

11th European Conference on Non-Destructive Testing

11th ECNDT
PRAGUE 2014
October 6 - 10, 2014

Czech Republic

EF European Federation for
Non-Destructive Testing
NDT



Czech Society
for NDT

GUARANT
INTERNATIONAL

BOOK OF ABSTRACTS

Better NDT
-Warranty of Quality
Reliability
and Safety

www.ecndt2014.com

ECNDT 2014 conference sponsors

Platinum sponsor

OLYMPUS

Advanced Technology Group N.V. O.



Gold sponsor

SENTINEL
YOUR KEY TO NDT



STARMANS

Silver sponsors



Bronze sponsors



HAMAMATSU
PHOTON IS OUR BUSINESS



Chemetall
expect more



POLATOM



PFINDER

SIUI

TUV NORD
Czech

Badge lanyards sponsor



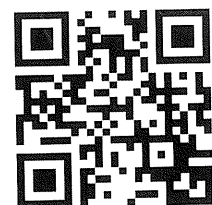
Pens and Notepads sponsor



Publisher:

Brno University of Technology
FME, Technická 2, CZ 602 00 Brno
© 2014

Co-Publishers:



www.ndt.net

ISBN 978-80-214-5019-6

**11TH EUROPEAN CONFERENCE ON
NON-DESTRUCTIVE TESTING**

BOOK OF ABSTRACTS

October 6 – 10, 2014

Prague, Czech Republic

Text deadline September 15, 2014

INTRODUCTION

This publication contains abstracts submitted for 11th European Conference on Non-destructive Testing, held in Prague, Czech Republic, from October 6 to October 10, 2014.

An index of main authors appears at the end of the publication.

DISCLAIMER

Publication of these abstracts does not necessarily mean that the information, data, results and conclusions presented are endorsed by the Organizing Committee or the Program Committee of the 11th European Conference on Non-destructive Testing.

Copyright: „All rights reserved. No part of the contents of these proceedings may be reproduced or transmitted in any form, or by any means, without written permission from the Brno University of Technology (the Publisher), Czech Society for NDT (the co-publisher), NDT.net (the co-publisher) or the authors.“

Advantage of presented method is in its fast, local, and easy-to-use application on various materials and structures with respect to their instantaneous or natural states. The method was tested on human skin tissues (in-vivo), on polymer, and composite samples. Comparative tests on isotropic materials were realized to verify the method and system accuracy.

Keywords: *Ultrasonic Testing (UT), signal processing, medical application, anisotropy*

Mo.D.3.5

Development and Investigation of Superficial Human Tissue Phantoms for Testing of Ultrasonic Imaging Techniques

Renaldas Raisutis ^{1*}, Skaidra Valiukeviciene ², Kristina Andrekute ¹, Gediminas Genutis ¹, Vykintas Samaitis ¹, Tomas Mikolaitis ¹

¹ Kaunas University of Technology, Kaunas, Lithuania

² Lithuanian University of Health Sciences, Kaunas, Lithuania

*e-mail: renaldas.raisutis@ktu.lt

The main complications of diabetes mellitus (DM) are ulcers of the foot, infections and amputation. Diabetic foot ulcers affect 15-20 % of the patients with DM. Amputation require 30-60 % of patients with foot ulcers. It was reported that callus influence the preceded ulceration for more than 82 % of the diabetic foot ulcer patients. Inflammatory changes may be observed in neighboring regions surrounding the callus when it evolves into the ulcer. In the case of early beginning of ulcer, the inflammatory changes of tissue can be estimated by ultrasonic technique. Tissue-mimicking phantoms are commonly used in the development of

imaging systems and evaluation of image processing algorithms applied for recognition or extraction of suspicious regions. The purpose of this study was to develop diabetic foot lesion mimicking phantoms and investigate with an ultrasonic imaging technique. In this study, in order to mimic callus, beginning of the ulcer or open ulcer, the rubber-based model of the diabetic foot with inserted multi-layered region was developed. The multi-layered region of the phantom was developed using the sheets of silicone rubber and the Aqualene elastomer (Olympus corporation, USA). A multi-channel ultrasonic system Dasel SITAUI 128 ch. (Dasel sistemas, Spain) with linear transducer array of 18.5 MHz (Imasonic, France, number of elements 128, pitch 0.25 mm) was used for ultrasonic investigation of the phantoms. For reconstruction of high resolution images the specific modes of data acquisition and post-processing, such as synthetic aperture focusing technique (SAFT) and total focusing method (TFM), were modified (optimized sharing of CPU and GPU) and applied. The developed phantom can be effectively used in development and evaluation of the ultrasonic measurement methods and image processing algorithms with the aim to perform the early stage diagnosis of the diabetic foot ulceration signs. The post-processing results obtained using SAFT, TFM and spatial contouring techniques give the sufficient accuracy of spatial imaging to be used for practical applications. This work was partially sponsored by the European Union under the Framework 7 project SkinDetector "Application of the innovative data fusion based non-invasive approach for management of the diabetes mellitus" No. 314913.

Keywords: *Ultrasonic Testing (UT), phased array, image processing, signal processing, medical application, materials characterization, SAFT, ultrasonic imaging, multi-layered phantom, rubber-based model, TFM*

20. Novel and Non-traditional NDT Techniques

Monday, 6 Oct 2014, 14:00-18:00 Club E

20.2 Novel and Non-traditional NDT Techniques - Club E, Monday, 6 Oct, 16:00

Mo.E.4.1

Micro surface defects detection by bacterial cells suspension

Telmo G. Santos ^{1*}, Patrick Inácio ², Alexandre A. Costa ², Pedro Vilaça ³, Rosa Miranda ², C. c. r. De Carvalho ⁴

¹ Faculdade de Ciências e Tecnologia - UNL, Caparica, Portugal

² Universidade Nova de Lisboa, Caparica, Portugal

³ School of Engineering, Aalto University, Aalto, Finland

⁴ Universidade de Lisboa, Lisboa, Portugal

*e-mail: telmo.santos@fct.unl.pt

Recent developments have shown that the use of bacterial cells in suspension is a non-destructive testing technique

viable to detect micro surface defects in some engineering materials. This new NDT technique explores the wide range of properties of bacterial cells, such as small dimension, high penetration capacity, motility, adherence, reproducibility and death, fluorescence, endothermic/exothermic properties, and also susceptibility to electric and magnetic fields. The generic methodology to perform this NDT technique is similar to the one used in dye penetrant and magnetic particles. In fact, bacterial cells preferentially adhere to surface irregularities, such as roughness, cracks and voids, allowing the identification of these defects in inspected surfaces. This communication presents results on the application of the technique in samples of different engineering materials with artificial micro defects, using two types of bacteria, in the presence or not of magnetic and electric fields. The technique was also validated in micro fabricated samples with real micro