Master in Photonics – "PHOTONICS BCN"
Master ERASMUS+ "EuroPhotonics"

MASTER THESIS PROPOSAL

Dates: April 2021 - September 2022

Laboratory: Polarimetry Lab, Feman Group
Institution: Universitat de Barcelona
City, Country: Barcelona, Spain

Title of the master thesis: A fast imaging Mueller matrix polarimeter for biomedical applications

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Keywords: polarimetry, imaging, polarization, Mueller matrix

Summary of the subject (maximum 1 page):

Mueller matrix polarimetric imaging measures Mueller matrices over a field of view and thus allows for visualizing the polarization characteristics of the objects. It has emerged as a promising technique in recent years for tissue imaging, improving image contrast and providing a unique perspective to reveal additional information that cannot be resolved by other optical imaging modalities. The Mueller matrix represents the transfer function of an optical system in its interactions with polarized light, and it contains all of the necessary information about the linear optical properties of the medium.

This work proposes the modification of an imaging polarimeter available in the lab and working in the backscattering configuration and capable of performing measurements in the visible and near infrared. The goal is to reduce significatively the measurement time in order to make possible polarimetry measurements based on the Mueller matrix in real time (the objective is to achieve a full measurement in around 1 second). We plan to use fast switching filter wheels to adjust the orientation of the retarders. This instrument will be used for enabling in vivo measurement in medical diagnostic applications.

Additional information:

* Required skills: Interest in polarization optics and experimental lab work is recommended. Some Labview and Phyton programming knowledge is recommended

* Future prospects: : For interested students, we offer the possibility to continue the research initiated during the Master Thesis work into a PhD Thesis at our lab in University of Barcelona, exploring further this field of research (or something related). Funding opportunities will be explored for these students.