

Edge AI Custom ITE Antenna Description

The Bluetooth 2.4 GHz antenna is a PIFA component. The same antenna is used in both the left and right hearing aids. The antenna is manufactured by Opti print and its part number is 82188-100.

The peak gain of the antenna in the assembled DUT is nominally -4.9 dBi (left) and -4.6 dBi (right) (see calculations on page 8, below).

Date of antenna pattern measurement: Left hearing aid – Feb 13, 2024
Right hearing aid – Feb 21, 2024.

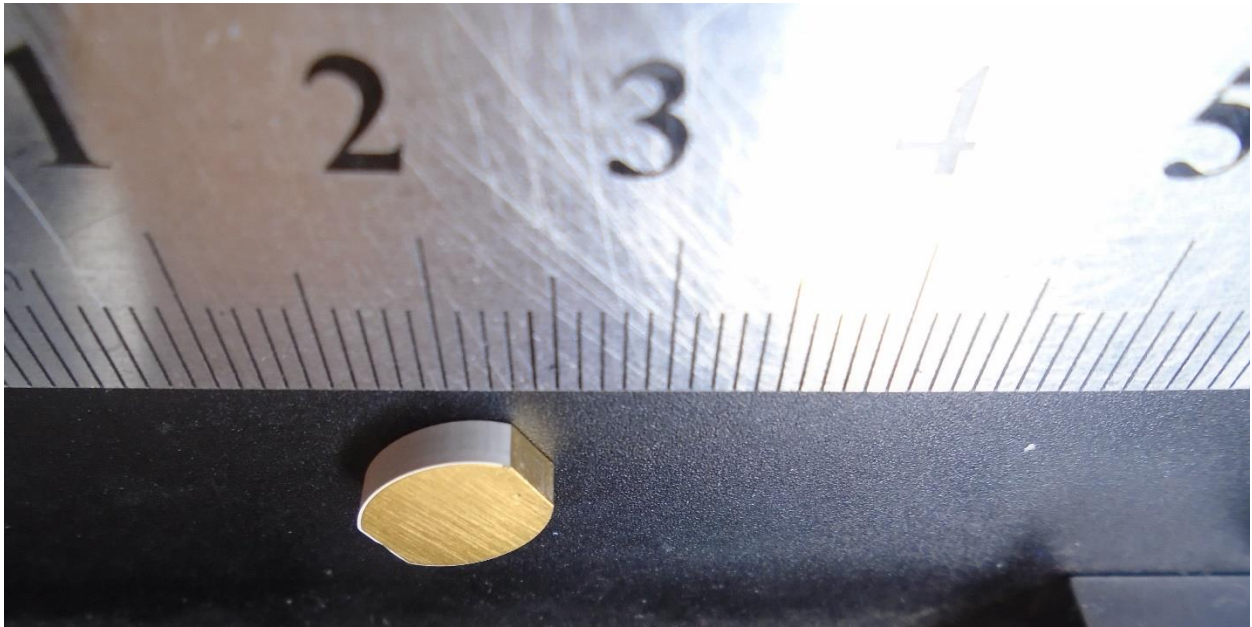
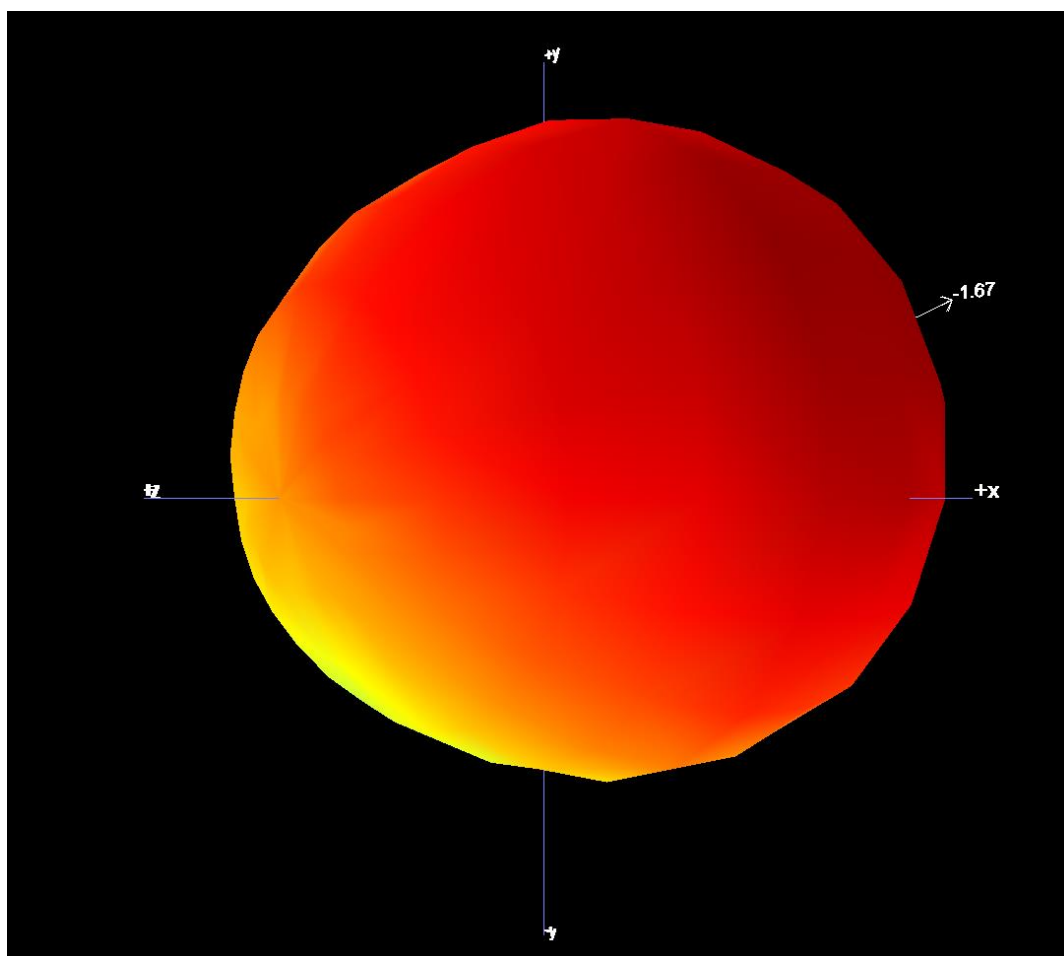
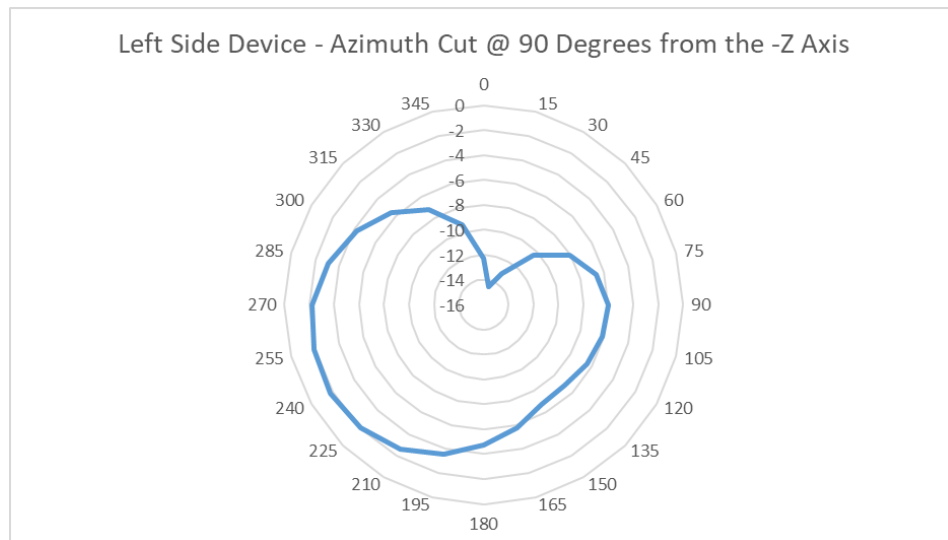
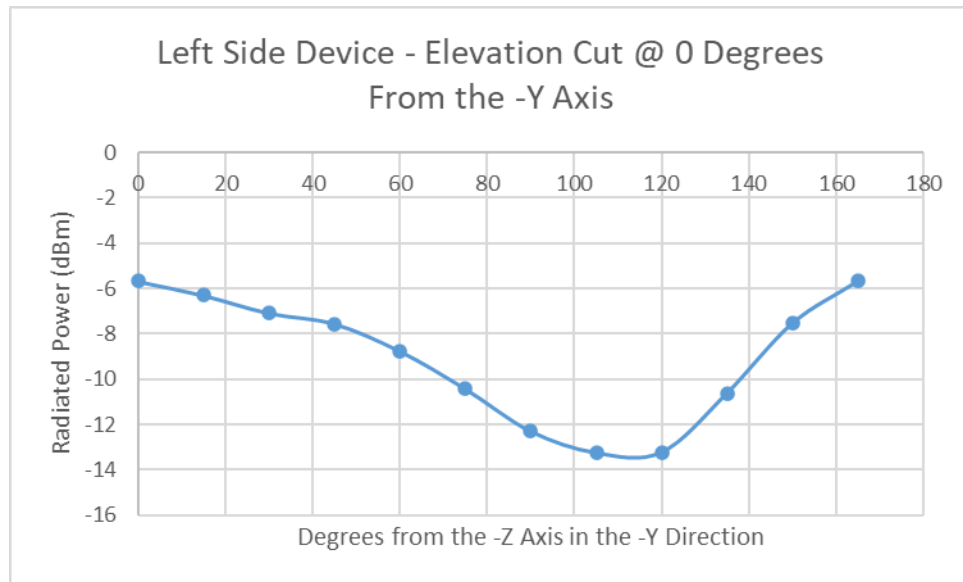


Figure 1 **2.4 GHz Antenna (scale in cm)**



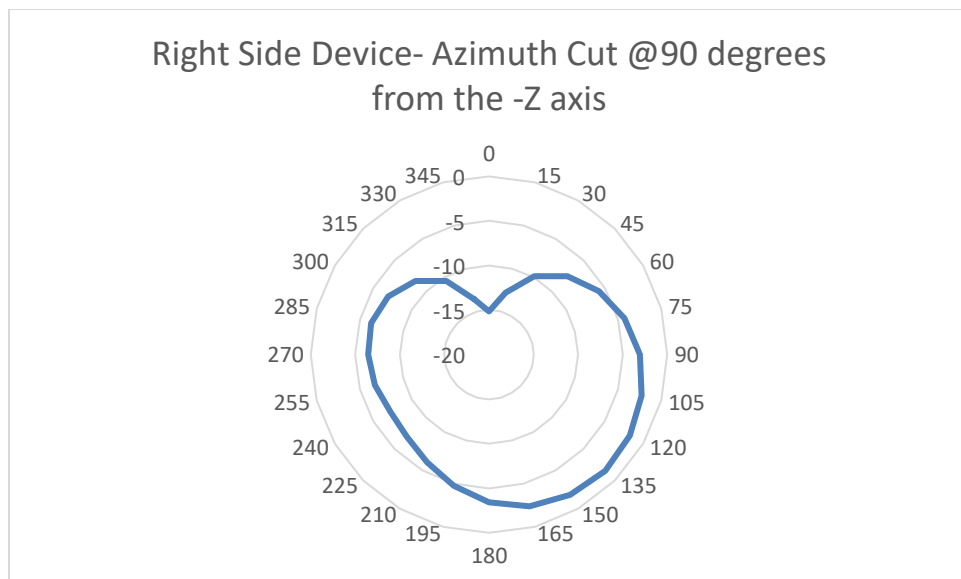
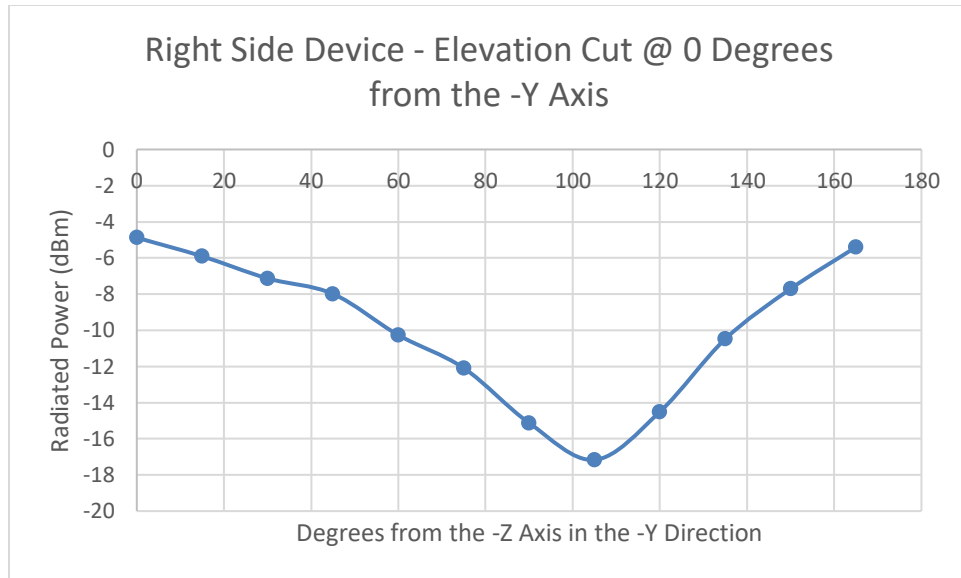
Three-dimensional pattern (scale in dBm noted)

Figure 2a **Left Hearing Aid 3-Dimensional Antenna Pattern**



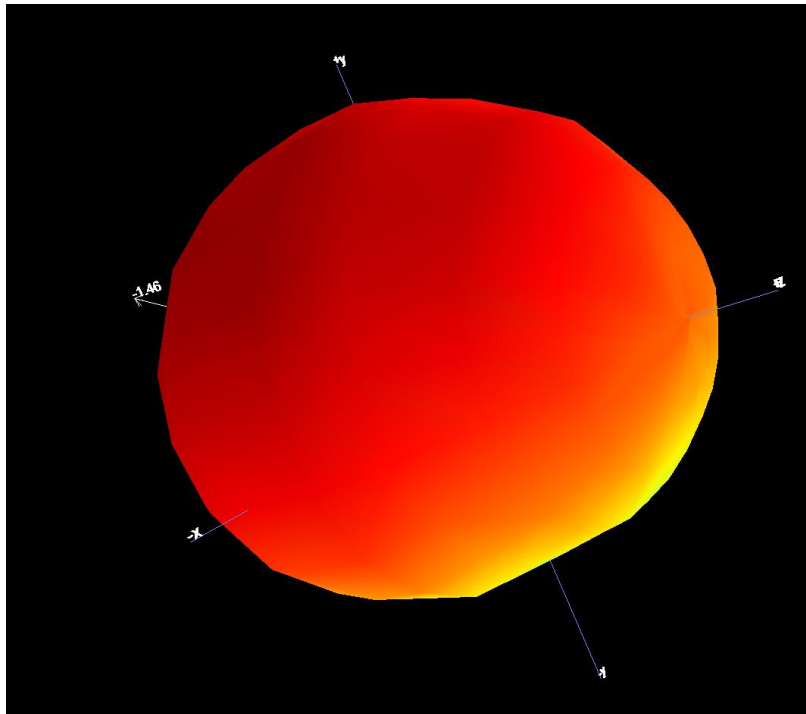
scale in dBm

Figure 2b Left Hearing Aid Antenna Elevation and Azimuth Cuts



Three-dimensional pattern (scale in dBm noted)

Figure 3a Right Hearing Aid Antenna Pattern



scale in dBm

Figure 3b Right Hearing Aid Antenna Elevation and Azimuth Cuts

Antenna Pattern Measurement Information

The antenna patterns shown in Figures 2a and 3a were measured using a MVG SG24L antenna test system with serial number of ATL3843S.

It is located at Starkey Laboratories, Inc., 6600 Washington Avenue, South, Eden Prairie, MN 55344
The system was calibrated on October 12, 2023, and due for calibration in October 2024.

Signal levels were measured using an Agilent N2090B MXA Signal Analyzer (Spectrum Analyzer), serial number MY63470227, calibrated on May 4, 2023, and due for calibration on May 4, 2025.

The antenna pattern plots in Figures 2 and 3 are generated by the SG24L test system software.

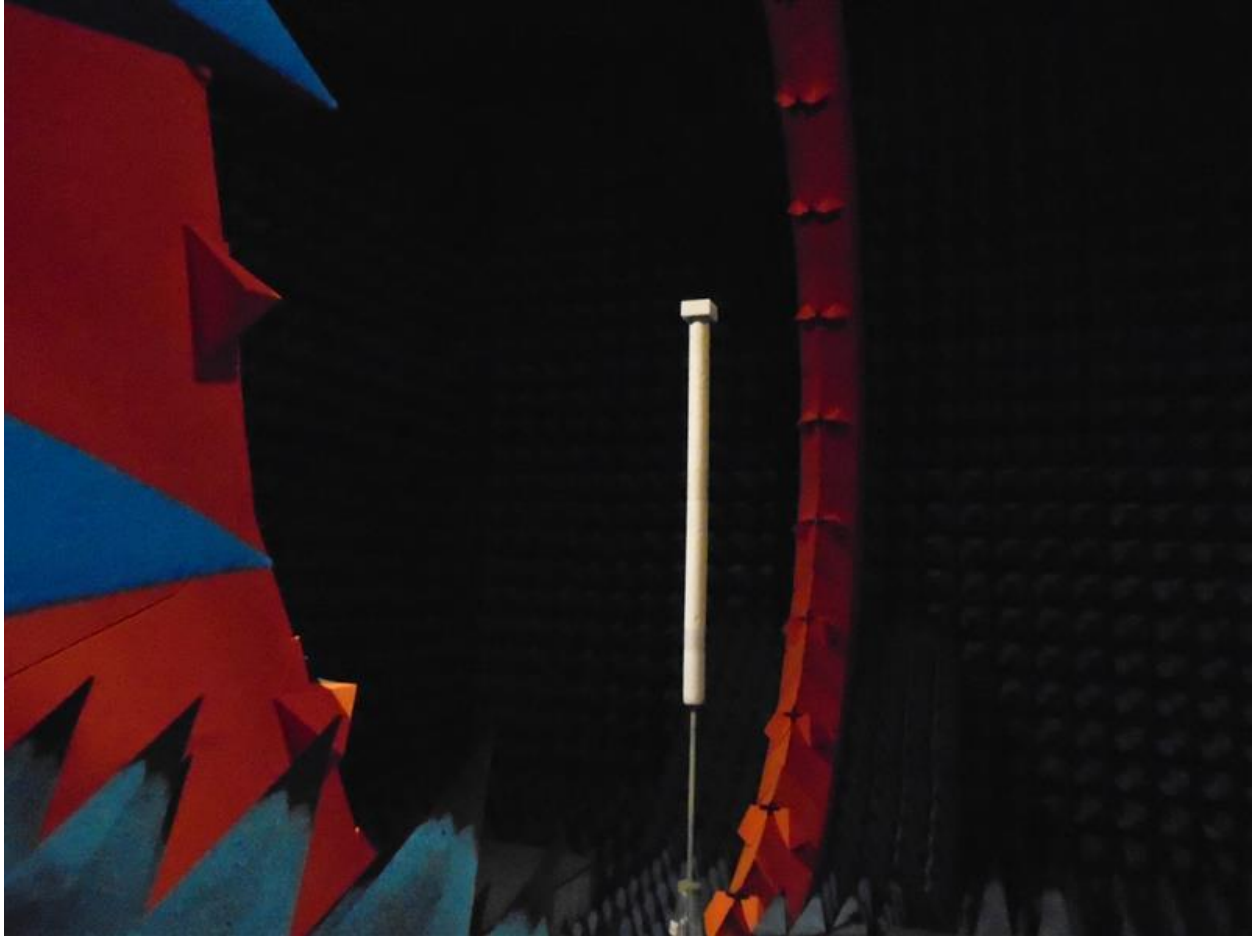


Figure 4a Overall view of SG24L test chamber, showing ring of receiving antennas

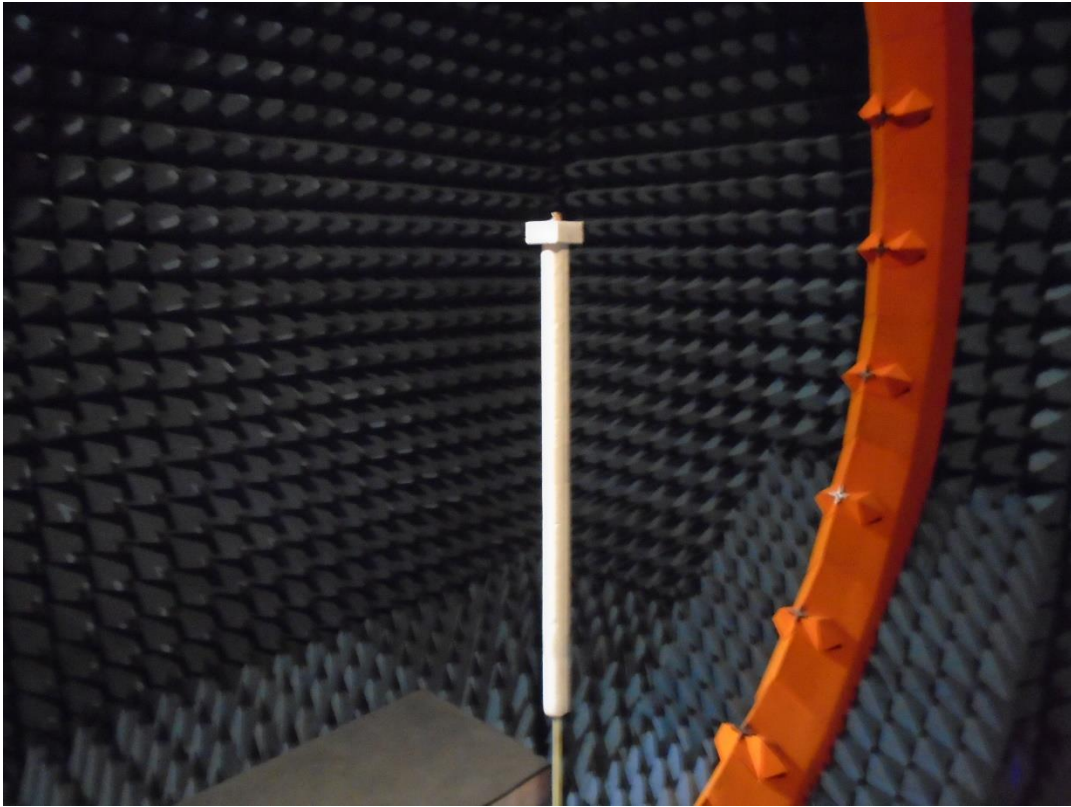


Figure 4b **Test stand in SG24L test chamber**

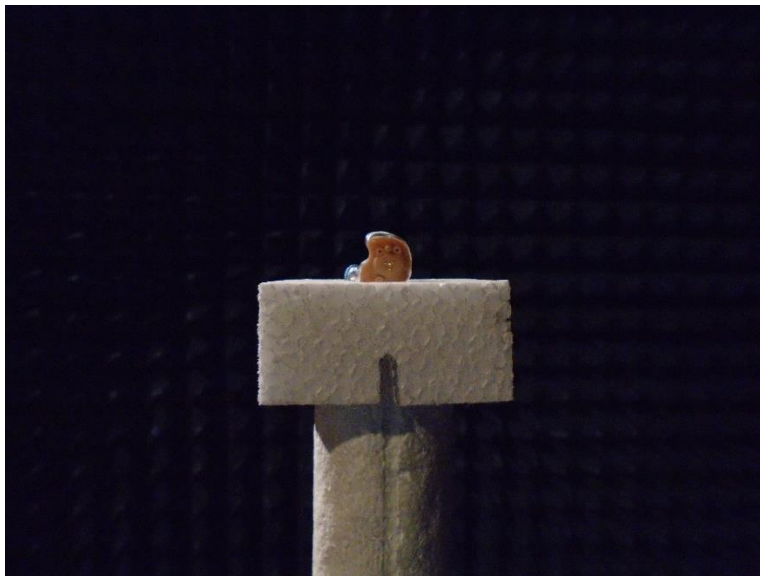


Figure 4c **close-up of unit under test in test chamber**

Antenna Gain Measurement Information

The MVG SG24L antenna test system runs internal scripts that yield the maximum EIRP from each radiated power measurement. From there, the equation:

$$\text{Max Gain} = \text{Max EIRP} - \text{Power at antenna pads}$$

can be used together with a conducted measurement of the power at the antenna pads by directly connecting a spectrum analyzer to the antenna pads. Note that the same procedure was used by Element's Brooklyn Park, MN laboratory in the FCC Part 15.247 test reports for these hearing aids.

Subtracting the conducted power at the antenna pads from the EIRP value, yields the antenna gain as follows:

Right side hearing aid:

- Max EIRP = -1.46dBm
- Power delivered to antenna terminal = 3.13dBm
- Therefore, Gain = $-1.46 - 3.13 = \underline{-4.59 \text{ dBi}}$

Left side hearing aid:

- Max EIRP = -1.67dBm
- Power delivered to antenna terminal = 3.22dBm
- Therefore, Gain = $-1.67 - 3.22 = \underline{-4.89 \text{ dBi}}$