

Phonak Insight.

Spheric Speech Clarity 2.0

Infinio Ultra introduces Spheric Speech Clarity 2.0 (SSC 2.0), which builds on the innovation of its predecessor, enhancing the efficiency of its Deep Neural Network by 30%. Clients can now enjoy SSC 2.0 for longer durations, benefiting from speech enhancement in complex auditory environments, which leads to improved speech understanding and reduced listening effort, as outlined below.

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Introduction

Recap Infinio & SSC 1.0

Building on years of acoustic research and real-world client insights, we set out to solve one of the most persistent challenges in hearing technology, understanding speech in the presence of loud noise. In 2024, with Infinio, we revolutionized the industry by introducing Spheric Speech Clarity (SSC) – a breakthrough powered by a deep neural network (DNN) capable of speech enhancement in real time.

While DNN applications in hearing aids are not new, DEEPSONIC with its patented, purpose-built design, is the first chip to overcome past limitations on the effectiveness of noise reduction in hearing aids. It's through this dedicated chipset that advanced AI-driven noise reduction is now possible directly on the device. SSC extracts the speech

signal, enhances it relative to the background noise, and then integrates the enhanced speech back into the signal flow. This innovation directly addressed the number one client need: clear speech understanding in loud, complex sound environments.

Evidence summary

Evidence supporting the functionality of Spheric Speech Clarity (SSC) has been gathered across three distinct domains: technical measurements, clinical studies, and comprehensive surveys of hearing care professionals (HCPs). This multifaceted approach ensures a robust understanding of SSC's performance, providing a well-rounded perspective on its capabilities and benefits in challenging listening environments.

In technical measurements conducted under realistic auditory scenarios, Spheric Speech Clarity demonstrates a

significant enhancement in signal-to-noise ratio (SNR), achieving an impressive benefit of up to 10.2 dB (Raufer, 2024). This improvement translates to an increase of up to 150% more access to speech cues according to SII (ANSI S.3.5, 1997) when compared to an omnidirectional condition. SSC effectively enhances speech over background noise, ensuring that the SNR benefit is preserved regardless of the direction from which the sound originates. Furthermore, independent assessments conducted by external testing facilities have confirmed that the Audéo Sphere™ Infinio device surpasses its competitors, achieving the highest ranking on speech-in-noise performance metrics to date (HearAdvisor, 2025).

The advancements observed in technical measurements are confirmed by clinical studies, which reveal that SSC improves speech understanding and reduces listening effort. In a comparative study with hearing instruments from Phonak and two other companies, clients listening with SSC technology were able to navigate more complex auditory environments without an increase in listening effort and were up to three times more likely to understand every word from any direction when utilizing SSC, compared to the two competitive devices (Wright, 2024).

Feedback from HCPs regarding SSC has been overwhelmingly positive. After receiving a live demonstration after launch in 2024, 99% of HCPs believed that SSC will set new technology standards in the hearing care industry, and 100% of HCPs were of the opinion that SSC is a game changer in the hearing aid industry (Sonova proprietary research, 2024). This consensus underscores the potential of SSC to redefine standards in the hearing aid industry and enhance the overall client experience in challenging listening situations.

Having established a comprehensive understanding of SSC through rigorous technical measurements, clinical studies, and HCP feedback, we now turn our attention to additional evidence that further underscores the impact of this innovative solution.

New evidence

The first study (Tian, 2025) we present originates from the Innovation Center in Shanghai, where a comparative analysis was conducted to evaluate the benefit of SSC compared to state-of-the-art directional microphone

technology, namely StereoZoom 2.0, for adults with moderate to severe hearing loss.

The hypothesis going into the study was that speech understanding and listening effort from 0 degrees would be comparable between SSC and StereoZoom 2.0. However, we wanted to prove that the key differentiator benefit of SSC was the ability to enhance speech from any direction resulting in better speech understanding and reduced listening effort off axis (60 and 300 degrees). Results confirmed the hypothesis, showing that SSC improved speech understanding by 24% from 300 degrees and 31% from 60 degrees, which lead to a reduction of listening effort of 35% and 34% respectively. These results underpin the uniqueness of SSCs against other more conventional approaches to noise reduction, namely directional microphones.

A separate study (Latzel, 2025) at the University of Oldenburg was conducted to investigate if SSC could provide benefit in more complex communication scenarios, in addition to investigating if higher level benefit could be measured in the area of cognitive load and fatigue. Participants in the study (22 adults with moderate to severe hearing loss) showed an improvement of 20 percentile points for speech understanding in a complex multi-talker scenario, which requires shared attention from the participants. This translates into a 50% improvement in relative performance with SSC compared to StereoZoom 2.0.

Furthermore, the Oldenburg study delved into the cognitive implications of using SSC, particularly in complex communication scenarios. The results indicate that SSC not only lowers cognitive load but also mitigates fatigue experienced by clients at the end of the day. The study also reported a reduction in listening effort by 37%. These outcomes highlight SSC's broader impact on quality of life, extending beyond just auditory performance.

In summary, both studies provide compelling evidence that SSC offers substantial improvements in speech understanding in noise and listening effort management, particularly for adults with moderate to severe hearing loss. These findings further solidify SSC's leading position in the realm of hearing device technology.

We are excited to introduce the 2.0 version of the SSC feature alongside Infinio Ultra, designed to significantly

improve the efficiency of our groundbreaking DNN-based denoising technology, allowing clients to benefit from it even longer. With the new generation, we've set a bold objective of achieving a 30% increase in efficiency without compromising the high-performance standards trusted by our clients.

For our clients, long battery life is not just a convenience – it's essential for continuous, reliable hearing support throughout the day. Efficient DNN processing enables clients to fully benefit from advanced features like intelligent noise reduction and enhanced speech understanding without compromising battery life and seamless client experience.

Improving the efficiency of DNNs is a multifaceted challenge that requires a careful balance between sustaining or even improving performance and reducing power consumption. Addressing this challenge calls for a comprehensive approach that integrates innovative, highly tailored strategies across model optimization and algorithmic refinement to find the right trade-offs among performance, energy consumption, and other resource constraints.

Methodology

In developing SSC 2.0, we pushed the boundaries of what the DEEPSONIC chipset could do, refining our DNN algorithms for an even closer integration between model and hardware to maximize performance and efficiency.

As discussed in Hasemann & Krylova (2024), a DNN is fundamentally a complex network of layered computations, where each layer performs matrix operations and nonlinear transformations to progressively extract meaningful patterns from raw input data. Improving model efficiency implies optimizing how these computations are performed. To create an even smaller, more energy effective DNN architecture for SSC 2.0 without sacrificing performance, we focused on further developing our *quantization* and *performance profiling* techniques.

Quantization in deep learning refers to the process of reducing the precision of the numbers used to represent a model's parameters. The improved DNN quantization in SSC 2.0 now enables even faster and more power-efficient calculations without substantially impacting model quality or accuracy. Profiling is the process of measuring and analyzing the performance of a deep learning model or training/inference pipeline. This analysis helps reveal how a DNN interacts with the underlying hardware, uncovering bottlenecks in computation, memory usage, and data transfer that can impact overall efficiency and scalability. To further streamline the performance of SSC on DEEPSONIC,

we enhanced our custom-built profiling tool to obtain deeper insights into DNN's computational efficiency and identify opportunities for further optimization. The resulting insights guided us in selecting model architectures that offer the most optimal trade-off between model quality and power consumption.

Results

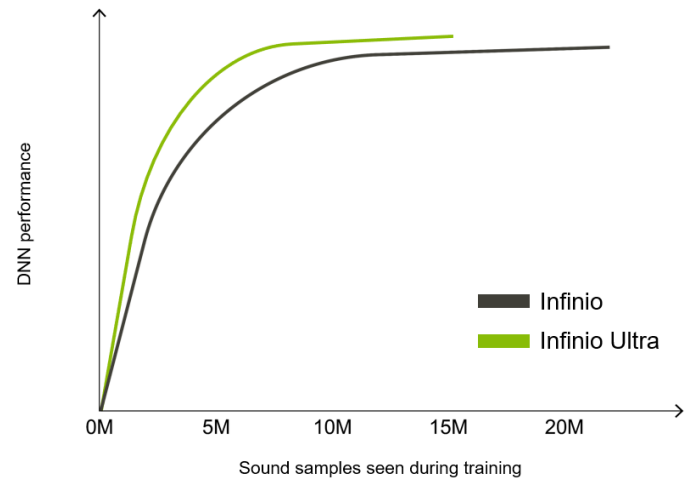


Figure 1: Training sound samples seen during training Spheric Speech Clarity for Infinio and Infinio Ultra to reach peak performance.

Figure 1 illustrates the DNN's performance relative to the number of sound samples used during training. For the original Infinio DNN, peak performance was achieved after training on 22 million sound samples. In contrast, Infinio Ultra, which incorporates architectural enhancements, demonstrates a significantly steeper performance increase. With these improvements, the model achieves optimal performance using only 15 million sound samples.

Just like its predecessor, SSC 2.0 underwent evaluation with the Audio Quality Estimator, our predictive model that can estimate human ratings for any audio sample in the categories of 'noise', 'sound quality', and 'overall impression' more accurately than any existing estimator (Diehl et al. 2022). Despite being trained on a reduced dataset of 15 million sound samples, the results indicate that there is no statistically significant difference between the performance of SSC 2.0 compared to SSC 1.0 (Figure 2).

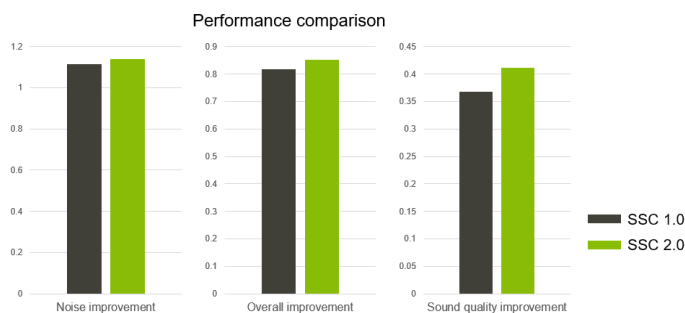


Figure 2: Performance comparison of Spheric Speech Clarity 2.0 (SSC 2.0) and its predecessor, SSC 1.0, as evaluated by the Audio Quality Estimator, showing no statistically significant difference between the two performances.

The same result in audio quality scores is attributed to the new DNN architecture and improvements to the training process, such as more advanced objective functions that more accurately signal the progress of DNN quality over the course of training, maintaining performance levels while enhancing overall efficiency.

These findings are also confirmed when analyzing the SNR improvement of the hearing aid implementation, which remains consistent between Infinio 1.0 and Ultra, achieving up to 10.2 dB SNR benefit in challenging listening environments characterized by a negative SNR, as shown in Figure 3.

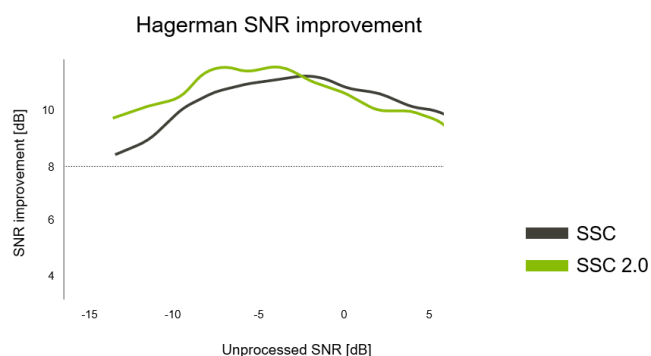


Figure 3: Hagerman SNR improvement showing consistent performance between SSC 1.0 and SSC 2.0, achieving up to 10.2 dB SNR benefit.

Battery runtime

Battery runtime measurements on Audéo Sphere Infinio confirm a significant improvement when utilizing SSC 2.0 over SSC 1.0. When utilizing SSC 2.0 nonstop, the device is capable of operating for up to 11 hours compared to up to 8h with SSC 1.0 during continuous use in demanding environments, such as busy workplaces or large social events, while delivering clear and intelligible speech that surpasses the capabilities of other existing technologies.

When clients are aiming for a total wearing time of 16 hours, SSC 2.0 can still be used for up to 9 hours within this

timeframe. This extended battery life allows for the substantial benefits of the SSC feature in enhancing speech understanding and reducing listening effort to be now experienced for even longer durations.

Both tests aimed at assessing performance found that SSC 1.0 and SSC 2.0 were comparable. The improvements in battery runtime achieved the initial goal of enhancing efficiency by 30%.

Conclusion

Our ongoing commitment to innovation has driven further advancements in our proprietary DNN technology, solidifying our position as an innovation leader in the field. The new Spheric Speech Clarity 2.0 feature is an integral part of Infinio Ultra and will also be made available through a firmware update to existing Audéo Sphere Infinio wearers. This ensures that technological advancements are not withheld but shared across our client base, including those who purchased earlier devices. This underscores our commitment to inclusivity, continuous improvement, and delivering cutting-edge solutions that elevate the client experience and support better auditory outcomes for all.

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Authors and investigators

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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.

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Alena is Chief of Staff at Audatic, a Berlin-based Sonova company specializing in AI-driven audio solutions. Since joining in 2020, she has supported strategic and operational initiatives focused on applying deep learning to real-world

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One-page summary

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Infinio Ultra introduces Spheric Speech Clarity 2.0 (SSC 2.0), enhancing the efficiency of its Deep Neural Network by 30%. Clients can now enjoy SSC 2.0 for longer durations, benefitting from speech enhancement in complex auditory environments, leading to improved speech understanding and reduced listening effort.

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Key highlights

- Clinical studies show that SSC significantly improves speech understanding (Wright, 2024), with clients being up to three times more likely to understand speech in noisy environments compared to two key competitors.
- New research confirms that SSC outperforms traditional directional microphone technology from various angles and significantly reduces listening effort (Tian, 2025).
- SSC 2.0, introduced with Infinio Ultra, enhances the efficiency of its Deep Neural Network by 30%, enabling clients to benefit in challenging listening situations for longer durations.

Considerations for practice

- As SSC 2.0 has been shown to help clients hear more clearly in noisy settings, this unique feature is the ideal choice for those navigating complex listening situations.
- SSC 2.0 is designed for performance in everyday life, validated by compelling evidence conducted in real-world scenarios, while outperforming key competitors.
- SSC 2.0 offers peace of mind and confidence for clients, requiring consistent performance throughout the day in the most demanding listening environments.