

Generation of Sub-keV Harmonics and Isolated Attosecond Pulses by an IR-OPA Source

Katsumi Midorikawa

RIKEN, Japan

We have investigated the driving wavelength scaling of high harmonics and isolated attosecond pulse generation by a high-power infrared optical parametric source. First, we show the generation of a coherent water window x-ray radiation by extending the plateau region of high-order harmonics under a neutral-medium condition. The maximum harmonic photon energy attained are 300 eV and 450 eV in Ne and He, respectively. Our proposed generation scheme, combining a 1.6 μm laser driver and a neutral Ne gas medium, is efficient and scalable in output yields of the water window x-ray. Thus, the precept of the design parameter for a single-shot live-cell imaging by contact microscopy is presented.

We also propose and demonstrate the generation of a continuum high harmonic spectrum by mixing the infrared optical parametric output and the fundamental laser fields. The observed spectra clearly show the possibility of generating isolated attosecond pulses from multi-cycle pump pulses.