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Plasma-based Attosecond X-ray Pulses

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Attosecond science has emerged as a major research direction in X-ray free-electron laser science. X-ray free-electron lasers can routinely generate attosecond pulses with a peak power in the tens to hundreds of GW and are employed for time-resolved experiments with sub-fs resolution.

Plasma-based injectors have the potential revolutionize ultrafast science thanks to their ability to generate high current bunches with a brightness that is orders of magnitude larger than conventional photoinjectors.

In my talk I will discuss our ongoing R&D efforts towards plasma-based attosecond X-ray pulses. By employing the strong accelerating field of plasma-based accelerators, we propose to chirp and compress high-brightness electron bunches to nm-scale lengths. The resulting charge distribution can emit coherently in the soft X-ray range, resulting in few-cycle pulses with TW peak powers.

This experiment can combine the bandwidth of state-of-the-art harmonic sources with the peak power of X-ray free-electron lasers, and open new directions in attosecond science.

Acknowledgments

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