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# Contents



RJAV

## Romanian Journal of Acoustics and Vibration

A publication of the Romanian Society of Acoustics

Volume X, Issue 1, 2013

### EDITORIAL

#### Editorial

*Polidor BRATU* ..... 2

### ARTICLES

**Analysis by Experiment of the Vibration of an Elastic Kinematic Element with Lubricated Mobil Rectilinear Pair Based on the Influence of the Lubricant Pressures Range**

*Madalina CALBUREANU, Raluca MALCIU* ..... 3

**Assessment of Damages in Sandwich Panels Based on the Damage Location Indexes**

*Zeno-Iosif PRAISACH, Gilbert-Rainer GILLICH, Ovidiu VASILE, Daniela Elena BÎRDEANU, Carla PROTOCSIL* ..... 9

**On the Efficiency of Different Dissimilarity Estimators Used in Damage Detection**

*Petru Florin MINDA, Zeno-Iosif PRAISACH, Nicoleta GILLICH, Andrea Amalia MINDA, Gilbert-Rainer GILLICH* ..... 15

**Noise Attenuation Due to Vegetation**

*Vasile BACRIA, Nicolae HERISANU* ..... 19

**Experimental Analysis on the Influence of Supports in Performing Pipes Inspection Using Longitudinal Guided Waves**

*Mihai Valentin PREDOI, Ovidiu VASILE, Cristian Cătălin PETRE* ..... 25

**Non-Inertial Elastics Effects of the Vibrations Insulation Panels Generated by Direct Incidence of Acoustic Wave**

*Ana GHEORGHE* ..... 29

**Ultrasonic Attenuation and Velocity in Steel Standard Reference Blocks**

*M.G.S. Ali, N.Z. Elsayed, Ahmed M. Eid* ..... 33

**Analysis of the Behavior of Large-Span Structures in the Case of Ambient Vibrations Considering the Variety of Motion Possibilities**

*Patricia MURZEA* ..... 39

**Improving the Sound Pressure Level for a Simplified Passenger Cabin by using Modal Participation and Size Optimization**

*Adrian COROIAN, Iulian LUPEA* ..... 47

**The Waves Homogenization as a Function of the  $\varepsilon$  - Period of Oblique Gridwork**

*Camelia GHELDIU, Mihaela DUMITRACHE* ..... 54

**The Influence of Perforations on the Surface of a Sound Absorbing Material on the Sound Absorption Coefficient**

*Ancuța Elena TIUC, Tiberiu RUSU, Ovidiu VASILE* ..... 59

#### Presentation

*Romanian Society of Acoustics* ..... 63

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## **Experimental Analysis of the Vibration Generated by an Elastic Kinematic Element with Lubricated Mobil Rectilinear Pair Based on the Influence of the Lubricant Pressures Range**

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*Abstract:* - The paper presents the experimental analysis of the vibration generated by an elastic kinematic element with a mobile rectilinear pair, lubricated by oil with average values for lubrication properties and kinematic viscosity. All study is based on the influence of the lubricant pressures field from the rectilinear pair. The pressure range is analysed by using finite element method; as input for performing the FEM analysis are the data obtained by experimental analysis of the elastic kinematic element vibration.

*Keywords:* lubricant, rectilinear pair, experimental determination, elastic kinematic element, pressures range, cavitation

## **Assessment of Damages in Sandwich Panels Based on the Damage Location Indexes**

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*Abstract:* - This paper presents a methodology to locate and evaluate transversal damages in composite structures, based on natural frequency shifts due to damage. In previous researches the authors succeeded

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to contrive a relation between the decrease of the strain energy stored in a damaged slice and the frequency change due to that damage. It can be used to create patterns, uniquely characterizing the damage position along the beam, so that damage localization becomes a pattern recognition problem. While for beams with constant rigidity in healthy state these patterns are not dependent on the beam's cross-section shape or structure, the damage location algorithm can be used also for composites, like sandwich panels. Once the location known, the damage severity/depth can be extracted from the above mentioned relation. This damage assessment algorithm was validated by measurements on numerous sandwich panel specimens.

*Keywords:* - vibration, natural frequency, Euler-Bernoulli beam, sandwich panel, damage assessment

## **On the Efficiency of Different Dissimilarity Estimators Used in Damage Detection**

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*Abstract:* - This paper deals with methods of interpreting the results of vibration measurement to identify structural changes in beam-like structures. We briefly presented an own developed damage assessment method, that considers a large number of frequencies for the weak-axis banding vibration modes; it allows first a precise localization and afterwards evaluation of the damage depth. The first step, recognition of the damage position, essentially consists in comparing a histogram obtained from measurement results with a series of histograms, namely the damage location indexes for all possible locations along the beam, obtained by calculus. To find the probable damage position, we tested some dissimilarity estimators like Minkowski-form Distances, Histogram Intersection and Kullback-Leibler Divergence. In order to avoid uncertainties, a graphic representation of the two histograms, one obtained by measurement and one by calculus that represent the probable damage location, are also presented. The method providing best results bases on the Minkowski Distance; it was tested for randomly selected locations, with real measurement results and with results artificially debased by noise, proving its reliability.

*Keywords:* - damage, severity assessment, natural frequency, vibration, fracture mechanics

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## Noise Attenuation Due to Vegetation

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*Abstract:* - It is well-known that noise decreasing techniques are based on two types of methods: one active and another passive. The latter often employs the vegetation which is planted forming green protection zones areas. In this paper we present some considerations concerning noise attenuation due to vegetation, emphasizing some elements which influence it. The elucidation of these elements has been done by measurements. The results of measurements were processed, analysed, interpreted and compared with the admissible values defined by standards.

*Keywords:* - noise, attenuation, passive method, vegetation

## Experimental Analysis on the Influence of Supports in Performing Pipes Inspection Using Longitudinal Guided Waves

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*Abstract:* - In the last decades, have been investigated guided waves in pipes, due mainly to their capacity of traveling long distances without substantial attenuation. The long range propagation is however limited, among other causes, by the unavoidable pipe supports. These mechanical structures are supporting the pipe weight and reduce its vibrations. Along a certain length, of several centimeters for small diameter pipes, up to tens of centimeters larger diameters, the pipe is in contact with other structures. For small diameters pipes, especially used in aeronautical industry, a rubber circular layer is placed between the pipe and the metallic support. These supports are reducing the guided waves energy sent through the pipe for inspection purposes.

For a particular type of support, the resulting amplitudes of the scattered waves can be obtained as function of frequency. In this paper, a particular ultrasonic signal is sent from one end of the pipe and reflected signals are measured. Comparisons of experimental values with numerical simulations are presented and an acceptable agreement was obtained. These are only preliminary results obtained in our laboratory and further work is necessary to include more parameters in the study and obtain individual mode contribution to the scattered field.

*Keywords:* - guided waves, longitudinal modes, experimental results

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## **Non-Inertial Elastics Effects of the Vibrations Insulation Panels Generated by Direct Incidence of Acoustic Wave**

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*Abstract:* - This paper presents methods for wave propagation through walls, modeled as non-inertial elastic elements. Modeling results are presented for two types of wall with different thicknesses thus, concrete wall in the frequency range of 0-35000 Hz and rubber wall in the frequency range of 0-500 Hz.

*Keywords:* - critical minimum frequency, concrete wall, rubber wall, Young modulus

## **Ultrasonic Attenuation and Velocity in Steel Standard Reference Blocks**

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*Abstract:* - In this paper, using two sets of reference steel blocks (area-amplitude and distance-amplitude) to investigate a modified method to verify the linearity of the system of instruments used in the ultrasonic inspection. The mechanical and physical properties of the material of the blocks before and after heat treatment are measured. The ultrasonic longitudinal and transverse velocities are measured in the blocks and the elastic parameters of the blocks are calculated. The attenuation of the ultrasonic wave at the centers of the blocks as a function of the metal distance in the distance-amplitude and the area amplitude as a function of the hole diameter for steel reference blocks with frequency 10 MHz using the immersion technique at a constant gain has been investigated. According to the experimental results, this study can significantly improve the detection accuracy of reference steel blocks, and will serve as a reference for assessing engineers.

*Keywords:* - ultrasonic attenuation, longitudinal and transverse velocity, mechanical properties, reference steel blocks, beam intensity

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## **Analysis of the Behavior of Large-Span Structures in the Case of Ambient Vibrations Considering the Variety of Motion Possibilities**

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*Abstract:* - The aim of the paper is to present the main results of the research regarding the dynamic characteristics and modal behavior of the Central ROMEXPO Pavilion at ambient vibrations, considering different variations of the possibilities of motion of the structure. The retained study models are only those parametric situations which may be considered, from the engineering point of view, with important risk in the dynamic evolution of the motion process under the action of a strong earthquake. For this purpose multichannel, simultaneous, digital recordings are performed on site and afterwards are processed using the basic records combination method. In order to validate the obtained results an ETABS structural model of the Pavilion is constructed and the signal is processed both in the computer program LabView as well as in DaisyLAB.

*Keywords:* - velocigrams, basic records combination, ovalizations, spectral analysis

## **Improving the Sound Pressure Level for a Simplified Passenger Cabin by using Modal Participation and Size Optimization**

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*Abstract:* - The interior acoustics is an important part in the design stage for automakers in order to reduce the sound pressure level in the passenger compartment by using Computer Aided Engineering (CAE). The sound field in the vehicle interior is affected by the vibration of the body in white (BIW) and by the acoustic modal characteristics of the enclosed volume of air. The Finite Element Method (FEM) was used for a vibro-acoustic analysis of a simplified passenger compartment. In order to simulate the sound pressure level (SPL) at the hearing point of the driver while the firewall panel is excited, the modal frequency response analysis has been used. The SPL versus frequency curve shows that at the excitation frequency of 50 Hz the highest value of 87.09 dB(A) is recorded. The modal participation analysis is carried out to find the structural modes which contribute most to the sound pressure level inside the vehicle cab. Based on the analysis results, a size optimization was performed in order to lower the SPL at the driver's ear location at the excitation frequency of 50 Hz applied to the firewall panel. The thickness parameters of the structural panels have been altered in order to reduce the interior noise level at the frequency of interest.

*Keywords:* - vibro-acoustic analysis, modal frequency response analysis, modal participation factors, vehicle interior noise, size optimization

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## **The Waves Homogenization as a Function of the $\varepsilon$ - Period of Oblique Gridwork**

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*Abstract:* - The article presents the homogenization of the wave problem after the  $\varepsilon$  - period of the gridworks structure in which the plates are oblique and the thickness of the structure is the same power with the  $\varepsilon$  - period that the plates are distributed. The method used is the variational method of Tartar of rapidly oscillating test functions.

*Keywords:* - gridworks structure,  $Y$ -periodic functions, wave equation, variational method of Tartar, rapidly oscillating functions

## **The Influence of Perforations on the Surface of a Sound Absorbing Material on the Sound Absorption Coefficient**

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*Abstract:* - The paper presents the research on the influence of perforations on the surface of a sound absorbing material on the sound absorption coefficient. The porous sound absorbing material used in this research was made from fir sawdust and polyurethane binder, and to improve its design and/or its sound absorbing properties, it was used a layer of cork with and without perforations. The sound absorption coefficient was determined using an impedance tube and in accordance with the experimental determinations it was observed an improvement at frequencies higher than 1100 Hz in the case when the cork layer was perforated.

*Keywords:* - sound absorption coefficient, perforations, sound absorbing material, impedance tube