

Bootstrapping (Ultrafast) Photoionization Dynamics

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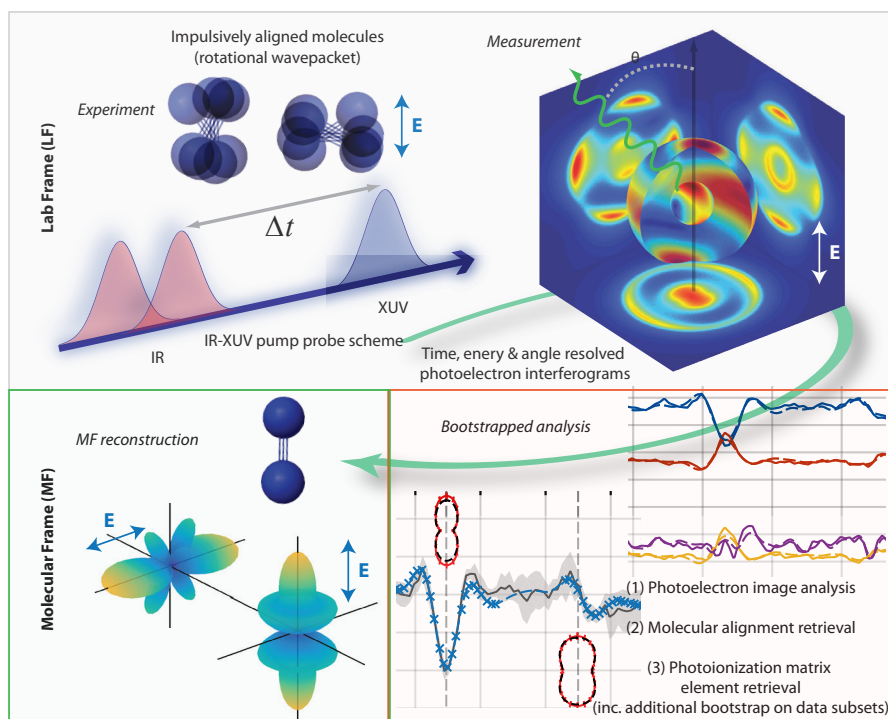
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Tuesday Morning Invited Session 1

Ultrafast photoionization dynamics, 9.50am

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Photoionization is an interferometric process, in which multiple paths can contribute to the final continuum photoelectron state. At the simplest level, interferences between different final angular momentum states are clearly manifest in the energy and angle resolved photoelectron spectra; metrology schemes making use of these interferograms are thus phase-sensitive, and provide a powerful route to detailed understanding of photoionization.



The high information content of angle-resolved interferograms, combined with geometric control over the photoionization dynamics, can provide sufficient data for reconstruction of the continuum state, in terms of the constituent partial waves and phases. This has recently been explored for a range of cases [1-4], including the use of ultrafast pump-probe schemes with a bootstrapping analysis methodology [1]: aspects of this work will be presented.

- [1] **Molecular Frame Reconstruction Using Time-Domain Photoionization Interferometry.** Marceau, C., Makhija, V., Platzer, D., Naumov, A. Y., Corkum, P. B., Stolow, A., Villeneuve, D. M., Hockett, P. (2017). *Physical Review Letters*, 119(8), 83401. <http://doi.org/10.1103/PhysRevLett.119.083401>
- [2] **Coherent control of photoelectron wavepacket angular interferograms.** Hockett, P., Wollenhaupt, M., & Baumert, T. (2015). *Journal of Physics B: Atomic, Molecular and Optical Physics*, 48(21), 214004. <http://doi.org/10.1088/0953-4075/48/21/214004>
- [3] **Complete Photoionization Experiments via Ultrafast Coherent Control with Polarization Multiplexing.** Hockett, P., Wollenhaupt, M., Lux, C., & Baumert, T. (2014). *Physical Review Letters*, 112(22), 223001. <http://doi.org/10.1103/PhysRevLett.112.223001>
- [4] **Coherent imaging of an attosecond electron wave packet.** Villeneuve, D. M., Hockett, P., Vrakking, M. J. J., & Niikura, H. (2017). *Science*, 356(6343), 1150–1153. <http://doi.org/10.1126/science.aam8393>

For more: *Quantum Metrology with Photoelectrons Vol. I & II* (IOP Concise Physics) <https://osf.io/q2v3g/>

