Guest lecture

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**High-order harmonic generation from laser-produced plasmas: recent achievements and trends**

Recent developments in high-order harmonic generation from laser-produced plasmas revealed many new approaches and achievements. Among them are studies of harmonics from clusters using the ablation of commercially available nanoparticles, fullerenes, and carbon nanotubes, resonance-enhanced features of odd and even harmonics, generation of extremely broadband high-order harmonics, application of high pulse repetition rate laser sources and ultrashort pulses for the HHG in plasma plumes, observation of quantum path signatures in the harmonic spectra from various plasmas, enhancement of harmonics from *in-situ*-produced clusters, development of a few theoretical approaches describing the observed peculiarities of resonance-enhanced harmonics, emergence of a “second” plateau in the harmonic distribution, development of two-colour pump schemes for plasma-induced harmonics, observation of extremely strong HHG in carbon-contained plasmas, proposals for the quasi-phase matching in plasma plumes, observation of the attosecond nature of pulse duration of the plasma-induced harmonics, etc [1]. Most of these findings will be discussed in the present talk.

Among future developments in the application of this technique, we will discuss such areas as the seeding of plasma resonance harmonics in XUV free-electron lasers, application of endohedral fullerenes for plasma HHG, analysis of molecular structures through the study of harmonic spectra from oriented molecules in plasmas, search for quasi-phase matching schemes in plasma plumes, generation of strong combs and single attosecond pulses, application of IR (1000 - 3000 nm) laser sources for the extension of the plasma harmonic cutoff, to mention but a few.

[1] R. A. Ganeev et al, Phys. Rev. A, 74, 063824 (2006); 75, 033804 (2007); 75, 063806 (2007); 76, 023805 (2007); 76, 023831 (2007); 76, 023832 (2007); 80, 033805 (2009); 80, 043808 (2009); 81, 063825 (2010); 82, 043812 (2010); 82, 043821 (2010); 82, 053831 (2010); 83, 013820 (2011); 83, 063879 (2011); 84, 013407 (2011); Phys. Rev. Lett. 102, 013903 (2009).

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