

Accession number:20114714528479

Title:Testing of composite materials using advanced NDT methods

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Source title:COMPEL - The International Journal for Computation and Mathematics in Electrical and Electronic Engineering

Abbreviated source title:COMPEL Int J Comput Math Electr Electron Eng

Volume:30

Issue:4

Issue date:2011

Publication year:2011

Pages:1260-1270

Language:English

ISSN:03321649

CODEN:CODUDU

Document type:Journal article (JA)

Publisher:Emerald Group Publishing Ltd., Howard House, Wagon Lane, Bingley, BD16 1WA, United Kingdom

Abstract:Purpose: The purpose of this paper is to present capabilities of terahertz imaging technology in case of various composite materials and to propose a new defect detection algorithm.

Design/methodology/approach: This paper first discusses an applicability of the terahertz technique in composite materials inspection. It then describes source of terahertz radiation (photoconductive antenna) and general structure of terahertz time domain imaging system. Next the terahertz imaging results of composite anticorrosion coating, glass-and carbon-fiber-reinforced laminates are presented. Then the signal processing and identification scheme based on time domain A-scan signal equalization and C-scan thresholding is presented. Data processed in this way are parameterized and defect identification database is prepared. The proposed procedure is verified using the exemplary inspection results of glass-fiber laminate delamination. Finally, some comparison of terahertz time domain inspection with low energy digital radiography is presented.

Findings: This paper shows terahertz imaging as a well-suited technique for composite structures inspection. The terahertz imaging results of composite anticorrosion coating, glass-and carbon-fiber-reinforced laminates are presented. An application of proposed signal processing algorithm enables accurate defects detection and effective data collection for identification database purpose. Originality/value: The paper provides an insight into the potential of terahertz imaging of various composite structures. Proposed signal processing and defects detection scheme is applicable to wide range of composite structures.

Number of references:5