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Phonak Audéo EON Sphere outperforms four other hearing aids for clear speech in loud noise.

Powered by the new HYPERSONIC™ chip, Audéo EON Sphere delivers up to 10 dB SNR benefit in a smaller, more energy-efficient device. Technical measurements across realistic sound scenes demonstrate that Audéo EON Sphere exceeds the performance of all four other hearing aids tested for clear speech in loud noise.

Ulloa Sanchez, D., Kepp K., Preuss, M., Raufer, S., August 2026

Introduction

Understanding speech in noise remains one of the greatest challenges for individuals with hearing loss and a key driver for innovation at Phonak. Directional microphone technology has long provided an effective way to improve speech understanding by emphasizing sounds from the listener's front and reducing sounds from other directions. This established approach is especially valuable when the listener is facing the talker. Real-world conversations, however, are often more dynamic, with speech and noise arriving from multiple directions. This creates an opportunity to combine spatial focus with a complementary form of speech enhancement.

Audéo Infinio Sphere™ introduced Spheric Speech Clarity (SSC), a DNN-based denoising feature enabled by the proprietary DEEPSONIC™ chip. SSC was designed to complement the hearing aid's microphone processing by enhancing speech over noise in real time and elevating speech clarity in complex acoustic scenes, including situations in which speech and noise arrive from different directions. By combining adaptive directionality with DNN-based denoising, Phonak brings together the strengths of spatial filtering and DNN-based denoising to support clearer speech in complex listening situations.

The first generation of the Spheric Speech in Loud Noise program in Audéo Infinio Sphere demonstrated unprecedented technical performance, including an SNR improvement of up to 10 dB relative to omnidirectional microphone mode (Raufer et al. 2024), establishing a new benchmark for real-time denoising in hearing aids. Audéo EON Sphere builds upon this by preserving strong speech-in-noise performance while improving efficiency and enabling a smaller form factor.

Results

Spheric Speech Clarity 3.0 improves power efficiency, allowing for a smaller form factor
The new Phonak Audéo Sphere EON introduces the new HYPERSONIC chip, which is 25% more efficient than the DEEPSONIC chip.

An additional efficiency gain was achieved by giving Spheric Speech Clarity 3.0 a newly designed DNN architecture, resulting in 16% reduced energy consumption compared to Spheric Speech Clarity 2.0. As shown in Figure 1, SSC 2.0 was 30% more efficient than SSC 1.0 and SSC 3.0 is 16% more efficient compared to SSC 2.0.

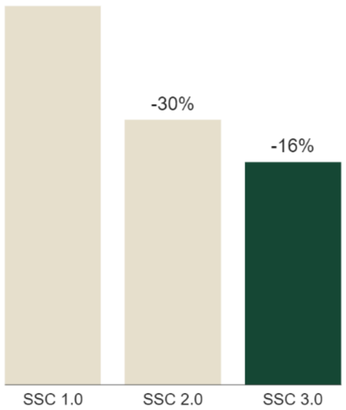

Figure 1. Relative power consumption across successive SSC generations, referenced to SSC 1.0. SSC 2.0 consumes 30% less power than SSC 1.0; SSC 3.0 consumes 16% less power than SSC 2.0.

When combined with the 25% efficiency improvement of the HYPERSONIC chip, the optimized SSC 3.0 architecture reduces energy consumption by 37% compared to SSC 2.0 on the DEEPSONIC chip.

These efficiency gains allow for a more compact product design. Audéo EON Sphere is 25% smaller and 20% lighter than the previous generation, making the technology accessible in a smaller form factor.

Spheric Speech Clarity 3.0 maintains SNR improvement
Figure 2 compares the isolated SNR performance of Spheric Speech Clarity 1.0 (SSC 1.0), SSC 2.0 and SSC 3.0, before implementation on the DEEPSONIC or HYPERSONIC chip, respectively. The optimized network architecture of SSC 3.0 maintains the same SNR performance as SSC 1.0 and 2.0. This demonstrates that the updated DNN architecture preserves the SNR performance compared to previous generations while substantially improving efficiency.

The SNR performance was evaluated across 500 sound files, including input SNRs from -15 dB to 20 dB. This large-scale evaluation is important because DNN-based processing is data-driven and cannot be reliably characterized from a single acoustic scene. The 500 sound files contain a large variety of background noise types and speakers. Although performance varies across individual scenes, the overall performance between SSC 1.0 and SSC 3.0 is the same, with median differences of less than half a dB.

Figure 2. Speech intelligibility index (SII) weighted signal-to-noise ratio (SNR) improvements for SSC 1.0, SSC 2.0, and SSC 3.0, evaluated with 500 sound files. The performance across the three generations of SSC is the same, with differences in the median of less than half a dB between any of the models.

Spheric Speech in Loud Noise maintains SNR improvement while increasing efficiency
The evaluation of 500 sound files presented in the last section enables a broad, data-driven comparison across a wide range of scenes. The laboratory measurements described in this section use a similar recording setup as the evaluation of Audéo Infinio Sphere (Raufer et al., 2024). Here, a smaller number of realistic background scenes is used. These scenes are publicly available and can be reproduced outside of Phonak's lab. Furthermore, the SNR benefit presented in this section reflects the performance of the complete hearing aid system as experienced by the user, including all onboard signal processing, rather than the isolated performance of Spheric Speech Clarity.

Figure 3 compares the SNR improvement of the Spheric Speech in Loud Noise program to omnidirectional microphone mode. SNR improvements are reported relative to omnidirectional microphone mode to quantify how effective the Spheric Speech in Loud Noise program is in enhancing speech over noise. The results in Fig. 3 show that Spheric Speech in Loud Noise maintains the same benchmark performance as the previous generation (Raufer et al. 2024). In Audéo Infinio Sphere devices, Spheric Speech in Loud Noise delivered up to 10.2 dB SNR improvement at maximum strength (9.0 dB SNR at default). This performance is maintained in Audéo EON Sphere devices with a 10.5 dB SNR improvement relative to omnidirectional microphone mode (9.7 dB SNR at default).

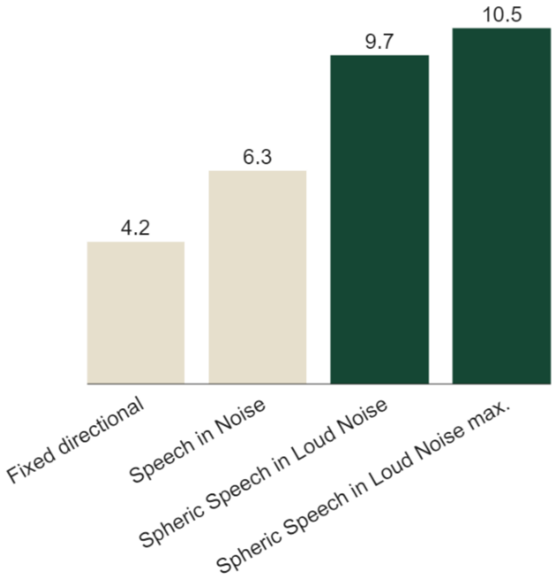

Figure 3. Speech intelligibility index (SII) weighted signal-to-noise ratio (SNR) improvements in dB with respect to the omnidirectional microphone mode for Phonak technologies averaged across three realistic scenes, including a café scene, dinner party scene and food court scene. Results are presented for a fully occluded coupling and for the better ear. The speech signal was always presented from 0° azimuth.

The data in Figures 2 and 3 show that the efficiency optimization did not compromise SNR performance. Instead, the new network, along with chip optimization, preserves the same high level of speech clarity while reducing computational demands. This demonstrates that innovations are not only in the SNR performance of the algorithm, but also in how efficiently that performance is achieved.

Spheric Speech Clarity outperforms four other hearing aids for clear speech in loud noise

Figure 4 compares the Audéo EON E90 Spheric Speech in Loud Noise program with corresponding manual programs of four other hearing aids in realistic speech-in-noise environments. Raufer et al. (2024) compared Audéo Infinio 90 Sphere with three other hearing aids, using a similar controlled technical measurement framework. In that study, Infinio Sphere outperformed the tested hearing aids.

The results in Figure 4 confirm that this performance leadership is maintained, when compared to the latest hearing aids by four other brands (as of July 2026). The next-generation Spheric Speech Clarity in Audéo EON Sphere delivers higher SNR improvements than the four tested hearing aids.
The comparison is particularly relevant because it evaluates the devices under ecologically realistic acoustic conditions. In everyday listening environments, hearing aid users often face complex mixtures of speech and noise, rather than idealized laboratory noise signals. Maintaining superior SNR improvement under these conditions indicates that the Spheric Speech in Loud Noise program continues to provide technical advantage in situations similar to those faced in real life.

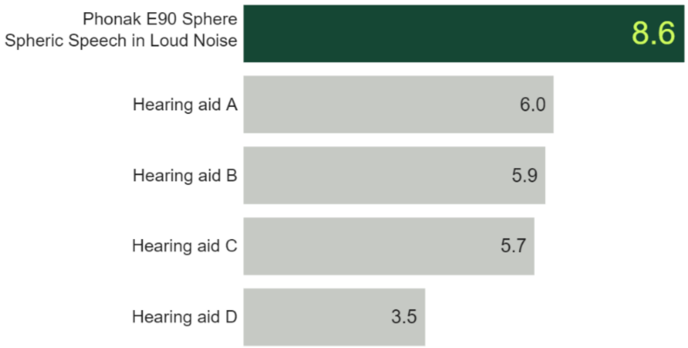

Figure 4. Audéo EON Spheric Speech in Loud Noise outperforms four other hearing aids for clear speech in loud noise. SII-weighted signal-to-noise ratio (SNR) improvements in dB with respect to unaided, averaged across three realistic scenes. Results are presented for a fully occluded coupling and for the better ear. The target speech was always presented from 0° azimuth. All hearing aids were tested in manual programs at their respective default settings.

Spheric Speech Clarity preserves access to speech from all directions

Figure 5 shows the SNR benefit of Spheric Speech Clarity 3.0 for target speech presented from different incident angles. Across the tested directions, SSC 3.0 provided a consistent SNR improvement, with average performance remaining within the ±1 dB range shown by the gray box. This indicates that the benefit of SSC 3.0 is not limited to speech presented from the front but is preserved across a broad range of target speech directions.

For the measurements shown in Figure 5, two microphone configurations were used to simplify the evaluation and enable a controlled comparison across target speech directions. For speech presented from 0° and 60°, SSC 3.0 was evaluated on top of a fixed directional microphone mode. For speech presented from 90°, 120°, and 180°, SSC 3.0 was evaluated relative to an omnidirectional microphone mode. In everyday use, the automatic program does not rely on these fixed settings. Instead, the beamformer adapts to the target location using SpeechSensor (Latzel et al. 2022).

These findings support the role of SSC as a complementary technology to microphone directionality. Directionality provides spatial focus when speech is in front of the listener, while SSC 3.0 adds DNN-based denoising benefit across the tested speech directions.

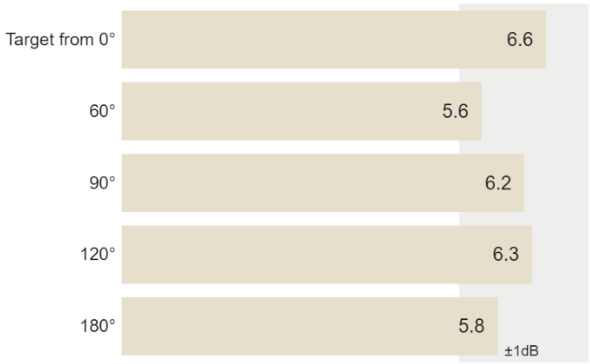

Figure 5. Spheric Speech Clarity benefit from different target speech incident angles. SII-weighted signal-to-noise ratio (SNR) improvements across three realistic scenes for a target speech signal presented from 0°, 60°, 90°, 120° and 180° azimuth. Results are presented for a fully occluded coupling and for the better ear. For 0° and 60°, the reference condition for Spheric Speech Clarity deactivated versus activated at maximum strength was a fixed directional microphone mode. For 90°, 120°, and 180°, the reference condition for Spheric Speech Clarity deactivated versus activated at maximum strength was an omnidirectional microphone mode. The gray box shows the +-1 dB range from the average performance across all directions

Evidence beyond technical performance

While technical measures such as SNR improvement remain important indicators of hearing aid performance, the ultimate goal is to improve communication in everyday life. Sphere's ability to support patients in dynamic environment has been evaluated in more than 20 completed studies, with others still running (cf. phonak.com/evidence for a complete overview). For example, Audéo Infinio Sphere demonstrates significant advantage compared to state-of-the-art directional microphone technology, resulting in an additional reduction of listening effort by 37% and an improvement in speech understanding by 50% (Latzel, 2025).

Benefits extend beyond speech intelligibility, including improved communication in dynamic social situations, reduced listening-related fatigue, and positive impacts on quality of life (Stropahl and Seitz-Paquette, 2026). These findings support a holistic view of hearing care in which advances in speech-in-noise technology contribute to overall well-being, not merely audibility and clearer speech.

This insight presents objective measurements confirming that SSC 3.0 maintains the SNR performance compared to earlier generations. It further shows that, consistent with comparative evaluations conducted in 2024 (Raufer et al., 2024), Audéo EON Sphere outperforms four other hearing aids in SNR benefit in loud noise.

Conclusion

With the next-generation Spheric Speech Clarity 3.0 on the HYPERSONIC chip, Phonak demonstrates that DNN-based denoising can be made more efficient without compromising performance.

The Spheric Speech in Loud Noise program with SSC 3.0 maintains an SNR improvement of up to 10 dB relative to omnidirectional microphone mode. It outperforms four other hearing aids in realistic speech-in-noise environments and preserves benefit for speech sources from all directions. The efficiency gains allow for a smaller and lighter device compared to the previous generation. Together, these findings show that Phonak continues to advance the state of the art in hearing aid signal processing, delivering clear speech in noise while optimizing the technology that makes this performance possible.

Methodology

Measurement setup

All measurements were conducted in an acoustically treated room using the same general setup as the original technical evaluation. Twelve Genelec 8020D loudspeakers (Genelec, Finland) were arranged in a circle with a radius of 1.5m, resulting in a 30° spacing between adjacent loudspeakers, see Figure 6. A KEMAR mannequin (GRAS Sound & Vibration, Denmark) with anthropometric ears was positioned at the center of the loudspeaker array and oriented toward 0°. The center of the ear canal of the KEMAR mannequin was placed at the same height as the loudspeakers.

An RME M-16 DA converter (Audio AG, Germany) was used to send audio signals to the active loudspeakers, and an RME Fireface 802 USB soundcard was used to record the processed signals from the KEMAR ear-canal microphones.

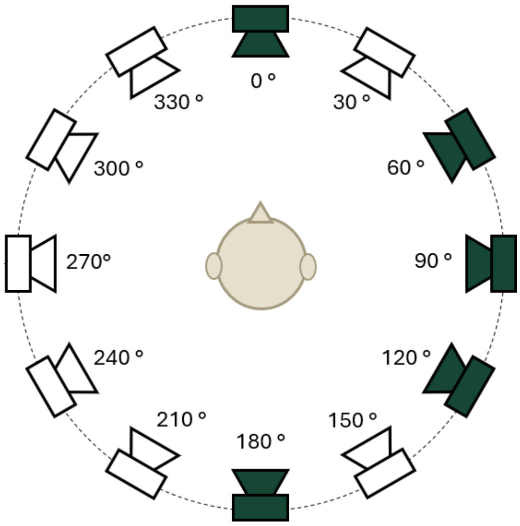

Figure 6: Top-down view of the setup. 12 Genelec 8020D loudspeakers were arranged in a circle with a 1.5m radius. A KEMAR mannequin with anthropometric ears was placed at the center of the loudspeakers and oriented towards 0°. The center of the ear canal of the KEMAR mannequin was at the

same height as the loudspeakers. Noise was presented from all speakers; speech was presented from 0°, 60°, 90°, 120°, or 180°, respectively, indicated by the green speakers.

Background noise and target speech

Three realistic sound scenes from the ARTE database (Weisser et al. 2019) were used as background noise: a café scene, a dinner party scene, and a food court scene. Scenes were presented at their recorded sound pressure levels: 71.7 dB SPL for the café scene, 72.8 dB SPL for the dinner party scene, and 78.2 dB SPL for the food court scene. These scenes were chosen because they present common scenes where the Spheric Speech in Loud Noise program would be automatically activated.

The ARTE scenes are Higher-order Ambisonics (HoA) recordings. The ARTE recordings were decoded and played back in the horizontal plane through 12 loudspeakers at a distance of 1.5m. To overcome drawbacks like spatial aliasing of standard HoA decoding, the Coding and Multi-Parameterization of Ambisonic Sound Scenes (COMPASS) method was used for decoding of the continuous background signals (Politis et al. 2018).

The International Speech Test Signal, or ISTS (Holube et al. 2010), was used as the target speech signal. The background noise was mixed with the ISTS speech signal to achieve free-field SNRs of -2.1 dB SNR for the café scene, -4.6 dB SNR for the dinner party scene, and -7.1 dB SNR for the food court scene. These SNRs are slightly different from the 0 dB, -3 dB, and -6 dB SNRs used in Raufer et al. (2024) and were updated to reflect real-world SNRs from Miles et al. (2022).

Stimulus preparation

Figure 7 shows an overview of the stimulus presentation. Before each measurement, 40 seconds of the ISTS speech signal and respective background noise were played to allow the hearing instruments to settle. The evaluation period was 10 seconds for each Hagerman phase-inversion block, i.e. the first 10 seconds of the ISTS speech signal and respective background noise were repeated with the respective Hagerman phase, leading to a total acquisition time of 70 seconds for one condition.

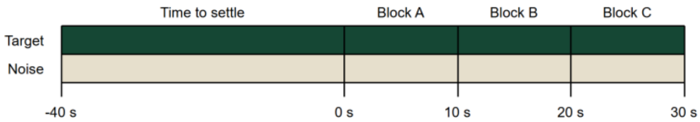

Figure 7: Stimulus presentation. Before each measurement, 40 seconds of the ISTS speech signal (S) and respective background noise (N) were played to allow the hearing instruments to settle. The evaluation period was 10 seconds for each evaluation block, see methods.

Hagerman and Olofsson Phase-Inversion Method

The phase-inversion method described by Hagerman and Olofsson (2004) was used for the measurements. It requires separate signal (S) and noise (N) audio signals such that they can be inverted and combined to play three blocks as follows: Block A = S+N, Block B = S-N, and Block C = -S-N to the devices under test. The recorded output of the hearing aids can then be separated into reconstructed signal (S') and noise (N') which allow calculating the signal-to-noise ratio (SNR'). The Hagerman error was below -10 dB (SII-weighted) for all measurement conditions, including hearing aids of other brands. For more details see Hagerman and Olofsson (2004).

SII-weighting

The signal-to-noise ratio (SNR) benefit was frequency weighted based on the band importance function according to the speech intelligibility index (SII, ANSI S3.5/1997, Table 3).

Hearing aid fittings

For the hearing aid fitting, a standard N3 audiogram was used (Bisgaard et al. 2010) as well as a fully occluded coupling. The real ear occluded gain (REOG) was measured using the international female noise (IF noise, Holube et al. 2010). For each device the REOG was >15 dB at frequencies between 100 Hz to 20 kHz. Additionally, the insertion between 100 Hz to 10 kHz was measured to make sure that the occlusion effect and insertion gain were symmetric between the left and right ears.
For each device, the proprietary fitting formula was used and 100% gain prescription for an experienced user was chosen. The feedback management system in each device was deactivated, so that the phase-inversion method could be performed. Impulse noise reduction and wind noise reduction were also deactivated for each device. The maximum power output (MPO) was set to maximum for all devices. Manual speech in noise programs were used for all device recordings, including hearing aids from other brands.

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Authors and investigators

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Diego is a Hearing Performance Engineer with a focus on the development and benchmarking of acoustical product performance in hearing aids. He earned both his B.Sc. and M.Sc. in Health, Science, and Technology from ETH Zurich, where he completed his Master's thesis at Sonova in 2020. Before joining his current role, Diego worked as a Clinical and Technical Specialist in the field of cochlear implants.

Kevin Kepp, Tech Lead Deep Learning

Kevin joined Audatic, a Sonova company specializing in AI-driven audio processing, in 2019 as a Deep Learning Engineer. As Technical Lead Deep Learning he is responsible for the development of the DNN-based algorithms behind Phonak's Spheric Speech Clarity feature. Kevin holds a M.Sc. in Computer Science from Technical University Berlin where he focused on artificial and human intelligence.

Michael Preuss, Senior Audiology Manager

Michael joined Phonak HQ as an Audiology Manager in 2020. Drawing on his experience as a lecturer at the Academy of Hearing Acoustics in Lübeck and his personal experience with hearing loss, Michael provides audiological input during product development and conducts in-depth expert training sessions. He holds a B.Sc. in Hearing Acoustics from the University of Applied Sciences in Lübeck, Germany.

Stefan Raufer, Senior Research Scientist

Stefan joined Sonova in 2021 and develops audiological concepts for new hearing aid features. Together with other teams, he helps bring latest technologies into products and ensures that new technologies translate into user benefit. Stefan holds a PhD in speech and hearing sciences from Harvard University.

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One-page summary

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Key highlights

- Audéo EON Sphere outperforms four hearing aids across realistic speech-in-noise scenes, maintaining its performance advantage.
- Spheric Speech Clarity (SSC) 3.0 and the HYPERSONIC chip maintain up to a 10 dB SNR improvement relative to omnidirectional mode while preserving the benefit for speech sources presented from all directions.
- Spheric Speech Clarity (SSC) 3.0 and the HYPERSONIC chip reduce computational energy consumption by 37%, enabling the Audéo EON Sphere to be 25% smaller and 20% lighter than the previous Audéo Sphere generation.

Considerations for practice

- Audéo EON Sphere meets the client's #1 listening need of clear speech in noise with unprecedented SNR benefit.
- The combination of SSC 3.0 and microphone directionality options in Phonak Target and myPhonak enables individualized settings that balance spatial access and front focus to optimize the client's listening needs when understanding speech in loud noise.
- Housed in a small RIC R form factor for the first time, Audéo EON Sphere enhances accessibility while preserving high-level speech-in-noise performance.