SYRP 1: Symposium 25 Years of Recollision Physics

Time: Friday 10:30–12:30 Location: RW HS

Invited Talk SYRP 1.1 Fri 10:30 RW HS

Attosecond seeding of high energy rescattered electrons — •Kenneth Schafer — Department of Physics and Astronomy, Louisiana State University, Baton Rouge, LA 70803 USA

Twenty five years ago, advances in both theory and experiment transformed strong field physics from a collection of interesting phenomena – notably above threshold ionization and high harmonic generation – into one of the most vibrant and relevant subfields of physics today. In this talk I will discuss work over the past decade to use attosecond pulses, the primary outgrowth of recollision physics, to study strong field processes themselves. In particular, we study the production of high energy photoelectrons via strong field-driven recollision when the tunnel ionization step is replaced by an attosecond pulse train. This allows insight into the rescattering of electron wave packets formed both near the laser field maxima, the normal tunnel ionization condition, and also near the laser field minima, something that does not occur via tunnel ionization.

Invited Talk SYRP 1.2 Fri 11:00 RW HS

The molecular selfie - atomic-scale imaging with a single electron — Benjamin Wolter[1], Michael G. Pullen[1], Anh Thu Lee[2], Matthias Baudisch[1], Katharina Doblhoff-Dier[3], Arne Senftleben[4], Michael Hemmer[1,5], Claus Dieter Schröter[6], Joachim Ullrich[6,7], Robert Moshammer[6], Stefanie Gräfe[8,9], Oriol Vendrell[5,10], Chii Dong Lin[2], and •Jens Biegert[1,11] — [1]ICFO-Institut de Ciencies Fotoniques, The Barcelona Institute of Science and Technology, 08860 Castelldefels, Barcelona, Spain — [2]J. R.Kansas State University, Manhattan, KS 66506-2604, USA — [3]Leiden Institute of Chemistry, Leiden University, Post Office Box 9502, 2300 RA Leiden, Netherlands — [4]Universität Kassel, Heinrich-Plett-Str. 40, 34132 Kassel, Germany — [5]Center for Free-Electron Laser Science, 22607 Hamburg, Germany — [6]Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg, Germany — [7]Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany — [8]Institute for Physical Chemistry, Friedrich-Schiller University Jena, 07743 Jena, Germany — [9]Abbe Center of Photonics, Friedrich-Schiller-University Jena, 07743 Jena, Germany — [10]Department of Physics and Astronomy, Aarhus University, 8000 Aarhus C, Denmark — [11]Institució Catalana de Recerca i Estudis Avançats (ICREA), Pg. Lluís Companys 23, 08010 Barcelona, Spain

We used laser-induced electron diffraction to image bond scission in real time and real space with 0.6 fs temporal and 6 pm spatial resolution.

Invited Talk SYRP 1.3 Fri 11:30 RW HS

Multidimentional attosecond spectroscopy — •Nirit Dudovich — Weizmann Institute of Sceince

Attosecond science is a young field of research that has rapidly evolved over the past decade. Performing time-resolved measurements with attosecond precision is a significant challenge. Currently, two main approaches have been successfully demonstrated. The first approach, Attosecond Pump-Probe Spectroscopy, applies an attosecond pulse to initiate or probe a fast-evolving process. An alternative approach, Attosecond Self-Imaging, applies the attosecond production process, to perform the measurement. In the talk I will describe a new measurement scheme in which we integrate the two main branches in attosecond spectroscopy. In this scheme extreme ultraviolet attosecond pulses initiate an electron wavepacket by photo-ionization, a strong infrared field controls its motion, and finally electron*ion collision maps it into re-emission of attosecond radiation bursts. Our measurements resolve the internal clock provided by the self-probing mechanism, probing the photoionization the build-up of photo-ionization in the presence of the strong laser field.

Invited Talk SYRP 1.4 Fri 12:00 RW HS

Recollision-based high-harmonic generation from solids — •Giulio Vampa — Stanford PULSE Institute, SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA

I will present how strongly-driven electrons and holes in crystals can lead to high-harmonic emission upon their recollision. The spatial periodicity and the non-trivial energy structure of solids adds a twist to the well-established recollision physics in the gas-phase, adding new phenomena and capabilities - some of which will be highlighted in the talk.