

PHOTONICS - EUROPHOTONICS MASTER COURSE

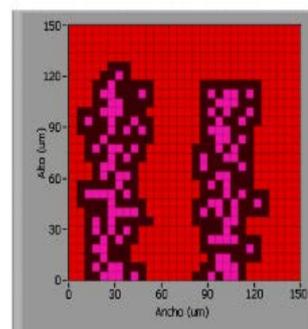
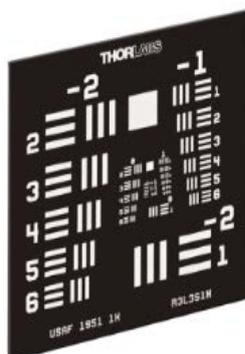
PROPOSAL FOR A MASTER THESIS

Dates : April 1st, 2016 – September 31st, 2016 (earlier start accepted)

Laboratory : Centre for Sensors, Instrumentation and systems Development (UPC-CD6)
City, Country : Terrassa, Spain

Title of the master thesis :

Prototyping and characterizing a reflection PhotoAcoustic Microscope



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Summary of the subject (maximum 1 page):

Photocoustics (PA, also called optoacoustics) is a powerful medical imaging arrangement of increasing popularity which combines the benefits of optical absorption and ultrasound propagation in living tissues to extract information on the properties of the media. The optics/ultrasound combination enables retrieving *in vivo* information from depths unattainable to optical techniques based only in scattering. When the media considered is living tissue, local changes of absorption or scattering values may usually be identified with interesting medical features. The main fields of

application are the noninvasive detection of tumors, and the functional imaging of different parts of the body, including the brain.

At CD6 we have an initial proof of concept of an acoustic resolution limited PA microscopy (PAM, see images) in the framework of a larger research project. In its current state, the prototype has all the electronics and components required for its functioning, and basic acquisition software, but the current approach becomes limited as far as it is only working in transmission mode (laser excites the media and the transmitted wave is detected using an acoustic detector).

The student(s) joining this project will join the team involved in the development of the setup, in order to specify, design, build and characterize a system required for reflection-based PAM setup. This includes a novel illumination and detection geometry and components (using specialized software tools), and the selection and/or construction of photoacoustic phantoms to adjust the capabilities of the device. Preliminary tomographic reconstruction of the obtained images or in modelling of the excitation are equally foreseen to extract with the best possible accuracy the optical properties of the tissue involved. The final goal is to develop an operative, compact PA setup which is able to provide tomographic information.

Keywords

Keywords : Photocoustics, optoacoustics, medical diagnostics, optomechanics, tissue optics, biomedical photonics.

Additional information :

* Amount of the monthly allowance (if it is the case):

To be discussed depending on the value of candidate

* Required skills :

Interest in application-driven experimental work for solving real-world innovation needs.

Interest in hands-on work.

Basic concepts in optical metrology and optical engineering .

Basic programming skills (C++, MatLab, Zemax, Labview) .

Search of resources and components, both scientific and technical.

Self-motivated, objective-driven, capable of autonomous working within a multidisciplinary team.

* Miscellaneous :

International team with several years of experience in the topic proposed.

Multidisciplinary environment with electronics and mechanics workshops, and specialists and technicians in metrology, optics, mechatronics, and electronics.

Possibility of joining the Centre for a PhD/Technician/ Project Manager career in case of common interest.

Early start welcome.