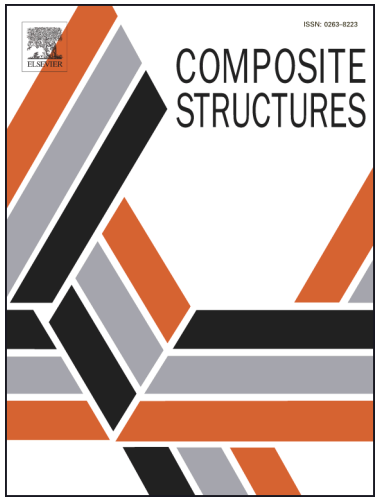

Delamination detection in composite laminates using low frequency guided waves: numerical simulations

Siavash Shoja, Viktor Berbyuk, Anders Boström

PII: S0263-8223(17)33429-3
DOI: https://doi.org/10.1016/j.compstruct.2018.07.025
Reference: COST 9942

To appear in: *Composite Structures*

Please cite this article as: Shoja, S., Berbyuk, V., Boström, A., Delamination detection in composite laminates using low frequency guided waves: numerical simulations, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.07.025

Delamination detection in composite laminates using low frequency guided waves: numerical simulations

Siavash Shoja*, Viktor Berbyuk, Anders Boström

Department of Mechanics and Maritime Sciences, Chalmers University of Technology, 41296, Gothenburg, Sweden

Abstract

The aim of this study is to find an efficient way of finite element modelling of guided wave propagation in composite laminates to detect delaminations. A novel approach is proposed to model delaminations by locally reducing the stiffness and it is implemented in a finite element shell model. The approach is verified by comparing the results with the results of two existing approaches. Results show that the stiffness reduction approach gives reasonable accuracy for the primary wave modes and improvement in simulation time. Moreover, it is shown that new convergence criteria should be considered to simulate the guided wave propagation. Additionally, the Pearson correlation coefficient is introduced as a good criterion for delamination detection in such problems. All the conclusions are made when simulations are performed in the low frequency range and can be used to study guided wave propagation in large composite structures such as wind turbine blades.

Keywords: Guided wave propagation, Composite laminates, Delamination detection, Low frequency, NDT

1. Introduction

In composite laminates, delamination is one of the main modes of failure for structures. Detecting the delamination in a structure is usually performed using

*Corresponding author
Email address: siavash.shoja@chalmers.se (Siavash Shoja)