

08:30-10:30

BALLROOM A

JFA - Joint Symposium on High Power Lasers and Their Applications II

President: P.V. Nickles, *Max Born Institut, Berlin, GERMANY*

08:30

JFA1

(Invited)

High-order harmonics: Generation and applications

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When an intense laser is focused into a gas jet, very high-order harmonics can be produced. The harmonics are emitted approximately with the same efficiency up to orders as high as 143 and to energies as high as 180 eV (6 nm). They have the same characteristics as the generating laser: they are collimated, intense, coherent and of short pulse duration. Thus, these phenomena are interesting not only from a basic point-of-view as a probe of the response of an atom to a strong laser field, but also, from a more applied point-of-view, as an interesting soft X-ray source, with specific properties. The radiation can be used in traditional applications in atomic, molecular and solid-state physics, such as lifetime measurements. More "exotic" applications, such as the production of attosecond (subfemtosecond) light pulses, have also been proposed. Both aspects, the understanding of the physics of harmonic generation, as well as the applications of this new XUV radiation source will be reviewed.

09:00

JFA2

(Invited)

Recent Progress of Nonlinear Short-Pulse Tunable VUV and XUV Generation

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Summary

Short-pulse, high peak power KrF (20mJ, 400 fs) and Ti:Sapphire lasers (200mJ, 150 fs) are used to generate coherent VUV and XUV radiation by low- and high-order nonlinear optical processes. In both cases, tunability is achieved by sum- or difference-frequency mixing with radiation from a high peak power optical parametric oscillator-amplifier system (mJ-level, around 500 fs).

With the KrF laser, resonant third- or fifth-order processes in Xe and Ar have been investigated. With optimized pulsed gas jets and a slight noncollinear phase matching geometry, tunable VUV radiation around 155 nm with energies up to 1 mJ at pulse durations below 1 ps and a conversion efficiency approaching 5% have been obtained. For the XUV range around 55 nm, energies of 0.1 - 1 μ J are expected.

In high-order harmonic generation with the Ti:Sapphire laser, typically a comb of almost equally intense harmonics is observed in the plateau region, covering spectral ranges down to 10 nm [1].

In order to structure this spectrum, high order $\omega - 2\omega$ frequency mixing experiments have been performed, including polarization control [2] and refractive index manipulation due to plasma formation in the nonlinear material. Indications of phase matching for individual harmonics and prospects for a harmonic engineering will be discussed.

References

- [1] J. J. Macklin, J. D. Kmetec, C. L. Gordon III; Phys. Rev. Lett. 70, 776 (1993)
 [2] H. Eichmann, A. Egbert, S. Nolte, C. Momma, B. Wellegehausen, W. Becker, S. Long, J. K. McIver; Phys. Rev. A 51, R 3414 (1995)