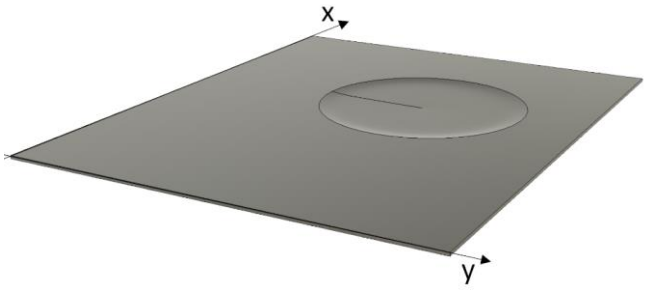
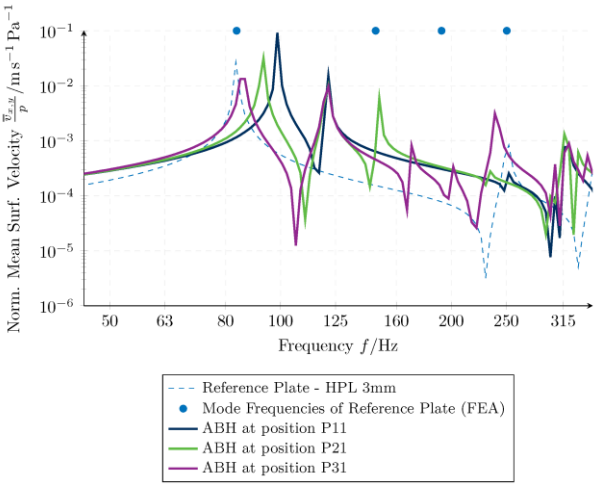
Fakultät Elektrotechnik und Informationstechnik, Lehrstuhl für Akustik und Haptik

Diplomarbeit

Topic: Investigating elliptical acoustic black hole applications for sound absorption





An acoustic black hole (ABH) is a power-law tapered profile that reduces wave propagation velocities to minimal levels. ABHs have been effectively applied in engineering structures for noise and vibration control.

In indoor environments, high-frequency noises can be reduced relatively easily with curtains, furniture, or specialized sound-absorbing materials, which require a modest amount of material. However, absorbing low frequencies presents a greater challenge, often requiring large obstacles, substantial structures, or thick materials. Traditional membrane or panel absorbers are commonly used to address low-frequency absorption but have a narrow effective frequency bandwidth, limiting their versatility. Consequently, more advanced designs are needed.

A panel absorber featuring a circular 2D-ABH pit has demonstrated significant improvements in sound absorption. This proposed thesis (Diplomarbeit) will explore the use of elliptical ABH pits in the front panels of panel absorbers. The study will involve vibro-acoustic modeling and prototype measurements of elliptical ABH designs, considering various parameters such as pit size, aspect ratio, and ABH location.

The following points can be defined as the milestones of the study:

- Performing a literature survey on ABHs for sound reduction applications
- Modelling vibro-acoustic behavior of panel absorber with elliptical ABH using FEM software
- Optimizing the geometrical dimension and locations of elliptical ABHs
- Validating the prototypes with vibro-acoustic measurements

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