The Siemens binax™ platform has led to incredible strides in the area of hearing aid directionality. A world's first, Narrow Directionality in binax RIC instruments allowed hearing impaired wearers to understand speech significantly better in demanding listening situations, such as noisy cocktail-parties, even better than their normal hearing counterparts (Powers & Froehlich, 2014). With Insio™ binax custom hearing aids, we introduce yet another world’s first: automatic and adaptive directionality in single-microphone hearing instruments such as CICs.

binaural OneMic directionality

For most hearing instruments, directional processing relies upon two microphones in the same housing. Over the years, this method of directional processing has become so advanced that automatic, adaptive, and multichannel directional technology have become the industry norm. However, in smaller hearing instruments, such as CICs, where there is only space for one microphone, this has not been possible. With the advent of e2e wireless 3.0, two hearing aids in a bilateral pair share acoustic information with each other. In single-microphone instruments, this means the signals can now be processed similar to having two microphones on each aid. binaural OneMic directionality is an effective, automatic, adaptive, and multi-channel directional technology dedicated to single-microphone hearing instruments (Figure 1).

As a part of the automatic microphone system, binaural OneMic directionality is integrated in the Universal program in CICs and other Insio 7bx single-microphone instruments. It fades to the directional processing from the omnidirectional mode automatically in noisy situations to help improve speech understanding, and is adaptive independently in 48 channels. It also can be enabled in other dedicated programs.

Narrow Directionality in two-microphone custom instruments

With the introduction of the new wireless, two-microphone custom instruments, Narrow Directionality can benefit an even wider segment of wearers. As can be seen in Figure 2, Narrow Directionality in these custom instruments exhibits a similar sAI-DI pattern to RIC instrument data. In fact, the measured sAI-DI from this in-the-canal (ITC) product is 1.3 dB larger than that observed with the RIC instrument. Since the microphone inlet ports of the ITC are seated in the concha, rather than on top of the pinna like the RIC, this difference likely is the result of the additional pinna effects. Although the measurement results shown below represents the directional performance from one specific custom hearing aid form factor, it can be expected that custom instruments of other sizes, such as full-shell or half-shell ITEs, would yield similar results.

Figure 1. Left panel: binaural OneMic directionality offers automatic directionality towards the front for single-microphone instrument wearers. Right panel: As can be seen in the sequential Directivity Index (sDI) curves, binaural OneMic directionality offers significantly higher directional benefit in the wearing position than relying on the natural pinna effect along (omnidirectional). sDI and sAI-DI values can be interpreted in the same way as traditional DI and AI-DI values (Aubreville & Petrausch, 2015).

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Just like in the RIC instruments, Narrow Directionality in two-microphone Insio binax instruments is fully integrated into the automatic Universal program, activates and deactivates automatically when necessary, and transitions between these two states smoothly. Not only does that mean wearer interaction is not required, it also assures very low power consumption at all times.

Summary

binaural OneMic directionality is a new binaural beamformer designed for single-microphone devices such as the new Insio binax CIC and IIC. This automatic, adaptive directional feature is shown to have significantly higher sAI-DI values than relying on the natural pinna effect alone. Furthermore Narrow Directionality in the new two-microphone ITC devices is shown in lab measurements to be as effective as in the RIC form factor, the latter which has been shown in clinical studies to result in better SRT for patients in certain noisy environments than even those with normal hearing.

Reference
