

# Audiodo™

# Personal Sound



## **Audiodo™ – Personal Sound**

Each person has unique hearing, a fact that few audio consumer products take into account today. Most products on the market have been made based on an assumption that everyone hears the same for their entire lifespan. Unfortunately, this is simply not the truth. This has an impact on people's daily lives in many ways. For us, it comes down to the issue that people are missing out on their listening experience. Since we all hear differently and this even changes over time, the sound can be individually optimized and tailored to your personal experience.

### **Why do we need Personal Sound?**

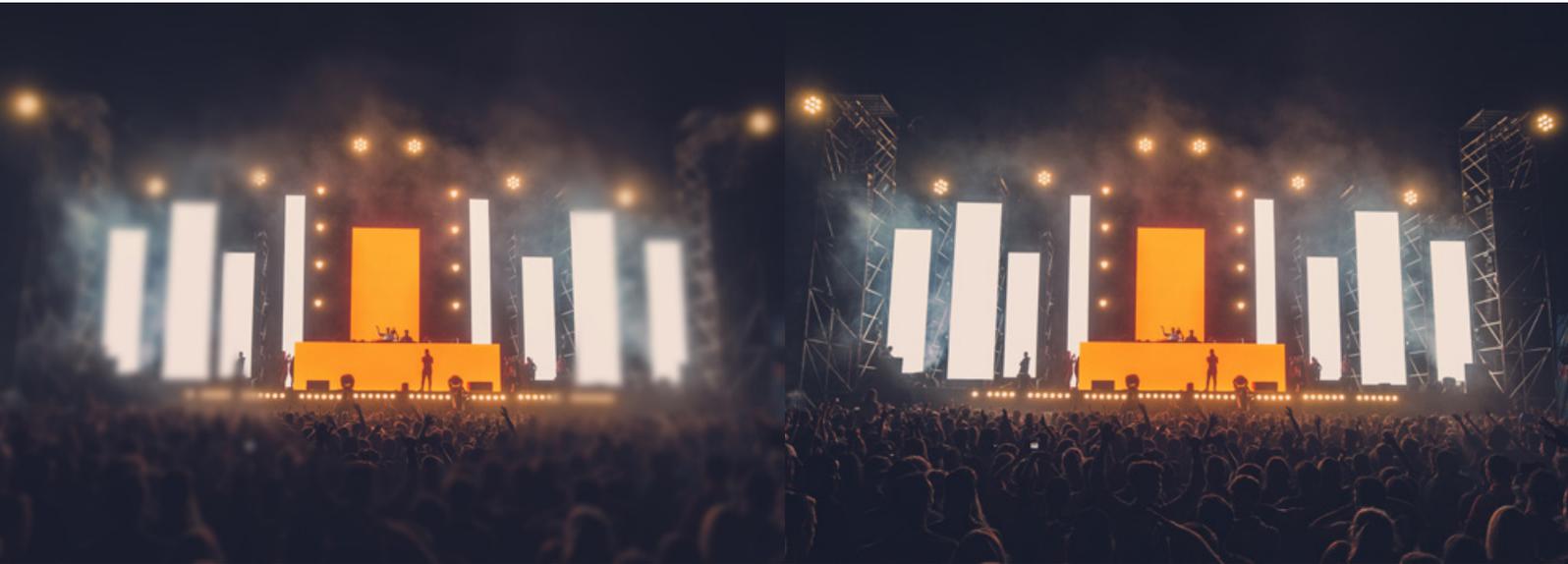
One can easily explain the concept by looking at the case of eyesight and glasses. Our vision deteriorates and changes over time, and we might need glasses to correct and compensate for the change. This change is however very personal and different people need different types of glasses and correction to compensate for their own personal vision.

The same goes for sound. Our hearing also changes over time, and this needs to be corrected to enable experiencing sound as it was supposed to be heard. Also, the differences in hearing in most cases are worse than sight since we often don't even know or notice that our hearing has changed. With sight, most people realize that they need glasses to correct their sight when it changes.

The effect of individually customized sound can be huge. First of all, it will most likely sound a lot better because it is adapted to your personal hearing. In addition, you will experience new details in the music that you may not have heard before, or at least haven't heard for a while. The difference in listening experience can be described as a transformation from a muffled, narrow, and cold impression to a warm, open, and wider experience.

Once you have experienced your personal sound, it becomes a necessity to use the new personal sound to truly appreciate the listening experience. Previous users and customers must and will buy their next headset with the same technology included.

*With Audiodo™ technology,  
each and every user can achieve  
the true music experience!*



*Not taking your unique hearing into account gives a narrow sound experience*

*Experience the entire band with Audiado™ – Personal Sound*

## Why Is Our Hearing Unique?

Main factors that affect your unique hearing are:

### **Heredity**

As with many other things, our hearing capabilities come from our parents.

### **Age**

Aging impacts our hearing capabilities. Hearing tends to get worse after 20-25 years of age. Loss usually starts with higher frequencies first.

### **Gender**

Females tend to have better hearing than males at the same age.

### **Lifestyle**

Your lifestyle and living/work environment might have a huge impact on your hearing. If you listen to music at a high volume or for extended periods of time, this can affect your hearing. Also, if you are subjected to environments with very loud sound levels (rock/pop concerts, military service and similar), this can affect your hearing.

# Personal Sound - the use case

## Different Types of Sound Adjustments



A **calibration** is performed by user



A **user profile** is calculated for both ears using our **technology**



A **media of choice** creates an audio signal...



...which is **processed** to the optimum levels based on the user profile



Enjoy **Personal Sound** on your headphones

Some providers use automatic techniques to conduct a hearing test, others use semi-automatic or manual testing. In Audiodo™, we understand that we “hear” with the ears but listen with the brain, and any hearing test or hearing calibration must thus be done in close interaction with the listener, to obtain a reliable, reproducible, and fast hearing test with high accuracy. We use a version of traditional tone audiometry, which is the same method commonly used by an audiologist.

Providers that use more automatic techniques often use Evoked Oto Acoustic Emissions (EOAE), which measures the vibration and sound reflection from the eardrum. This technique is very fast but does not always provide a reliable result. We at Audiodo™ do not believe in this technique since we understand that we listen with the brain. An automatic method that decides the hearing profile, without taking the user’s perception into account during the hearing assessment, will yield inadequate results.

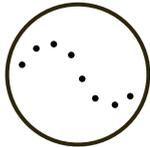
Another automatic method is ear canal/chamber measurement, which is more or less a room calibration of the inner ear canal (and sometimes even the outer). This does not actually say much about the user’s hearing. Using this method to personalize sound would more so optimize the sound for the “room,” i.e., the acoustics in the ear canal, than optimize it for the listening experience.

# Different Solutions of Personal Sound

There are a few companies that offer Personal Sound, either as IP providers or as head-phone manufacturers. Their different solutions provide a wide variety of desired results. The solutions depend on the notion of what Personal Sound is, and to what degree acoustic and psycho-acoustic factors should be taken into account.

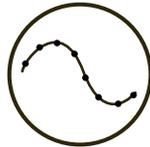
Solutions range from more simplistic approaches, where the volume is simply increased in some pre-defined areas for those who do not hear well, to highly advanced solutions like Audiodo™, which take all aspects of the hearing into account to truly optimize the personal listening experience.

## Audiodo™ – Technology



### Calibration Technology

Our calibration technology brings high accuracy and reliability in a simple format



### Calculation Technology

We create a truly personal profile based on your calibration results



### Processing Technology

Our processing algorithms are slim and effective as well as easy to integrate

Our feature consists of several steps or building blocks. These together are all necessary to give the optimal solution for the listener, independent of his/her individual hearing.

### These blocks consist of the following important processing blocks:

- **Hearing Calibration**
- **Compensation Calculation**
- **Compensation Processing**

## **Hearing Calibration**

Our latest hearing calibration has been developed and designed to require a very limited time to perform (under 3minutes), while still providing an accurate result. The hearing calibration is based on a tone audiometric test, playing tones at different frequencies and strengths in order to create a hearing profile for the user. This profile is used as a starting point for all further calculations. Our hearing calibration takes the actual headphone into consideration and is therefore independent of headphone type and sound characteristics.

## **Compensation Calculation**

The interpretation and calculation of the hearing profile is more or less the “heart” of our solution. The heart together with the “brain,” which in our case could be considered to be the processing block, formulates the full-body solution used during music playback. We have developed clever algorithms that can interpret the test results in order to calculate a perfect compensation filter that sounds “correct” to the end user.

## **Compensation Processing**

When playing music, the signal is filtered through our processing (compensation) filter and is controlled by an adaptive gain control through a feature we call IGC (Intelligent Gain Control, patent pending). The dynamic gain takes the signal content into consideration and is adaptively updated according to the frequency content and compensation filter characteristics.

## **Audiodo™ SW Product**

The Audiodo™ Personal Sound feature product is a complete system solution that includes everything needed to achieve audio personalization. All the necessary applications to control the software, to conduct the hearing calibration, and to handle the unique hearing profiles, as well as all Bluetooth communication with, and the audio processing in, the headset are included. We deliver library modules to be included and integrated into both the app and the headset together with integration documents and technical support for this work. We also deliver fully functional reference apps (as source code) for both iOS and Android to be used as examples in how to use all library functions for performing hearing calibration, hearing profile handling, and communication with the headset over Bluetooth to enable the personalization feature.

\*Requirements for 8670/75, latest build.

