G8 White Paper

Audio Service G8 is the smartest choice for speech in noisy social situations.

November 2024

Audio Service

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G8 technology and the latest Multi-Track Processing outperform competitors with the most beneficial Signal to Noise Ratio (SNR) for better hearing in noise.

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Abstract

Audio Service is the smart choice for better hearing in noise.

For many hearing aid users, listening environments with multiple speakers from various directions with background noise pose significant challenges.

Measuring the performance of hearing aids, both in real life situations and laboratory conditions, has helped the industry improve the solutions provided over the years. It also offers valuable insights on the performance of the hearing aids available for the end users.

This white paper reports the results from research evaluating the Signal to Noise Ratio (SNR) performance from various hearing aids, primarily focusing on the advantages offered by the Multi-Track Processing strategy.

Measurements were performed under a challenging situation, with speech sources alternating between two directions, while constant background noise was present. By incorporating both frontal and lateral speech alternating, the study offers a more accurate representation of challenging social settings and provides guidance into how Audio Service's G8 Multi-Track Processing effectively addresses these complex scenarios, consistently outperforming the solutions offered by competitors.

Introduction

Context and Challenges

Following a conversation with background noise remains one of the most persistent challenges for individuals with hearing loss. Many everyday situations, like crowded restaurants, public spaces, or gatherings with friends, present a significant intelligibility challenge. The surrounding

noise has a double effect, as it tends to mask the conversation, and may contribute to a general discomfort.

By reviewing the results of multiple satisfaction ratings for hearing aid users in different countries, “Use in noisy situations” and “Conversation in large groups” are still ranked among the most difficult conditions. EuroTrak surveys (2022, 2023, 2024)[1].

The hearing aid industry has consistently pursued ways to improve speech recognition and overall comfort and, made improvements through the years in offering amplification for speech and reducing background noise; yet traditional amplification often struggles to deliver consistent results in dynamic settings.

To this date, many hearing aids rely on directional microphones and noise reduction algorithms, which can improve focus on speech but may fall short in more complex acoustic environments. Users may still find it hard to discern speech with ease from background noise, leading to difficult interactions, as an additional trade-off, it may compromise natural sound quality and perception of surrounding sounds.

Audio Service’s Approach

Audio Service, keeping with the slogan “The smart choice” aims to provide continuous technology improvements for the hearing aid users.

The introduction of the G7 technology, which was launched in 2022, offered a paradigm-shift in audio processing that drastically upgraded the performance in noise situations.

Using Multi-Track Processing, G7 hearing aids separate target speech and environmental sounds to process them individually. This remarkable approach of sound processing results in both better speech understanding and increased environmental awareness.

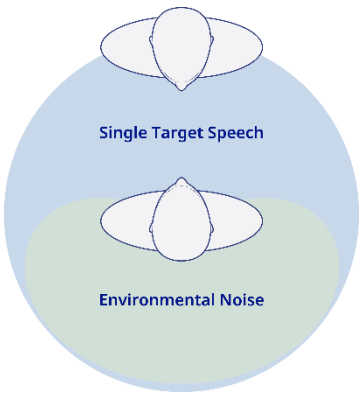

Figure 1. Representation of the independent audio tracks enabled with G7 technology and the Multi-Track Processing feature.

Audio Service continues to develop the technology, the next generation was launched at the beginning of 2024, introducing the G8 platform that takes hearing in noise to the next level.

G8 technology is specifically designed to address additional challenges, such as hearing in noisy situations when multiple conversation partners interact.

G8 hearing aids can automatically track and optimize multiple speakers at once. Featuring the updated Multi-Track Processing, with up to five independent audio tracks; four of the tracks specialized for conversation with multiple speakers simultaneously, and one track maintaining environmental awareness. Each track is processed separately to provide the best balance and better speech understanding, even when conversation partners move, new conversation partners join, or in a dynamic situation where the hearing aid users moves the head in different directions.

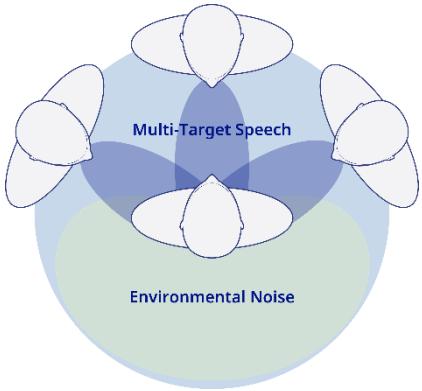

Figure 2. The image represents the improvement of Multi-Track Processing on G8 Technology with up to five independent audio tracks.

G8 technology is the smart choice for better hearing in any challenging and demanding listening situation.

Relevance of Signal to Noise Ratio

The G8 technology's development has been guided by rigorous research aimed at optimizing hearing aid performance in complex listening environments. Researchers assessed the improvement in speech recognition for challenging noisy situations as group conversations.

A key measure used in this white paper and the studies reported in it, is the Signal to Noise Ratio (SNR).

SNR expresses the relation in intensity (or volume) between the signal (or target speech) and the background noise. Therefore, an increase in SNR means a clearer differentiation between speech and noise, which typically leads to an easier identification of the target signal.

There is often a clear connection between SNR and speech intelligibility. The SNR required to obtain a certain level of speech intelligibility may vary depending on the individual listener; people with hearing loss usually require a higher SNR compared to normal hearing people to achieve similar recognition results.

Quantifying the difference between the signal and surrounding noises is crucial, as it offers accurate guidance on the clarity provided by the hearing aids from which users benefit later in realistic listening situations.

Technology Review

Research Background

This white paper primarily focuses on the results of two studies from 2023 and 2024. In the studies, quantitative measurements were performed on different hearing aids to determine the Signal to Noise Ratio in a simulated noisy group conversation, reporting the advantages of Multi-Track Processing feature offered by the G8 technology.

After a detailed exploration of the findings on each study, it is demonstrated how Audio Service G8 technology not only meets but exceeds the performance over the industry benchmarks in challenging listening situations, including background noise and multiple speakers.

Methodology

The base of the studies is the Hagerman phase inversion method Hagerman & Olofsson (2004)[2], the measurement setup considered modifications following the version from Aubreville & Petrausch (2015)[3].

Testing took place in a sound-treated room with a KEMAR manikin positioned at the center and four loudspeakers placed at 1 meter.

Speech was played from two of the loudspeakers, positioned at 0° (directly in front of the manikin) and 315° (to its left), at a level of around 76 dBA.

Background noise, created by mixing sounds from a busy cafeteria with pink noise, was played from two other loudspeakers positioned at 135° and 225°, at a slightly lower level of 72 dBA.

All sounds were played for 50 seconds initially, to allow the hearing aids' noise reduction features to be fully activated and stable before beginning actual measurements.

After 50 seconds a conversation scenario was simulated, where speech signals alternated every 10 seconds between the front and the side speakers (S0 and S315).

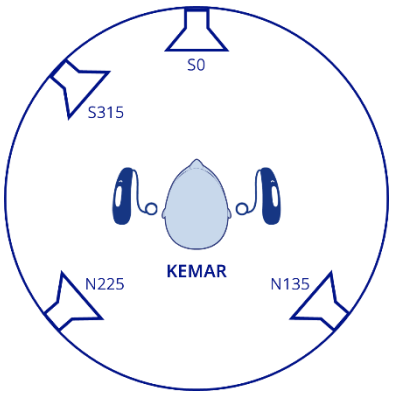

Figure 3. Setup used for output SNR measurements. Speech (S) signals were presented from the two loudspeakers in the front hemisphere, and noise (N) signals were presented from the two loudspeakers in the back hemisphere. The signals processed by the hearing aids were recorded in the KEMAR ears, with and without phase inversion of each signal, and the Hagerman method was used to generate estimates of the various S and N signals, both alone and in combination.

To measure the output SNR, the recordings were performed with and without a phase-inversion of the different sound signals. This allowed the researchers to isolate and analyze the output for both speech and noise signals. Each recording included four speech segments, for a total of 40 seconds, with only 6 seconds per segment analyzed for accuracy around the speech transitions.

The primary outcome was the average output SNR across these recordings. The results from the left ear were used to calculate the lateral SNR as the speaker S315 was positioned on this side.

The study's methodology goes beyond the conventional focus on frontal speech by also analyzing speech coming from lateral directions in a dynamic situation to simulate a more realistic group conversation.

Hearing aids

The selected hearing aids used for the comparison in each study were RIC (Receiver-In-Canal) from the highest technology level of each competitor.

All hearing aids were fitted binaurally considering a symmetrical, flat 50 dB hearing loss, following the proprietary fitting rationale. Adaptive features such as feedback cancellation and frequency compression were disabled.

To establish a baseline reference SNR, the recording from the manikin ears (unaided) was used, this represents the input SNR without any hearing aid processing.

Each pair of hearing aids were placed with closed coupling on the KEMAR ears. The universal or standard program was used with the default settings. For one competitor that includes AI co-

processor-driven technology, a second measurement was applied changing to a manual program to measure the performance with the AI feature disabled.

The hearing aids used represented the latest technology platform offered by every competitor at the time of each study.

Results

The studies compared Audio Service G8 with the competitor hearing aids, using the unaided KEMAR open ear results as baseline.

The results in this white paper are expressed as the improvement achieved by each competitor over the baseline SNR from the KEMAR unaided response.

2023 Study Results

The comparison included G8 devices and four competing hearing aid models, focusing on the output SNR. Measurements were conducted for both frontal and lateral talker positions. The results detail the individual performance for each position and provide an overall assessment expressing the average of the frontal and lateral speakers.

In this study, one competitor's device was excluded from the averaged industry comparison due to subpar performance.

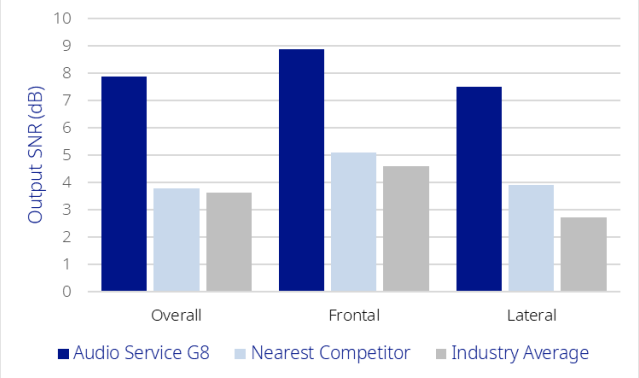

Figure 4. Speech output SNR from first study (2023) including overall, frontal, and lateral results.

When considering the "Overall" output SNR performance, as shown in Figure 4 (left), Audio Service G8 delivered an improvement of 7.9 dB. The average performance across competitor devices was 3.6 dB. Audio Service G8 outperformed this average by 4.3 dB and surpassed the

closest competitor by 4.1 dB. This substantial increase shows G8's ability to significantly promote speech reception in dynamic group conversations.

Figure 4 (mid and right) illustrates the results obtained individually in the "Frontal" and "Lateral" speech performance, there is also a clear advantage of SNR from G8 hearing aids over competitors.

For frontal speech, Audio Service G8 achieved an impressive 8.9 dB result, while competitor devices averaged 4.6 dB, Audio Service held an advantage of 4.3 dB compared with the benchmark and of 3.8 dB with the nearest competitor.

For lateral talker position Audio Service G8 surpassed the unaided response by 7.5 dB. In this situation, competitors averaged 2.7 dB, Audio Service G8 outperformed the benchmark by 4.8 dB, while also leading the nearest competitor by 3.6 dB.

This level of performance indicates that G8 provides a considerable advantage both for frontal and lateral speech when considered individually.

2024 Study Update

The 2024 follow-up study reassessed G8's performance against newly released products, including a competitor's hearing aid that incorporates AI co-processor-driven technology. The study methodology followed the settings as in the earlier study reported from 2023.

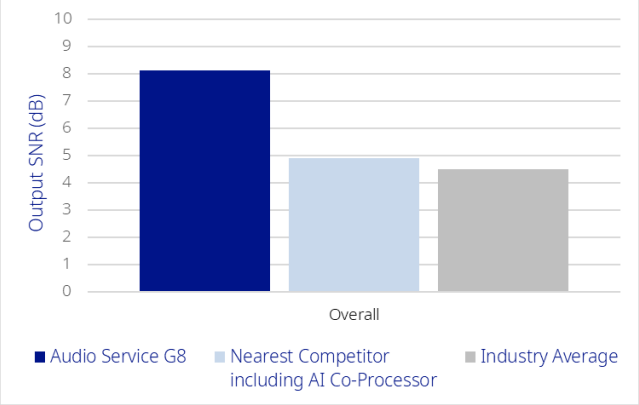

Figure 5. Speech output SNR from updated study (2024) including overall results and the comparison with the AI co-processor-driven technology.

Audio Service G8 results are consistent with the findings from the previous year, as presented in Figure 5. The improvement registered in the current study was 8.1 dB from the unaided baseline, a 0.2 dB slight difference from the previous study. The updated average across competitors was increased to 4.5 dB. That is, G8 provided an output SNR which was 3.6 higher than the industry

average, and surpassed the results of the closest competitor, the hearing aid that includes AI co-processor-driven technology, by 3.2 dB.

The updated study demonstrates that, despite the advances in recent launches, including AI co-processor-driven technology, G8's Multi-Track Processing remains highly competitive in providing speech highlight in group conversations over background noise.

Conclusions

Data Driven Insights

The SNR results from both studies were analyzed to compare the effectiveness of each competitor hearing aid to highlight the speech coming from diverse angles over the background noise.

Audio Service G8 technology has consistently shown superior output SNR across different talker positions, frontal and lateral, as well as when considering the overall results with the average from both signals alternating, in comparison with both traditional and AI co-processor-driven technology devices from competitors.

By allocating specific tracks to follow multiple speakers and maintain ambient sounds, G8 provides improved signal-to-noise ratio even in challenging noisy situations with multiple conversation partners outperforming industry benchmarks.

Comparative Advantage

Comparing the results from the 2023 and 2024 studies reveals a notable trend: competitor hearing aids have shown measurable improvements in their output SNR over the past year. This development suggests that competing brands are refining their technologies to enhance speech recognition in noise, particularly as G8 revolutionary Multi-Track Processing feature set a high standard in the 2023 study.

However, despite these advancements, Audio Service G8 technology exceeds the performance over the industry benchmarks, maintaining a clear lead over all compared competitor brands.

Even after considering more advanced models and the integration of devices with AI co-processor-driven technology from competitors, G8 still holds a significant SNR advantage. For instance, G8's superiority of 4.3 dB over the overall industry average in 2023 is sustained as a 3.6 dB advantage in the 2024 study. This demonstrates that while the industry is advancing, G8's Multi-Track Processing still offers a top-tier experience, reinforcing Audio Service as the smart choice for users seeking consistent performance improvements over time.

G8 technology continues to deliver strong results, making Audio Service, even more, the smart choice for users in complex listening situations.

Summary

In summary, the Audio Service G8 platform provides the smartest solution for those seeking high-quality hearing support in challenging situations. The revolutionary Multi-Track Processing adapts dynamically to conversations and alternating speakers, even with competing background noise.

Through extensive studies, the G8 technology has demonstrated industry-leading performance in SNR enhancement, potentially promoting better speech reception from various positions over the surrounding noises. This white paper outlines how the G8 hearing aids have set an important benchmark confirming its advantages for complex listening situations, such as group conversations.

As evidenced by the comparative studies, G8 technology stands as the optimal and smart choice for users looking to improve speech reception in dynamic environments. G8 technology reaffirms its position as a leader in modern hearing solutions.

For more detailed information on Audio Service's portfolio, or to experience the G8 technology firsthand, please visit our website.

www.audioservice.com

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