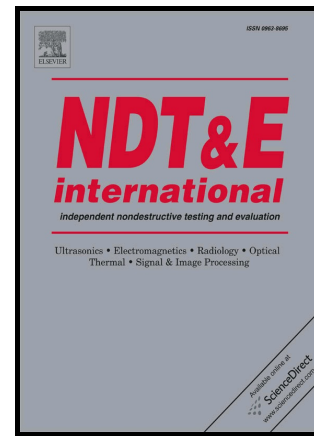# Author's Accepted Manuscript

Design of a guided wave absorber for Structural Health Monitoring system development

M. Bilodeau, N. Quaegebeur, P. Masson

Cite this article as: M. Bilodeau, N. Quaegebeur and P. Masson, Design of a guided wave absorber for Structural Health Monitoring system development, *NDT and E International*, http://dx.doi.org/10.1016/j.ndteint.2017.03.003

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 galley proof before it is published in its final citable 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.

Design of a guided wave absorber for Structural Health Monitoring system development

M. Bilodeau, N. Quaegebeur, P. Masson

GAUS, Université de Sherbrooke, Sherbrooke, QC, CANADA, J1K 2R1

Abstract

The objective of this paper is to present and validate an efficient guided wave absorber for increased sensitivity of structural health monitoring systems based on guided wave, and especially for inspection close to structure boundaries. Such an absorber would also help with systematic characterization of guided waves interaction with defects in aerospace structures. A complete numerical parametric study is undertaken using the power flow in the structure to determine the reflection and transmission coefficients and thus the dissipated energy by the absorber. Starting with the determination of the geometry and dimensions using Finite Element Modelling (FEM), and following with an investigation on the influence of the absorbers mechanical properties, a practical and efficient absorber is identified. The dimensions of the developed absorber are minimized to provide optimal results for frequencies ranging from 50 kHz to 500 kHz for an incident A_0 mode. The resulting right triangle cross section absorber of Teflon has been machined and tested experimentally using a piezoelectric wave generator on one side of the absorber, and a tri-dimensional laser Doppler vibrometer (3D-LDV) to measure the transmitted wave on the other side. Using a spatial Fourier transform approach for the determination of the experimental reflection and transmission coefficients, the numerical results have been successfully validated.

Keywords: Guided waves, SHM, absorber, FEM, parametric study

1. Introduction

Guided Waves (GW) have been extensively used as a good physical approach for damage detection within Non-Destructive Testing (NDT) and Structural Health Monitoring (SHM) systems. One of the advantages of