

Accepted Manuscript

Low frequency acoustic properties of bilayer membrane acoustic metamaterial with magnetic oscillator

Nansha Gao, Hong Hou, Yihao Mu

PII: S2095-0349(17)30078-8
DOI: <http://dx.doi.org/10.1016/j.taml.2017.06.001>
Reference: TAML 170

To appear in: *Theoretical & Applied Mechanics Letters*

Received date : 16 February 2017
Accepted date : 31 May 2017

Please cite this article as: N. Gao, H. Hou, Y. Mu, Low frequency acoustic properties of bilayer membrane acoustic metamaterial with magnetic oscillator, *Theoretical & Applied Mechanics Letters* (2017), <http://dx.doi.org/10.1016/j.taml.2017.06.001>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Low frequency acoustic properties of bilayer membrane acoustic metamaterial with magnetic oscillator

Nansha Gao^{a,b,*}, Hong Hou^a, Yihao Mu^a

^a School of Marine Science and Technology, Northwestern Polytechnical University, Xi'an, 710072, China

^b State Key Laboratory for Strength and Vibration of Mechanical Structures, Xi'an Jiaotong University, Xi'an 710049, China

* Corresponding author email address: gaonansha@hotmail.com

Abstract:

A bilayer membrane acoustic metamaterial was proposed to overcome the influence of the mass law on traditional acoustic materials and obtain a lightweight thin-layer structure that can effectively isolate low frequency noise. The finite element analysis (FEA) results agree well with the experimental results. It is proved that the sound transmission losses (STLs) of the proposed structures are higher than those of same surface density acoustic materials. The introduction of the magnetic mass block is different from the traditional design method, in which only a passive mass block is fixed on the membrane. The magnetic force will cause tension in the membrane, increase membrane prestress, and improve overall structural stiffness. The effects of the geometry size on the STLs are discussed in detail. The kind of method presented in this paper can provide a new means for engineering noise control.

Keywords: Bilayer membrane acoustic metamaterial, Low frequency sound insulation, Sound transmission loss, Magnet oscillator

Phononic crystals and acoustic metamaterials are types of artificial composite material that can effectively control the propagation characteristics of vibration waves [1-4]. Similar to a phononic crystal, an acoustic metamaterial also has local resonance features. Although acoustic metamaterials are designed with a periodic structure, their

Download English Version:

<https://daneshyari.com/en/article/7196526>

Download Persian Version:

<https://daneshyari.com/article/7196526>

[Daneshyari.com](https://daneshyari.com)