PhD position

at the Institute of Research in Electrical Energy of Nantes-Atlantique
University of Nantes, France,

in the frame of the Marie Skłodowska-Curie European Training Network:

"Training Network in Non-Destructive Testing and Structural Health Monitoring of Aircraft structures"
EU call: H2020-MSCA-ITN-2016

Title of the PhD Research Project: Development of multi-physics multi-scale modelling platform for CFRP composites using inductive thermography and Eddy Current techniques

Due to their excellent mechanical performance, the use of carbon fiber composites has been growing in recent decades. However, the large-scale development of these materials depends on the improvements of the processes during the various stages of their whole life cycle (eg. producing, forming, assembly, inspection, recycling). At various stages of the life cycle of the material, nondestructive testing (NDT) methods can be used to characterize the health state of the material. They play a vital role in the quality control and risk management. The **Induction Thermography NDT** based on the measurement of eddy current thermal effects and the **Eddy Current NDT** based on the electromagnetic effects in the material are really promising techniques for this type of new materials. The development of these methods requires multiphysics electromagnetic – thermal modelling. The developed models will deal with some numerical issues concerning thin regions of strong anisotropy and the multiscale geometries. Also, as the CFRPs are poor conductors, high frequencies solicitations will be applied. These original simulations will need to use particular coupled numerical methods (degenerated Whitney elements, shell elements, surface impedance boundary conditions,…) in the modelling. The new implemented simulation tools will allow reasonable computational time while retaining the desirable accuracy of numerical solutions for a close to real representation of the behaviour of these complex materials. Validations will be driven by comparisons with experimental measurements and other techniques. These tools will allow accurate assessment of the performance of the both induction thermography and high frequency EC techniques.

Starting Date: 1st February 2017
Duration:36 months

Expected start of the application: 1st November 2016
Deadline: 31th December 2016

Job description and eligibility criteria:
The PhD position is in the PhD School of Sciences and Technology of Information and Mathematics. Since the research topic is situated in the field of electromagnetic and thermal nondestructive testing, an excellent background in electromagnetism and thermal physics is requested. Moreover, interests in numerical methods as well as in inverse problems are desirable and appropriate skills in French/English speaking and writing are mandatory.
The research activity will be performed at Saint-Nazaire in the team "Electromagnetic Device Modelling" of the Institute of research in Electrical Energy of Nantes-Atlantique at University of Nantes, but also periods of secondment at other partners of the consortium are planned (CEA-LIST France, University of Perugia Italy, University of Newcastle United-Kingdom, RECENDT Austria, …)
The successful candidate will be therefore eager to move in other countries during the project.
In addition, the successful candidate will satisfy at the time of the recruitment (1st February 2017) the following mandatory characteristics:
• having not more than 4 years of equivalent research experience (i.e. working as researcher after obtaining his/her master's degree);
• having not been awarded a title of PhD;
• having not resided or carried out her/his main activity in France for more than 12 months in the last 3 years,

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