Towards spectro-microscopy at extreme limits

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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.