A GWatt attosecond source for non-linear XUV optics and XUV-pump-XUV-probe studies

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ABSTRACT

The observation of multiple ionization of noble gases through multi-XUV-photon absorption induced by a powerful laser driven high-harmonic-generation source is presented [1]. The enhancement of the XUV energy was of crucial importance for the studies in the non-linear XUV regime and for the achievement of this goal loose laser focusing geometry combined with a multiple gas jet configuration (quasi-phase matching conditions) were implemented. Comparing the measured intensity dependence of the yield of the different Argon charge states with numerical calculations we can infer the different channels -direct and sequential- underlying the interaction. While such studies were feasible so far only with FEL sources, this table-top high-harmonic-generation source which delivers pulses with energy ≈230 μJ in the ~50 nm spectral range connects highly-non-linear-XUV-processes with the ultra-short time scales, inherent to the harmonic pulses, and highlights the advanced perspectives of emerging large scale laser research infrastructures. The uniqueness of the combined high intensity and short pulse duration of the source enables non-linear XUV-optics experiments and furthermore advances the implementation of XUV-pump-XUV-probe schemes in the XUV spectral region.

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