Early Stage Researcher (ESR) position

Elastodynamic Guided Wave Transducer

The advertised position is funded by the Marie Skłodowska Curie Action within the framework of the Innovative Training Network scheme H2020-MSCA-ITN-2016. The position is vacant again because the former ESR had to quit for personal reasons. The duration of the fixed-term contract is 12.5 months and the earliest starting date is **May 16th, 2019**. The period of 12.5 months can be used as preparation for a doctoral study, which is offered to the applicant if he/she performs well.
The "NDTonAIR" consortium involves Universities, Research Organisations and major European companies working on Non-Destructive Testing (NDT) and Structural Health Monitoring (SHM) techniques for aerospace. The goal is to train a new generation of scientists and engineers with a wide background of theoretical and experimental skills, capable of developing their research and entrepreneurial activities both in academy and industry and playing an active role in promoting the importance of quality inspection and structural monitoring in aerospace components. For more details also see: www.ndtonair.eu.

Objectives: The challenge for guided elastic wave (GEW) applications are the dispersion effects and the mutual existence of several guided (Lamb) wave modes. There are several attempts to decrease the number of GEW modes involved in a measurement. The simplest is lowering the frequency below the cut-off frequencies of higher modes. This restricts the symmetrical and anti-symmetrical modes to a number of two. Another method is to use directivity by appropriate formed transducers. Recently, we proposed a new type of fibre patch transducers, which are able to excite shear horizontal (SH) waves in a very efficient way (SH-piezoelectric fiber patch transducer = SHPFP)[1]. The lowest SH-mode (SH0) is dispersion free and the use of SHPFP would simplify the evaluation of the SHM indications considerably. In the project the SHPFP transducer will be realized in various forms and adapted to plate like structures from various aerospace construction materials (CFRP, aluminium, glare, …). The operation of the transducers will be characterized by 3D-laser vibrometry. Key parameters of the transducers are the efficiency of mode excitation and the purity of the modes.

[1] Köhler, B.; Gaul, T.; Lieske, U. & Schubert, F.; "Shear horizontal piezoelectric fiber patch transducers (SH-PFP) for guided elastic wave applications" NDT & E International, 2016, **82**, 1-12
Kim, Y. Köhler, B. "Improved shear horizontal wave piezoelectric fiber patch (SH-PFP) for structural health monitoring applications", Proc. 10th Int. Symposium on NDTinAerospace, Th.6.B.3, hosted by NDT.net (https://www.ndt.net)

Project status:
The former ESR reached already several results which are:

- Demonstration of the feasibility of the SHPFP sensor type

- Improved performance (efficiency, purity = ratio between SH and other plate modes, directivity) compared to other types of SHM transducers;
- Agreement between modelled and experimental determined SHPFP transmitted wave modes for first demonstrators.

Expected further results:
- set up of an additional SHPFP variant with further improved properties
- A demonstrator (structure with a defect) should be set up at the final step of the project to demonstrate the advantage of the SHPFP transducer concept

The position includes planned secondments to Material to Katholieke Universiteit Leuven (Belgium) and the University of Warwick (United Kingdom). The candidate will take part in scientific training courses for "fundamental skills for NDT".

The successful candidate must
- be in the first four years (full-time equivalent research experience) of her/his research career, after e.g. completion of her/his Master/Diploma degree,
- not already possess a doctorate degree,
- not have resided or carried out his/her main activity (work, studies etc.) in Germany for more than 12 months in the 3 years immediately prior to the time of recruitment.

Relevant Qualification & Experience:
- M.Sc. / Diploma in Engineering or Physics
- Experience in ultrasound with acoustic/ultrasonic transducers or ultrasonic NDT/SHM is helpful
- Basic knowledge on modelling of elastic waves is also helpful
- Programming and data evaluation experience (LabView and/or Matlab)

Communication and Interpersonal Skills:
- Very good organisational skills
- Willingness to undertake interdisciplinary research
- Willingness for secondments at project partners
- Fluent in written and spoken English and/or German

Benefits:
Living allowance EUR 3.072,00 per month + mobility allowance: EUR 600,00 per month (contribution to household, relocation and personal travel expenses), family allowance: EUR 500,00 per month (for fellows who have family at the time of recruitment – i.e. persons linked to the fellow by marriage or a relationship with equivalent status or dependent children who are actually being maintained by the fellow)

Candidates interested in the position should **send their applications via e-mail** to:

Dr. Bernd Köhler
Fraunhofer IKTS
Maria-Reiche Str. 2
01109 Dresden
Bernd.koehler@ikts.fraunhofer.de