

Audiological Bulletin no. 48

Smoother and wider frequency response with a Receiver-In-Canal (RIC) hearing aid

News from Audiological Research and Communication

In Widex Passion, the receiver is placed in the ear canal instead of in the main housing as in a conventional BTE hearing aid. Moving the receiver into the ear canal results in a hearing aid that is smaller and thereby less visible, it offers the possibility of providing larger vents while ensuring less risk of feedback, and it results in a desirable influence on the frequency response of the hearing aid. This bulletin describes the frequency response of the Widex Passion hearing aid, and how this response is displayed in Compass performance graphics.

The frequency response of an RIC hearing aid

In Widex Passion, the receiver is placed in the ear canal instead of in the housing of the hearing aid. This means that the amplified sound is transmitted directly into the ear of the client, and that the tubing connecting the hearing aid with the receiver contains a wire. This is a desirable design since transmitting sound through a tube creates resonances and disturbing peaks in the frequency response of the hearing aid. This is the case for both conventional tubing and élan tubing, since the length of the tube instead of its width dictates the resonances. Filtering the hearing aid response can compensate for the peaks associated with tubing resonances, but then if the length of the tubing is varied, the resonances can reappear.

Another limitation of the conventional hearing aid design, using a tube for sound transmission, is that tubing limits the high frequency abilities of the system, and results in high frequency roll-off. This can be avoided by transmitting the sound directly into the ear of the client, resulting in an extended high frequency response. With Widex Passion we can obtain a bandwidth of up to 10 kHz (see figure 1).

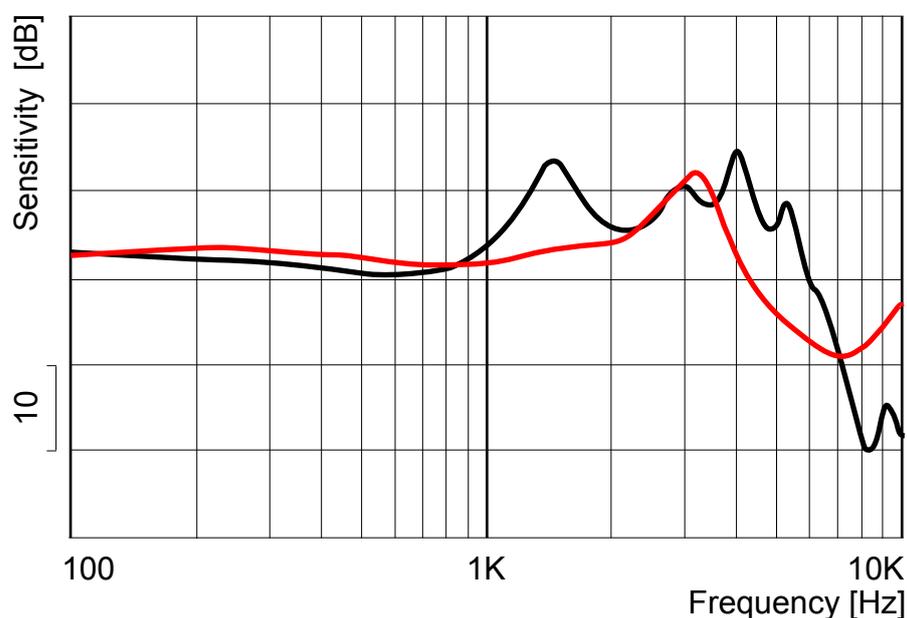


Fig 1: The frequency response of the Widex Passion RIC hearing aid (the red line) compared to the frequency response of a conventional BTE hearing aid (the black line). Notice how the high frequency bandwidth is extended with Widex Passion, and how the frequency response is considerably smoother than the response for a conventional BTE design.

Changes in graphics in Compass

The Sound Explorer section of Compass allows the user and hearing care professional to explore the sound processing capability of Passion. The Sound Explorer also includes tools for visual evaluation and demonstration of the individual fitting. To reflect the high frequency capability of Widex Passion, the performance graphics in Compass have been extended. As can be seen in figs. 2 to 5, the graphics for Passion display useful information up to 10 kHz as opposed to the Compass view for a conventional BTE, which displays information to around 6 kHz.

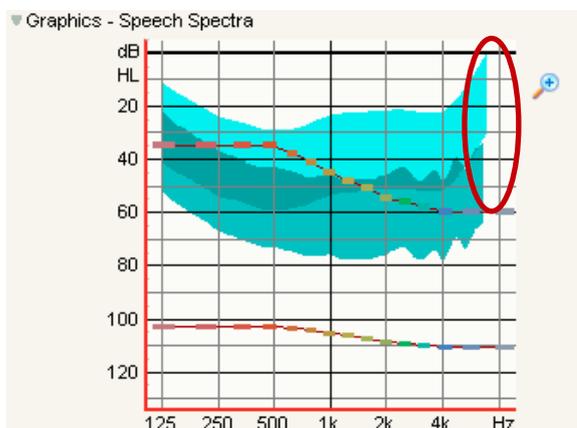


Fig 2: Long-term average speech spectra for a conventional BTE hearing aid

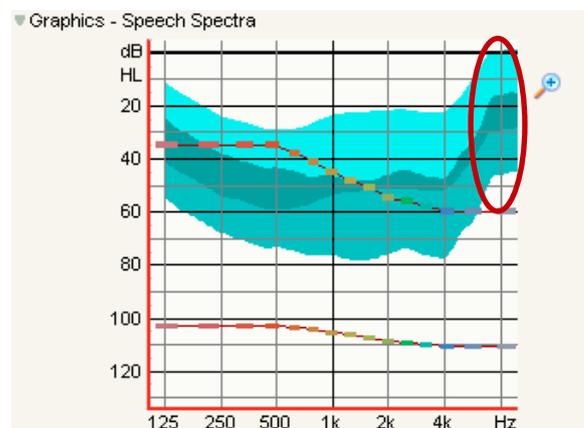


Fig 3: Long-term average speech spectra for Passion

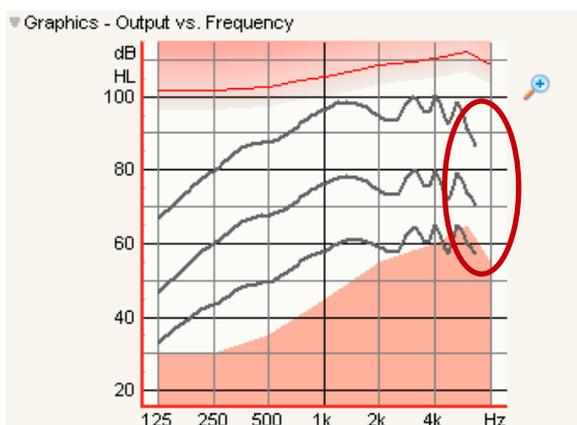


Fig 4: Output vs. Frequency for a conventional BTE hearing aid

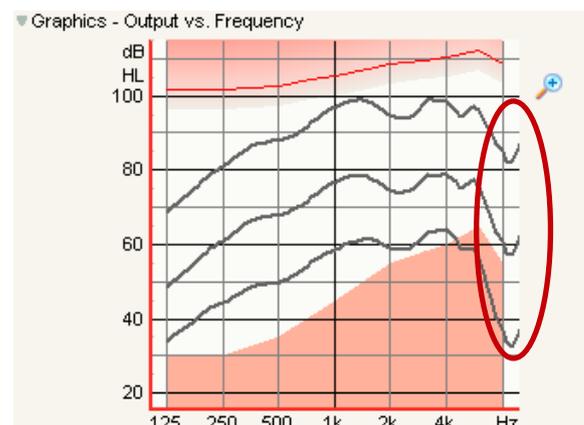


Fig 5: Output vs. Frequency for Passion

Summary

The change in design from a conventional BTE, using tubing and hooks for sound transmission, to a RIC hearing aid can be desirable, since it results in both a smoother and wider frequency response. These changes are taken into account in the Compass fitting software by expanding the graphics for Passion up to 10 kHz.