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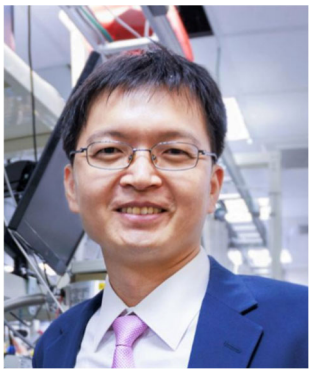
Direct Generation of Bright Isolated Attosecond Pulses from Post-Compressed Yb Lasers



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Abstract

Attosecond science enables direct observation of electron dynamics, but current isolated attosecond pulse (IAP) sources are limited by photon flux and scalability. Here, we present a new approach to generating bright IAPs driven by post-compressed ytterbium (Yb) lasers. Using advanced post-compression techniques, long Yb pulses are compressed to the few-cycle regime, enabling direct high-order harmonic generation (HHG). In particular, cascaded focus-and-compression schemes allow large nonlinear phase accumulation while preserving beam quality. We further show that filamentation in a semi-infinite gas cell induces spatiotemporal reshaping of the driving pulse, including self-compression and self-guiding, leading to enhanced phase-matching gating and the generation of bright, high-contrast IAPs. This approach provides a scalable route to high-flux attosecond sources, opening opportunities for ultrafast spectroscopy, coherent soft X-ray science, and precision metrology.