Audio Efficiency™

Hearing aid technology has made enormous progress in recent years, and new features are still being added. Yet, the addition of new features requires coordination to ensure full benefit. To that end, Bernafon has developed Audio Efficiency™, a system that coordinates hearing aid technology – in a way similar to how a conductor leads an orchestra.

Audio Efficiency™ sets up the backbone of the Chronos hearing aid family and ensures that the hearing instruments achieve their goal – helping the user without drawing attention to themselves. For your clients, this means: put on the hearing instruments and engage in daily routines, without further caring about the instruments.

Audio Efficiency™ offers four main advantages

- Speech understanding and natural sound
- Comfort of open fittings and whistle-free operation
- Hearing comfort in steady and transient noise
- Hearing focus towards sound from the front and natural localization

These advantages emerge from the combination of established features with newly developed ones: ChannelFree™, Adaptive Feedback Canceller Plus, Transient Noise Reduction, and True Directionality™. Together, they provide a natural listening experience.
While often in the past, the choice was between opposite fitting goals – e.g. speech understanding vs. hearing comfort – Audio Efficiency™ has overcome such constraints. In what follows, we will look at each advantage separately.

Speech understanding and natural sound

In a study, Gatehouse et al. (2006) found that the traditional ways of wide dynamic range compression enhance either speech understanding or listening comfort. To some extent, the reason is that traditional systems improve intelligibility at the expense of sound quality.

ChannelFree™ signal processing also aims at improving intelligibility, but uses a different setup and a refined strategy to maintain sound quality.

For your clients, this means several benefits: speech clarity at comfortable loudness, participation in group discussions, pleasure of listening to music.

Comfort of open fittings and whistle-free operation

In the past, feedback cancelling was of limited use. Traditional approaches succeeded in preventing the instruments from whistling, provided that your clients used conventional earmolds with vents. In the meantime, however, a new trend has gained acceptance: the open, occlusion-free fitting. With this trend, the safety against howling has decreased. The reason is simple: To a large extent, the open fitting already uses up the margin of feedback-free gain.

With open fittings, the former level of safety can only be restored by better feedback cancelling. Using refined strategies, the Adaptive Feedback Canceller Plus achieves enhanced performance, eliminating feedback even before it becomes audible. For your clients, this means the benefit of an open fitting and the safety against whistling in demanding situations: when they hug a friend, put on a hat, or bring a phone receiver close to their ear.

Bernafon’s exclusive ChannelFree™ signal processing operates on the level of phonemes, analyzing the input signal and adjusting the gain 20,000 times per second. This speed allows ChannelFree™ to process each phoneme, i.e. the smallest components of speech, separately and accurately – a property that is decisive for speech understanding.

The Feedback Monitor in Bernafon’s AFC Plus monitors the frequency content of incoming signals and sends information to the Oscillation Suppression block to cancel feedback components before they become audible.
Hearing comfort in steady and transient noise

Adaptive noise reduction has been part of the hearing aid technology for a long time. Traditionally, its use is limited to steady noise, though – typically to car and machine noise. The reason is that the traditional approach monitors the modulation of sound. Then, it attenuates parts of the sound, namely in those frequency bands where there is little or no modulation. While useful in steady noise, the traditional approach fails in transient noise, such as clattering dishes e.g.

To cope with transient noise requires a different approach. A refined strategy monitors when the sound pressure level increases all of a sudden and then suppresses the peak-like signal. Such a strategy is the essence of Transient Noise Reduction, which complements the traditional approach in Audio Efficiency™. For your clients, this means hearing comfort in a variety of noisy environments: in a car, workshop, cafeteria, etc.

Hearing focus towards sound from the front and natural localization

Adaptive directionality has also been part of the hearing aid technology for a long time. As a unique feature, it improves speech understanding in noise because it increases the signal-to-noise ratio. The effect results from the use of two microphones – a front and a rear microphone – and a sophisticated way of processing the signals they pick up. The resulting directional microphone is more sensitive towards sound from the front than to the side and back. Despite this advantage, people often complain about reduced localization. As demonstrated in a study by Best et al. (2010), they confuse sound coming from the front with sound that approaches them from the back. The reason is that the adaptive directionality differs from the way the pinna produces directionality in a natural way.

To eliminate the drawback requires a strategy that mimics the effect of the pinna. Such a strategy is the essence of True Directionality™, which complements the traditional approach in Audio Efficiency™. For your clients, this means the benefit of hearing focus towards sound from the front and natural sound localization.

Summary

Audio Efficiency™ is the central processing system in the Chronos hearing aid family. The system coordinates the interplay of established and newly developed features – in such a way as to provide your clients the best possible benefit.
Since 1946, we have been passionate about developing quality hearing systems that enable people with hearing difficulties to enjoy authentic listening experiences. With Swiss Engineering, precision technology, and our commitment to individual service, we strive to exceed our customers’ expectations. Our aim is to provide extra value to our partners every day. Bernafon representatives and employees in over 70 countries fulfill our vision to help people with impaired hearing communicate again without limitations.

**Literature**