

## Accepted Manuscript

Numerical analysis and experimental observation of ultrasonic wave propagation in CFRP with curved fibers

Takeshi Ashizawa, Yoshihiro Mizutani, Nobuyuki Toyama, Akira Todoroki, Yoshiro Suzuki

PII: S0263-8223(17)33806-0  
DOI: <https://doi.org/10.1016/j.compstruct.2018.03.089>  
Reference: COST 9536

To appear in: *Composite Structures*

Received Date: 17 November 2017  
Revised Date: 26 February 2018  
Accepted Date: 26 March 2018

Please cite this article as: Ashizawa, T., Mizutani, Y., Toyama, N., Todoroki, A., Suzuki, Y., Numerical analysis and experimental observation of ultrasonic wave propagation in CFRP with curved fibers, *Composite Structures* (2018), doi: <https://doi.org/10.1016/j.compstruct.2018.03.089>

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.



**Title**

Numerical analysis and experimental observation of ultrasonic wave propagation in CFRP with curved fibers

**Authors**

Takeshi ASHIZAWA<sup>a\*</sup>, Yoshihiro MIZUTANI<sup>a</sup>, Nobuyuki TOYAMA<sup>b</sup>, Akira TODOROKI<sup>a</sup>, Yoshiro SUZUKI<sup>a</sup>

**Affiliations**

<sup>a</sup>Department of Mechanical Engineering, School of Engineering, Tokyo Institute of Technology

\*tashizaw@ginza.mes.titech.ac.jp

<sup>b</sup>Non-destructive Measurement Group, Research Institute for Measurement and Analytical Instrumentation, National Institute of Advanced Industrial Science and Technology (AIST)

**Abstract**

The relationship between the propagation directions of ultrasonic wave and the direction of the principal axis of anisotropy in uni-directional CFRP with straight fiber is well known. However, the behavior of ultrasonic wave in CFRP with curved fibers is not clarified in details. In this paper, numerical analyses using the finite difference method were conducted to visualize the behavior of ultrasonic waves in CFRP with concentrically curved fibers. Numerical simulation results showed the energy of quasi-longitudinal ultrasonic wave curved along the fiber direction. In order to confirm the analytical result, CFRP specimen with curved fibers were prepared by utilizing 3D-printer and the behavior of ultrasonic propagation was observed by using Laser ultrasonic system. The observed results confirmed the analytical results that the ultrasonic wave curved along carbon fibers.

**Keywords**

CFRP, concentrically curved fiber, non-destructive testing, ultrasonic wave, finite-difference method

Download English Version:

<https://daneshyari.com/en/article/6703532>

Download Persian Version:

<https://daneshyari.com/article/6703532>

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