KU LEUVEN

PhD Research position

In the frame of the EU-ITN-project

NDTonAIR

at the Department of Materials Engineering (MTM)

KU Leuven, Belgium

Inspection of aerospace structures by IR thermography and optical vibrometry

Highly motivated applicants are invited for a 3-years research and training position in the field of non-destructive testing (NDT) of aircraft components, potentially leading to a PhD degree. All research and training activities are part of the EU-funded International Trainings Network (ITN) "Training Network in Non-Destructive Testing and Structural Health Monitoring of Aircraft structures (NDTonAIR www.ndtonair.eu).

Major research objectives:

(I) To extend and validate an optical vibrometry method for the detection of defects by exploiting cross-modulation effects caused by their nonlinear elastic behaviour [1];

(II) To develop an active thermography (STH) technique for the inspection of composite materials that uses simultaneously different heating sources associated a different physical phenomena, e.g. flash-STH, induction-STH and vibro-STH;

(III) To compare the sensitivity of the two techniques on a range of different structures and defect types (natural cracks, delaminations) and evaluate their performances.

Non-linear optical vibrometry allows the detection of defects, such as closed defects, that do not cause reflection or mode conversion of acoustic waves; multi-physics TH should enhance the defect detection efficiency by naturally fusing information of various techniques. Both techniques are in a prototypal stage and the long-term objective is to implement them on-field and to evaluate their POD.

For a set of 3 relevant structures, a metallic plate, a multidirectional CFRP plate, a slat track, an assessment will be delivered on the feasibility of laser Doppler scanning vibrometry, shearography, photorefractive interferometry and multiphysics stimulated thermography.The feasibility parameters (referenced to the state of the art) will be: the minimum size of defects detectable, the measurement time per inspected surface, the cost of a measurement setup, the specificity of detection of defects compared to other typically occurring factors that influence the signal. The use of multiple heating sources will be allowed by the use of coded signals excitation and pulse-compression procedure.

[1] Jichuan Xiong and Christ Glorieux, "Spectrally resolved detection of mixed acoustic vibrations by photorefractive interferometry", J. Appl. Phys. 113, 054502 (2013)

As the research topic is situated in the field of ultrasonics and related sensing applications, applicants are required to have an excellent proven background in related natural or engineering sciences, including profound knowledge on signal processing as well as on the respective hard- and software. Moreover, appropriate skills in English speaking and writing are mandatory.

The work will be performed in the "Laboratory of Acoustics" of the Department Physics and Astronomy, in the group of "Materials Performance and Non-destructive Testing" at the Department of Materials Engineering at KU Leuven, as well in the including short-term research and training stays at international project partners in Austria and Italy. As a part of an International Training Network (ITN) of the EU, candidates must prove to fulfil the respective eligibility criteria for this position: (i) not residing in Belgium for at least 24 months in the last 3 years, and (ii) having not more than 4 years of research experience (working as researcher after obtaining your master's degree). Please submit your complete application until the 1st of December, 2016

Contact:

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