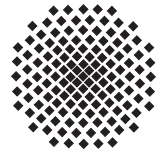


# Stuttgarter Physikalisches **ONLINE Kolloquium**

Max-Planck-Institut für Festkörperforschung  
Max-Planck-Institut für Intelligente Systeme  
Fachbereich Physik, Universität Stuttgart

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**Dienstag, 9. Juni 2020**

**16.15 Uhr**

**Stuttgarter Max-Planck-Institute, Heisenbergstraße 1, 70569 Stuttgart-Büsnau**

## **Towards spectro-microscopy at extreme limits**

**Hanieh Fattahi**  
MPQ Garching

### **Abstract**

This talk is devoted to modern methods for attosecond and femtosecond laser spectro-microscopy with the special focus on applications that require extreme spatial resolution.

In the first part, I discuss how high-harmonic generation by high-energy, high-power light transients holds promise to deliver the required photon flux and photon energy for attosecond pump-probe spectroscopy at high spatiotemporal resolution in order to capture electron-dynamic in matter. I demonstrate the first prototype high-energy field synthesizer based on Yb:YAG, thin-disk laser technology for generating high-energy light transients.

In the second part of my talk, I show resolving the complex electric field of light at PHz frequency by means of electro-optic sampling in ambient air, and discuss the potential of the technique in molecular spectroscopy and high-resolution, label-free imaging.

1. A. Alismail et al., "Multi-octave, CEP-stable source for high-energy field synthesis," *Science Advances* 6, eaax 3408 (2020)
2. H. Wang et al., "High Energy, Sub-Cycle, Field Synthesizers," *IEEE Journal of Selected Topics in Quantum Electronics*, (2019).
3. A. Sommer et al., "Attosecond nonlinear polarization and energy transfer in dielectrics," *Nature* 534, 86 (2016).
4. H. Fattahi, "Sub-cycle light transients for attosecond, X-ray, four-dimensional imaging," *The Contemporary Physics Journal*, 57, 1 (2016).
5. H. Fattahi et al., "Third-generation femtosecond technology," *Optica* 1, 45 (2014).