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Laser-Vibrometric Measurement and Numerical Modeling of Local and Continuous Mode Conversion of Lamb Waves in CFRP Plates

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Lamb waves based methods of structural health monitoring (SHM) of CFRP structures take advantage of mode conversions and wave reflections at distinguished discontinuities, which simply can be measured with piezoelectric sensors. This well known behaviour can be used to identify structural failures, such as cracks, delaminations and other structural discontinuities. In addition to this source of mode conversion, recently we have found another type of mode conversion from S_0 to A_0 occurring continuously in certain CFRP laminates including twill fabric layers. This phenomenon was visualized by scanning laser vibrometry and partially clarified with help of finite element analysis.

The paper describes the experimental setup and the wave mode interpretation using mode selection methods. B- and C-scans of the propagating waves clearly show the continuous conversion from the S_0 to the A_0 mode. This unexpected behaviour has also been found in finite element simulations taking into account the micro-structure of the composite.

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Ключевые слова:

Содержание

Abstract
Introduction
Experimental setup
Modeconversion at defects
Description and identification of continuous mode conversion
Conclusion
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