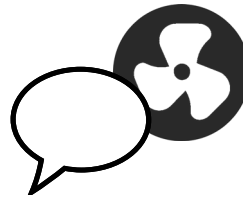


Automatically Exceptional



The final straw that triggers people to start wearing hearing aids is usually their desire to connect with people. Either they have lost a connection with someone or they are struggling to communicate. Ideally, they want a quick and easy solution to get them back in the conversation, even the most challenging conversations with competing background noise.

Directional microphones and noise reduction have been part of hearing aid technology for many years, but not all systems are created equal. Some systems perform well under specific conditions, such as white noise from behind in a sound chamber. But the real world is far different from these artificial conditions. The real world has varying types of noise – anything from simple white noise to interfering speech. And in the real world these noises are not static; they fluctuate in time and location relative to the listener. To deal with the real world, a system needs to be able to detect noise and speech signals, where they are coming from, and both adaptively and intelligently respond to both types of sounds. But it should also do this in a way that is both dynamically responsive and not disturbing to the person wearing the hearing aids. If the system changes too abruptly or too slowly, the listener could be bothered, distracted, or miss out on the conversation. The detection system needs to be extremely fast to monitor the live situation and the reaction of the system needs to be carefully regulated based on the listening environment, temporal changes and even personal preferences.

HearIntelligence™ from HANSATON is comprised of various features, which support your clients' natural hearing intelligence. Let's focus in on a few specifically designed to handle the more complex listening situations as described above.

Our environmental detector in Intelligent AutoSurround is constantly sampling the sound space around clients and categorizing the audio into up to seven environments: Conversation in quiet, Conversation in a small group, Conversation in a crowd, Conversation in noise, Quiet, Noise, and Music. Each environment has its own frequency response and feature settings. Intelligent AutoSurround is the master controller, ensuring smooth blending of environments and transitioning between environments. The blending can happen between all the environment types aside from Music, which is an exclusive environment. Acoustic situations are often complex or fluctuating and therefore blending of the environments is often the case, rather than being solely in one environment.

In addition to the environmental detectors, HANSATON hearing aids have specific speech and noise detectors. When the situation gets quite noisy and speech is detected, the hearing aids can automatically engage Dynamic SpeechBeam. Dynamic SpeechBeam helps your clients to focus on a conversation partner in difficult listening environments, regardless of which direction the speech is coming from. It uses a binaural 360° speech recognition capability to know where the conversation is coming from and aim the directional beam towards that direction.

Dynamic SpeechBeam uses information from both hearing aids to locate speech and then uses a binaurally coordinated response to speech coming from the front, sides or back. Figures 1, 2 and 3 show the directional response of the hearing aids and how it varies depending on the location of the speech signal.



Figure 1. When **speech is detected from the front**, Dynamic SpeechBeam focuses the directional beam to the front.

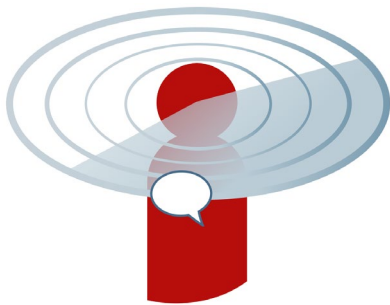


Figure 2. When **speech is detected from the side**, Dynamic SpeechBeam uses an asymmetrical pattern, where the ear closest to the speech opens up it's directional beam to include speech from the side, but the far ear keeps it's focus to the front. The result is a beam that includes the speech, but also maintains sounds from the front, where your client is looking.

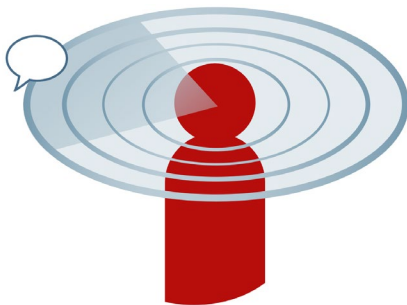


Figure 3. When **speech is detected from the back**, Dynamic SpeechBeam allows sounds from all directions to be processed, but puts the most emphasis on speech from the back.

All of these dynamic changes to the directional beam are controlled through smoothing functions to ensure the changes are as fluid as possible for your client. The main reason for these smoothing functions is so your clients can focus on the conversation and not on any changes the hearing aids are doing to support them in the conversation – even amidst changing background situations or movement in the location of the talker.

Sometimes the noise in the background is a loud machine-like noise, like a smoothie maker or fan. This noise in the background makes it more difficult for your clients to hold a conversation. A new feature has been incorporated to make the speech stand out **EVEN MORE**. Dynamic SpeechBeam now additionally has Intelligent NoiseReduction. When the type of noise is fairly constant and the speech is coming from the front, Intelligent NoiseReduction adds additional cancelling to noises that come from the sides and back, so your clients can focus even better on their conversation partner.

Your clients don't need to adjust anything, because Intelligent NoiseReduction is also automatically engaged in this situation. Intelligent AutoSurround recognizes the situation as Conversation in noise. Dynamic SpeechBeam is engaged to focus to the front and then Intelligent NoiseReduction adds additional cancelling to noises that come from the sides and back – on top of NoiseReduction – so loud sounds don't need to interfere as much with your clients' conversations.

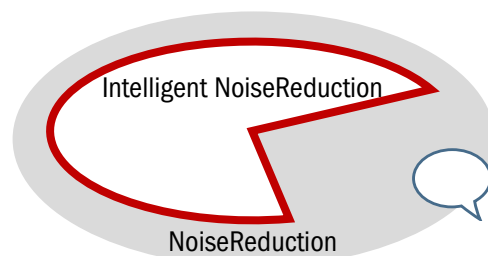
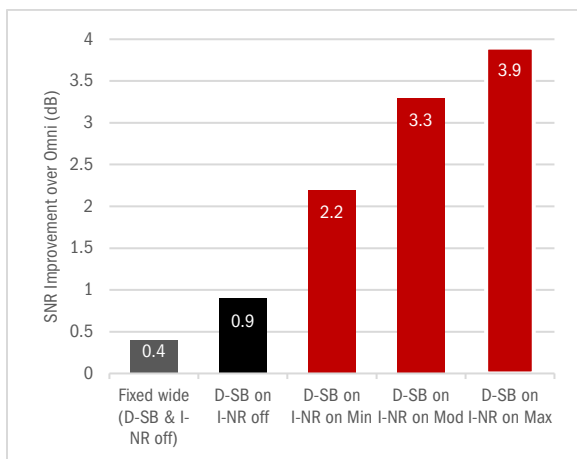


Figure 4. When speech is from the front and Intelligent NoiseReduction is engaged, it is layered on top of standard NoiseReduction to provide even more relief from noises from the sides and back.

Intelligent NoiseReduction only engages when Dynamic SpeechBeam recognizes that speech is from the front. Dynamic SpeechBeam with Intelligent NoiseReduction was designed to reduce intense noises, like a smoothie maker or a loud fan, allowing speech from the front to be highlighted.

Table 1 shows how much noise blocking Intelligent NoiseReduction provides. Starting with Dynamic SpeechBeam not engaged, the default Fixed Wide microphone mode delivers a Signal-to-Noise Ratio (SNR) improvement of 0.4 dB, which is already significant and beneficial compared to omni. With Dynamic SpeechBeam engaged, but with Intelligent NoiseReduction still off, the SNR improves to 0.9 dB. With Intelligent NoiseReduction engaged, you can see a further SNR increase of approximately 1dB for each increase in the strength setting. So with Dynamic SpeechBeam and Intelligent NoiseReduction fully engaged, there is nearly a 4 dB improvement in SNR.



D-SB = Dynamic SpeechBeam
I-NR = Intelligent NoiseReduction

Table 1. Dynamic SpeechBeam with Intelligent NoiseReduction provides 2.2 to 3.9 dB improvement in Signal to Noise Ratio, depending on the feature strength selected in scout fitting software.

For these measurements, the values are derived from recordings done on KEMAR in an 8 speaker array. Speech stimulus from the front was the ISTS signal presented at 65 dB SPL. Noise from sides and back

was the broadband IF Noise (International Female Noise, see EHIMA)) also presented at 65 dB SPL.

Hearing speech better is critical – it's why people come to you to get their hearing tested and get hearing aids. Dynamic SpeechBeam with Intelligent NoiseReduction was designed to automatically reduce intense noises, like a smoothie maker or a loud fan, allowing speech from the front to be highlighted. For clients who were struggling to communicate, the significant, automatic benefits of Dynamic SpeechBeam with Intelligent NoiseReduction can help get them back in the conversation, even the most challenging conversations with competing background noise.