



## **MASTER IN PHOTONICS – PHOTONICS BCN EUROPHOTONICS-POESII MASTER COURSE**

### **PROPOSAL FOR A MASTER THESIS**

**Dates: April - September 2019**

**Laboratory : Attoscience and Ultrafast Optics**  
**Institution: ICFO – The Institute of Photonic Sciences**  
**City, Country : Castelldefels (Barcelona), Spain**

**Title of the master thesis: Attosecond spectroscopy of electronic excitation**

**Name of the master thesis supervisor: Dr. Themis Sidiropoulos, Dr. Jens Biegert**

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#### **Summary of the subject:**

The motion of electrons, or excitations, inside matter determines photosynthesis, chemical reactions, the efficiency of sensors or e.g. solar cells. Attosecond soft X-rays are the key to investigate such electronic motion in real time. Our group has developed the first attosecond soft-X-ray source and your project will deal with experimental aspects of such research. You will investigate results from condensed matter and extract information about which molecular bond participates in the relevant processes.

Your task will be to familiarize yourself with our research. (We will explain it to you)

- Learn how to use Arthemis and Python to analyze soft X-ray spectra
- Preparation of samples for a soft X-ray attosecond measurement
- Participate in a measurement campaign and analyze your data

Reading material:

- S.L Cousin, F Silva, S Teichmann, M Hemmer, B Buades, J Biegert, ” High-flux table-top soft x-ray source driven by sub-2-cycle, CEP stable, 1.85- $\mu\text{m}$  1-kHz pulses for carbon K-edge spectroscopy” Optics Letters, 39, 5383-5386 (2014).
- B. Buades, D. Moonshiram, T. P. H. Sidiropoulos, I. Leon, P. Schmidt, I. Pi, N. Di Palo, S. L. Cousin, A. Picon, F. Koppens, J. Biegert, “Attosecond dispersive soft X-ray absorption fine structure spectroscopy in graphite”, Optica 5, 502-506 (2018)

**Keywords : Attosecond, XAFS, electronic excitation**

**Additional information:**

\* Required skills: Diligence, programming