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Numerical and experimental study of the sound-insulating properties of a deformable plate located between two chambers

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Abstract

The paper deals with the numerical solution of acoustic wave propagation plane problem. Being formed by sound source in a high-pressure chamber, the acoustic wave propagates through a deformable thin plate, which radiates the sound wave in a low-pressure chamber. The considered problem represents the mathematical modelling of the experimental setup used to find sound-insulating properties of thin-walled structures realized by the method of adjacent reverberation chambers in acoustic test laboratories. Based on two dimensional approximation of wave equations, two problem schemes are introduced. These problems differ in terms of sound source specification in the high-pressure chamber. Present study shows that both of the considered problems lead to virtually same results when determining the plate's sound reduction index. The results of theoretical and experimental investigations are compared.

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1. Introduction

Over the past decade the problems of noise reduction in the aviation industry have led to the uprise of a new scientific field – aviation acoustics: it is associated with the acoustics of aircrafts and includes aero-acoustics and structural acoustics [1, 2 et al.]. The latter constitutes a trend at the junction of acoustics and dynamics of elastic

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