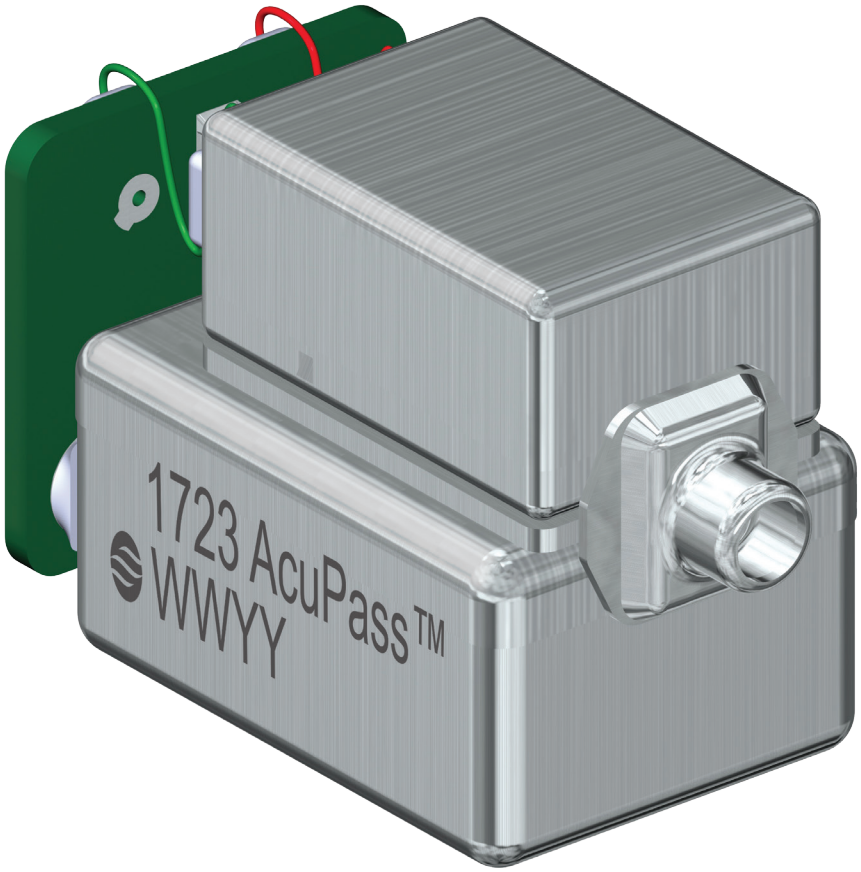


Sonion 1723 AcuPass™

DK: +45 4630 6666
USA: +1 952 543 8300
PRC: +86 512 6832 3401
NL: +31 20 6068 100

Introduction

The 1723WT03 is a receiver module consisting of a 1700 woofer and a 2300 tweeter combined into a single spout. This module is primarily intended for high – end earphone applications. This is where the uniqueness of the 1723 AcuPass™ shines - as a turnkey high fidelity solution!

At a minimum impedance of 22 Ω @ 4200 Hz and DCR of 41.5 Ω the 1723 is easy to drive from the most common audio sources. Connecting it to MP-3 players, computers or specialized headphone amplifiers – it doesn't matter; it still provides the same great sound signature with various input sources.

Ideal for Universal Fit and Custom Applications

The sound signature can be chosen to be fairly neutral using the non-vented version 1723WT03. If a bass emphasized solution is needed you can chose the 1723WT03/9 tuned vent model. The sound signature can easily be modified by changing the acoustics within the application. Choice of damper, dimensions of the nozzle and possible ear-tip modifications allow the sound signature to be altered and the HF performance to be modified to the desired taste of the designer.

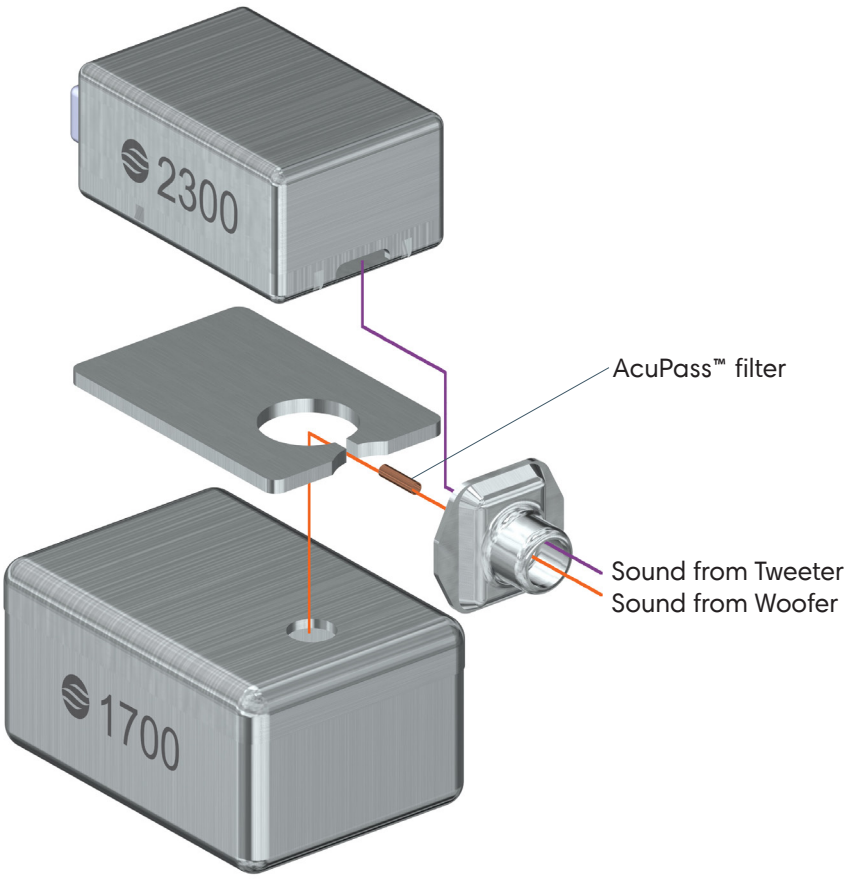
Included in this application note are some guidelines for your design.

Designs Basics

What is AcuPass™?

The 1723WT03 is a real 2-way system based on AcuPass™ technology. AcuPass™ proprietary technology uses a unique and innovative acoustic low pass filter for the woofer portion of the module. The construction of this acoustic filter minimizes any interference between the woofer and tweeter, resulting in a smooth response and better bandwidth. Figure 1 illustrates the construction of the 1723 module.

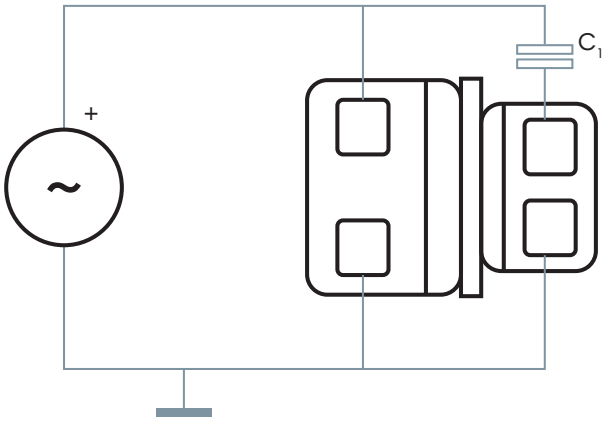
Figure 1:
Construction of the 1723WT03 module



Connections and Electrical Crossover

The receiver module comes with a PCB using an integrated crossover network (2.2 µF ceramic cap) for the tweeter. The PCB is designed with oversized solder pads for ease of connecting the headphone cable directly to it; eliminating the need for litz wire connections. The electric circuit is shown in figure2.

Figure 2
Electric circuit

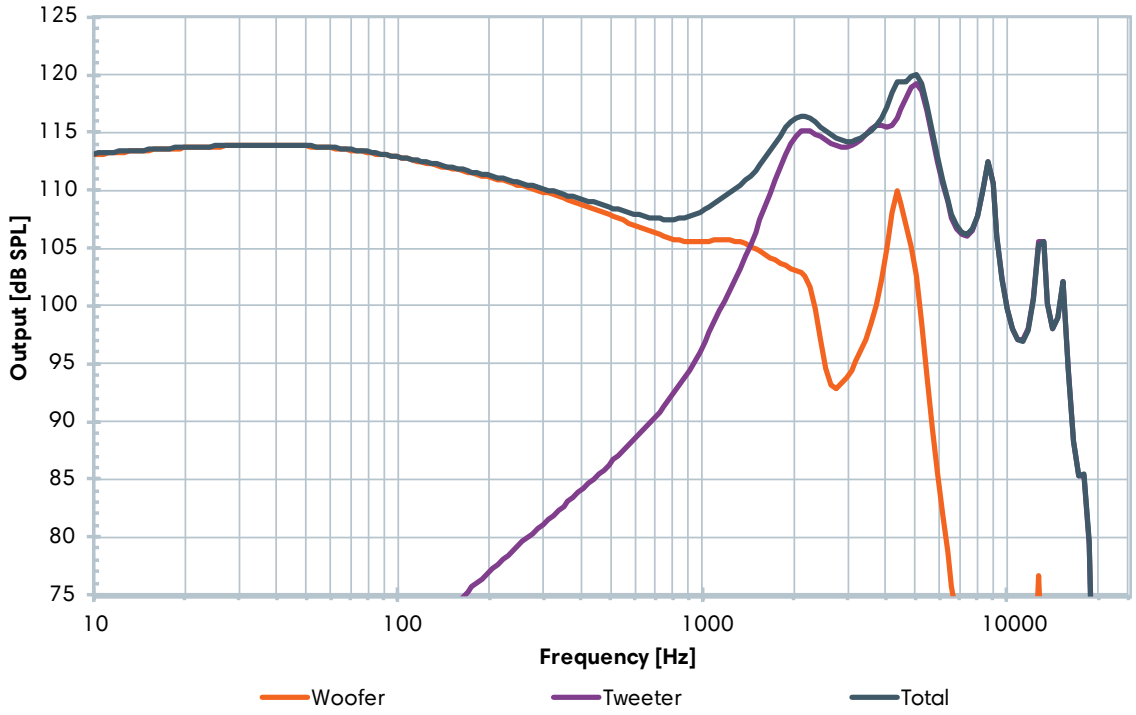


Woofer/Tweeter Response

The crossover point is determined in combination by AcuPass™ technology and the crossover network and is set at 1,430 Hz. The combined frequency response is shown in figure 3. The woofer is capable of providing undistorted output up to125 dB @ 200 Hz. The tweeter does not contribute at all in the lower frequencies which keeps the overall distortion low.

Figure 3

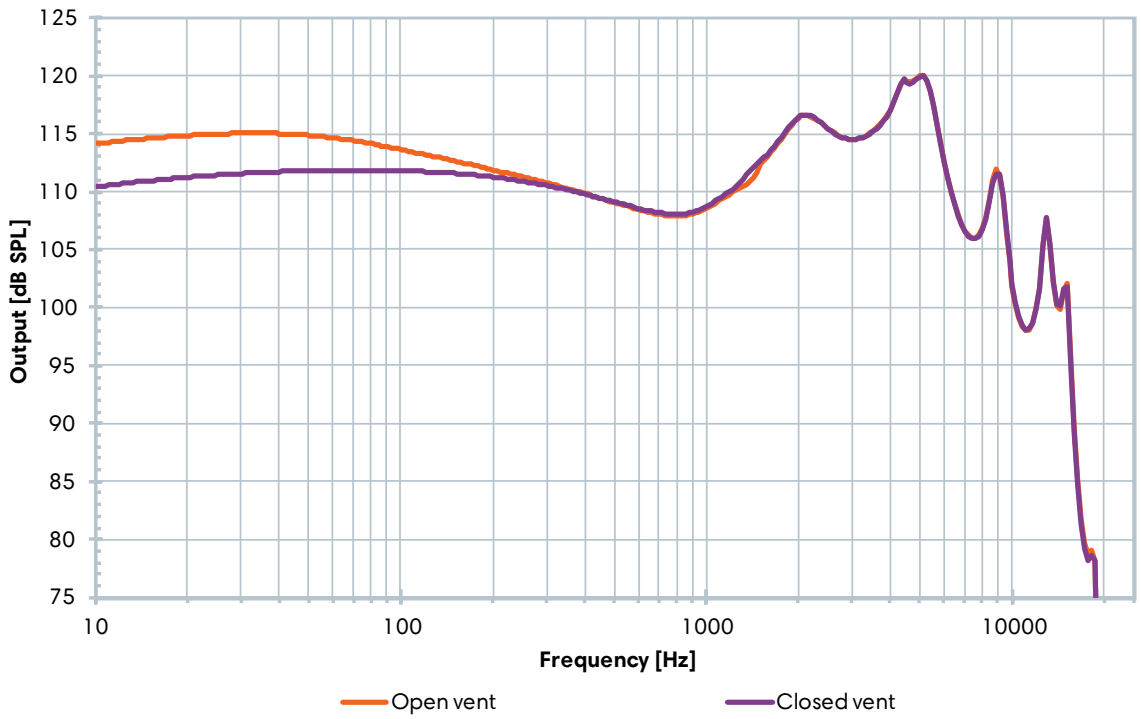
Overall and individual woofer / tweeter response on IEC 711 + PA tubing, 100 mV drive



Vented and Non-vented Response

The 1723WT03 is a non vented version with a fairly neutral sound signature and the 1723WT03/9 offers tuned venting creating a low frequency emphasis. Figure 4 shows the difference between these variants.

Figure 4
Difference between the vented and non vented woofer



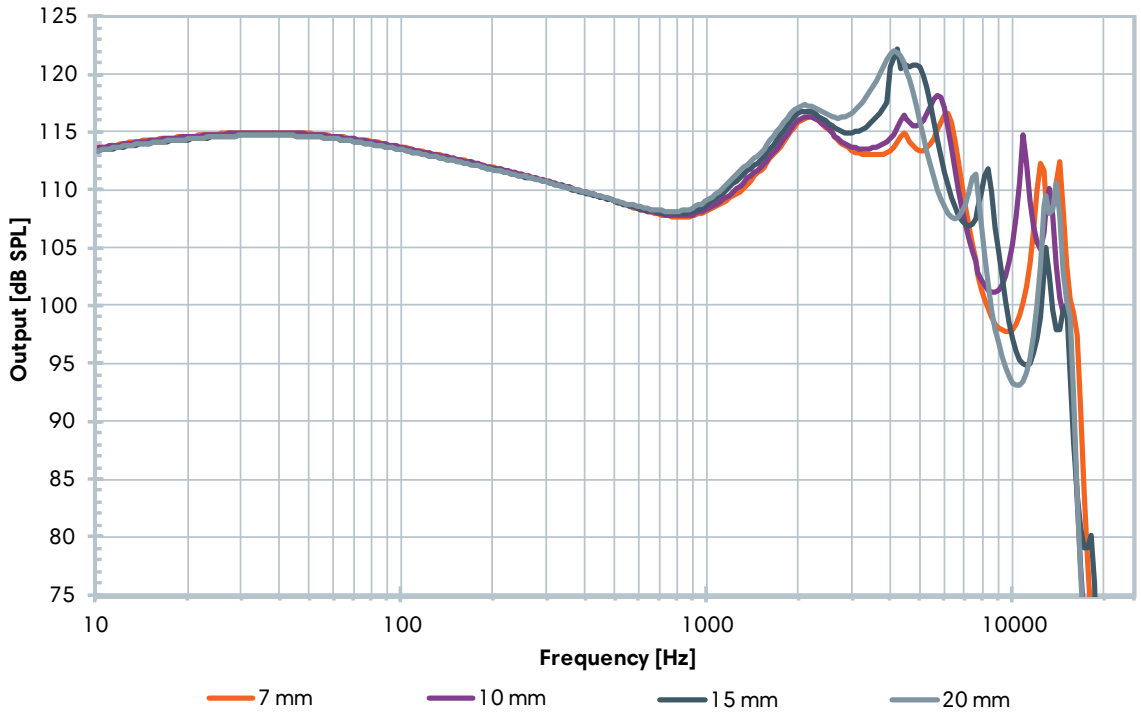
Implementation Guidelines

In custom applications the receiver module typically has a certain length of tubing and a damper to fine tune the frequency response. In universal fit applications the module will be typically connected to a nozzle with an ear-tip; which offers some freedom for the acoustic design. Both applications have basic acoustic differences because of the way they load the ear canal: custom ear molds for professional applications generally have a deeper fit than universal fit consumer products that are worn at the entrance of the ear canal.

Adjusting Tubing Length

The length of the tubing can be adjusted to obtain a balanced distribution of the acoustic peaks. Tubing length greatly affects the frequency response of the receiver module in the application and can lead to an uneven distribution with undesirable deep valleys between the peaks. The end result is missing high frequencies. Figure 5 shows the affect of changing the length of a 2.0 mm ID. un-damped tube.

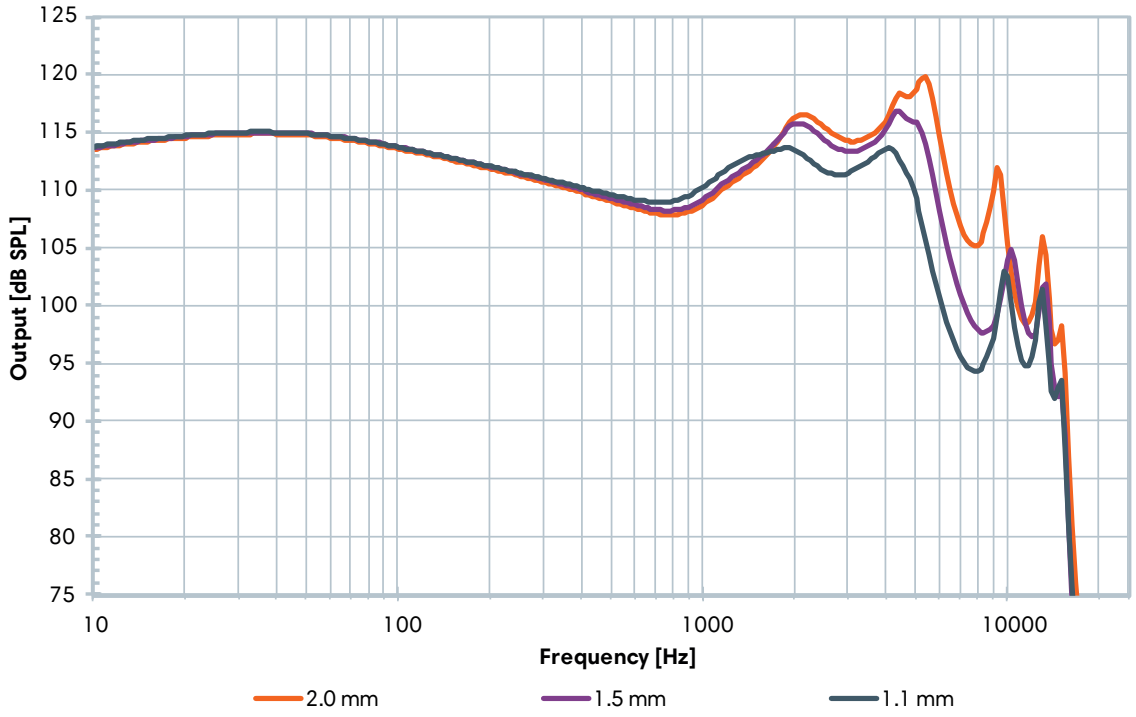
Figure 5
Response adjustments setting the length of the tubing



Adjusting Tubing Diameter

The diameter of the tube can be used to adjust the high frequency balance of the module. It is important to choose the inner diameter of the tubing larger; as small diameters will function as an acoustic low pass filter. In general, diameters below 1.5 mm should be avoided. Shown below in figure 6 are the affects of varying the tubing diameter. Length is kept constant at 12 mm and without any damping.

Figure 6
Effects of tubing diameter

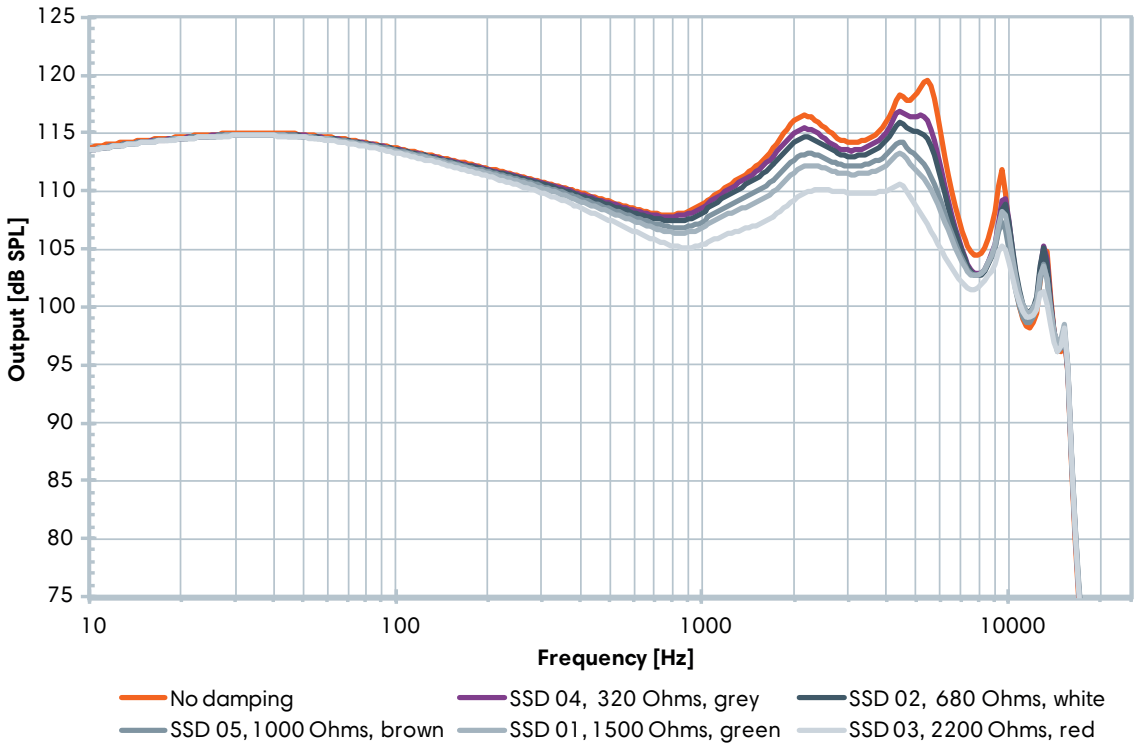


Adjusting Damper Values

Sonion offers acoustic dampers in the range of 320 Ω to 4700 Ω. Dampers can be used to smooth the response of a 1723WT03 and the most appropriate models at achieving this are SSD 01 to SSD 05. Varying the amount of damping allows the presence of the sound signature to be changed. The default value is 1000 Ω (SSD 05/brown). Using less damping such as 320 Ω, (SSD04/grey) brightens the sound signature and reveals more music details. Using higher values of damping such as 2200 Ω (SSD 03/red) decreases the high frequencies further and the sound signature will be less explicit and detailed. Figure 7 shows some test results with various dampers, 1.9 mm diameter and 12 mm long tube.

Figure 7

Modifying the response of the 1723WT03/9 using different SSD dampers



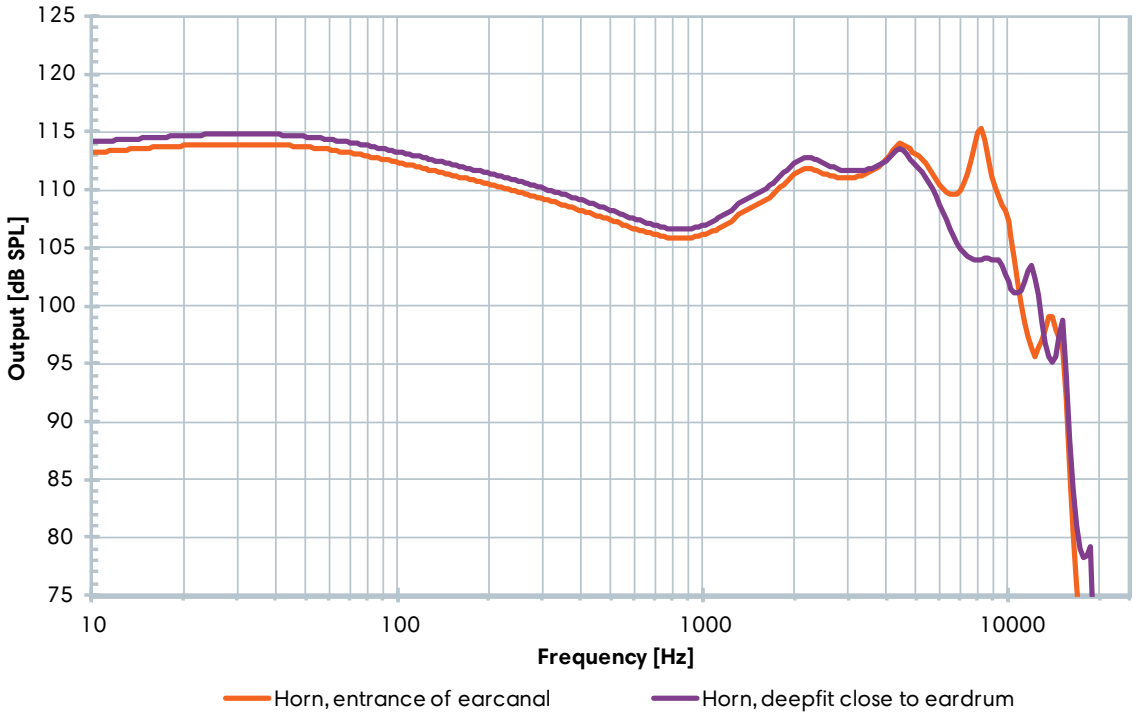
Example of an optimized design

Applications with custom ear molds will have the sound exit closer to the eardrum than most universal fit earphones; where the ear tip is placed at the entrance of the ear canal. This leads to a different acoustic environment that needs to be considered when designing for a particular application.

Instead of using a straight tube; the nozzle might need to be designed with a stepped inner diameter. Larger exits of the ear tip are considered to be part of the acoustic design/pathway and can be used to achieve more bandwidth and output in the high frequencies. In figure 8 the result of an optimized design using a stepped nozzle approach is shown. The overall length of this particular nozzle is 13 mm. It contains a section of 1.5 mm ID x 7.5 mm, a section of 2.1 mm ID x 2.5 mm (containing a SSD 05 damper), and a section of 3 mm ID x 3 mm at the ear tip. Figure 8 shows the difference between a deep fit and the ear tip positioned at the entrance of the ear canal.

Figure 8

Response of example with nozzle optimization for custom and universal fit



Handling Notes

- Please follow the general “Handling Transducers” application note for the 1723 (see www.sonion.com/Products/Application Notes)
- For the tuned vent version (1723WT03/9): please make sure the vent hole is not clogged with foreign material during the assembly process
- For soldering, please follow the general “Soldering RoHS Compatible Transducers” (see www.sonion.com/Products/Application Notes)

DK: +45 4630 6666
USA: +1 952 543 8300
PRC: +86 512 6832 3401
NL: +31 20 6068 100