MASTER IN PHOTONICS – PHOTONICS BCN
EUROPHOTONICS-POESII MASTER COURSE

PROPOSAL FOR A MASTER THESIS

Dates: April - September 2017

Laboratory: "Nonlinear Optics, Nonlinear Dynamics and Lasers" (DONLL)
Physics Department
Polytechnic University of Catalonia
City, Country: Terrassa, Spain

Title of the master thesis: "Ultra short laser pulse characterization device based on disordered nonlinear crystals"
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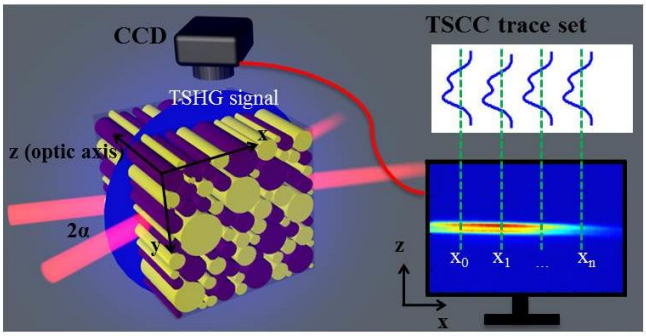
Summary of the subject:
Lasers delivering ultrashort pulses play nowadays an increasingly important role in many research and technological fields where the interaction of fs light pulses with different media is crucial, as for example material processing, high-resolution imaging and detection, investigation of complex molecular system's dynamics, biomedical science and medicine. These applications are meaningful only if one knows all the characteristics of laser pulses used in the experiment. Most of the different techniques used for a partial or complete temporal characterization of laser pulses are based in nonlinear interactions and they can be quite complex and expensive.

Few years ago we have proposed novel auto-correlation scheme based on the detection of the second harmonic signal generated in a nonlinear crystal with a random-sized domain distribution. This method was proved to be a simple and effective single-shot technique for the partial temporal characterization of ultra-short pulses.



This project is devoted to the design and construction of a compact device based on this technique, capable to measure different characteristics of the pulse as duration, shape, chirp, and front tilt. This device should be able to measure the pulse characteristics at the desired position inside the set-up using a system which would work for different wavelengths without any tuning or adjusting parameter.

Keywords : nonlinear optics, short pulse measurements, photonic crystals