)	Max. average total radiated power (dBm)
1	BT LE	2402	-1.70	3	1.30
		2440	-1.18	3	1.82
		2480	-0.82	3	2.18
	Proximity	2404	0.79	3	3.79
		2441	1.65	3	4.65
		2478	1.20	3	4.19
2	BT LE	2402	-1.27	3	1.73
		2440	-0.85	3	2.15
		2480	-0.58	3	2.42
	Proximity	2404	0.98	3	3.98
		2441	0.99	3	3.99
		2478	1.30	3	4.30

Table 3: Maximum average total radiated power.

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

Evaluation Results

Each supported transmission technology will be evaluated using the following relations for the calculations.

- Wavelength:

$$\lambda[m] = \frac{c[m/s]}{f[Hz]};$$

- Reactive field, radiating near-field and far field distances:

$$d_{Re act F} = \frac{\lambda[m]}{4}; \quad d_{Re act F} < d_{Rad F} < d_{Far F} ; \quad d_{Far F} = \frac{2D[m]^2}{\lambda[m]}$$

- Power density:

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

- Minimum compliance distance:

$$R_{min}[m] = \sqrt{\frac{P_{E.I.R.P.}[W]}{4\pi S[W / m^2]}}$$

Assessment summary

Radiofrequency radiation exposure limits			
FCC § 1.1310			
Antenna	Band (MHz)	Technology	VERDICT (Pass/Fail)
1	2450	BT LE	Pass
	2450	Proximity Protocol	Pass
2	2450	BT LE	Pass
	2450	Proximity Protocol	Pass

Table 4: Assessment summary.

Appendix A – FCC RF Exposure

FCC RF Exposure evaluation for mobile devices

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to CFR-2015-Title 47, Vol 1, § 1.1310 Radiofrequency radiation exposure limits, section 2, at operating frequencies less than or equal to 6 GHz, the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1, may be used instead of wholebody SAR limits as set forth in paragraph (a) through (c) of this section to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b), except for portable devices as defined in § 2.1093 as these evaluations shall be performed according to the SAR provisions in § 2.1093.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	* 100	6
3.0–30	1842/f	4.89/f	* 900/f ²	6
30–300	61.4	0.163	1.0	6
300–1,500			f/300	6
1,500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	* 100	30
1.34–30	824/f	2.19/f	* 180/f ²	30
30–300	27.5	0.073	0.2	30
300–1,500			f/1500	30
1,500–100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

FCC MPE Evaluation Results

Antenna 1 – BT LE

Max time average power (dBm):	- 0.82
Antenna Gain (dBm):	3
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	2480
General public - Power density limit (mW/cm ²):	1
Controlled exposure - Power density limit (mW/cm ²):	5
Maximum EIRP (mW):	1.65

Power density at minimum use distance:

Power density (mW/cm ²):	0.0003
Verdict for general public:	PASS
Verdict for controlled exposure:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	0.36
Verdict for general public:	PASS
Minimum distance for controlled exposure (cm)	0.16
Verdict for controlled exposure:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Antenna 1 – Proximity Protocol

Max time average power (dBm):	1.65
Antenna Gain (dBm):	3
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	2441
General public - Power density limit (mW/cm ²):	1
Controlled exposure - Power density limit (mW/cm ²):	5
Maximum EIRP (mW):	2.92

Power density at minimum use distance:

Power density (mW/cm ²):	0.0005
Verdict for general public:	PASS
Verdict for controlled exposure:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	0.48
Verdict for general public:	PASS
Minimum distance for controlled exposure (cm):	0.22
Verdict for controlled exposure:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Antenna 2 – BT LE

Max time average power (dBm):	- 0.58
Antenna Gain (dBm):	3
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	2480
General public - Power density limit (mW/cm ²):	1
Controlled exposure - Power density limit (mW/cm ²):	5
Maximum EIRP (mW):	1.75

Power density at minimum use distance:

Power density (mW/cm ²):	0.00035
Verdict for general public:	PASS
Verdict for controlled exposure:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	0.373
Verdict for general public:	PASS
Minimum distance for controlled exposure (cm):	0.167
Verdict for controlled exposure:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

Antenna 2 – Proximity Protocol

Max time average power (dBm):	1.3
Antenna Gain (dBm):	3
Minimum use distance (cm):	20
Worst Case Frequency (MHz):	2478
General public - Power density limit (mW/cm ²):	1
Controlled exposure - Power density limit (mW/cm ²):	5
Maximum EIRP (mW):	2.69

Power density at minimum use distance:

Power density (mW/cm ²):	0.0005
Verdict for general public:	PASS
Verdict for controlled exposure:	PASS

The power density level for this transmission mode is below general public and controlled exposure power density limits.

Minimum compliance distance for this technology:

Minimum distance for general public (cm):	0.46
Verdict for general public:	PASS
Minimum distance for controlled exposure (cm):	0.21
Verdict for controlled exposure:	PASS

The minimum use distance is larger than general public and controlled exposure minimum compliance distances.

All operating technologies for each antenna is in compliance with the limits for maximum permissible exposure (MPE) from FCC § 1.1310 Radiofrequency radiation exposure limits.