

Research, Informatics and Graduate Studies

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PhD Position in Multiscale modeling of strong field phenomena driven by plasmonic fields (GS-2020005) – Group of Assoc. Prof. DSc. Dr. Marcelo Ciappina

The Physics Program (group of Associate Professor DSc. Dr. Marcelo Ciappina) is looking for 1 PhD student to conduct theoretical research projects in plasmonics related to attosecond physics. Contract duration: 3 + 1 years.

Project Details

Coherent light sources in the ultraviolet (UV) to extreme ultraviolet (XUV) spectral range are in high demand nowadays for use in basic research, materials science, biology, and possibly lithography. The caveat of their use is the demanding infrastructure of XUV generation and target delivery, as well as their low efficiency and low duty cycle. It has been recently demonstrated that these problems may be overcome by using surface plasmons (also known as plasmonics) as light amplifiers. The interaction of coherent electromagnetic radiation with nanostructures is, therefore, a very new and exciting topic. In order to fully understand the underlying mechanisms and the experimental outcomes it is necessary to develop specialized and rigorous numerical tools that cover a wider range of temporal and spatial radiation sources. To further advance the field, a close collaboration between theory and experiment is desirable. On the one hand, theoretical predictions can spark new experimental directions and, on the other hand, experimental results can validate the theoretical models.

At present, the numerical and semi-classical approaches used to study strong laser-matter processes in atoms and molecules—for instance High-order Harmonic Generation (HHG) and Above-Threshold Ionization (ATI)—are based on the assumption that the laser electric field is spatially homogeneous in the region where the electron dynamics takes place. When plasmonics are used to produce HHG and ATI, the laser electric field is no longer spatially homogeneous in the relevant regimes, and consequently important changes in the laser driven phenomena will occur.

The goals of this project are divided into two major milestones: i) to extend the already developed single atom response models by including macroscopic effects. For instance, it seems to be plausible to implement a multi-scale approach, i.e. to solve the Maxwell equations, which govern the macroscopic world, joint with approximated models for the single atom response. In this way, more realistic predictions could be accomplished; ii) Interact with experimental groups in order to, (a) compare theoretical results with experiments; (b) incorporate more realistic parameters into the numerical approaches, and (c) propose new experiments based on the theoretical predictions.

Keywords

Strong field phenomena, numerical modeling, attosecond physics, plasmonics, beam propagation, multiscale modeling

Selection Criteria

- Master degree (or equivalent) in Physics, Atomic Physics or Laser Physics (essential)
- Strong background in plasmonics (preferable)

Position

PhD

Program

Physics

Research Area

Multiscale modeling of strong field phenomena driven by plasmonic fields

Contact

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[Web Page Link](#)

Application Deadline

Open till filled

Date Posted

14 October 2020

Location

Guangdong Technion – Israel Institute of Technology (GTIIT), China & Technion-Israel Institute of Technology, Israel.

Fees & Finance

how to apply

- Strong interest in beam propagation (essential)
- Strong interest in programming and numerical modeling(essential)
- Strong interest to work temporarily at research institutes in China, Europe, Israel and South Korea (essential)
- Good communication skills, good command of English (essential)
- Ability to work independently as well as in a team environment (essential)
- Ability to author scientific reports and co-author scientific publications (essential)
- The PhD candidate must fulfill the requirements for admission to the Technion Graduate School and needs to comply with its regulations leading to the PhD/Master degree: <https://graduate.technion.ac.il/en/prospective-students/>