Experimental validation of an optimised resonator configuration for sound absorption

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Introduction

One of the aims of the EU project FACE (Friendly Aircraft Cabin Environment) is to reduce aircraft interior noise. For this purpose, sound absorbing trim panels with acoustic resonators have been designed. By applying tube resonators with different lengths and radii, the absorption characteristics can be optimised for various frequency ranges.

Objective

The objective of the present study is the experimental validation of the optimised resonator configurations on a small scale.

Methods

The trim panel can be subdivided into a number of identical characteristic areas (see Figure 1). A sample of such a characteristic area is placed at one end of an impedance tube (see Figure 2). At the other end a broadband sound field is generated by a speaker. The absorption coefficient for each frequency can be calculated from the dimensions of the impedance tube and the measured transfer function between two pressures.

Results

Figure 4 shows the measured absorption curves of two samples with the same, but differently distributed, resonators (see Figure 3). The resonator dimensions have been optimised for maximum sound absorption in a frequency range of 1000-2000 Hz. Very high absorption levels are obtained and the agreement between theory and experiment is fairly good. The fact that the measured absorption curves of the two samples are different, indicates that the absorption characteristics are influenced by the position of the resonators in the surface.

Discussion

The predicted and measured absorption curves match fairly well. The influence of the position of the resonators needs to be examined further.

Reference