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Status and Prospects for the Plasma-drived Attosecond X-ray (PAX) source experiment at FACET-II

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Plasma-driven light source development has recently made significant progress with multiple demonstrations of plasma-FEL gain [1-2] and the ongoing work of various facilities dedicated to plasma-FEL development [3]. In this contribution, we report on the status and prospects for one-such plasma-driven light source effort, the Plasma-driven Attosecond X-ray (PAX) experiment at FACET-II [4]. This unique experimental thrust seeks to compress electron beams generated by plasma accelerators to 10s of nm bunch length and use these beams as drivers for an attosecond X-ray source. This approach is motivated by the possibility to generate ultra-short (10s of as) high power (TW) X-ray pulses, as well as the order-of-magnitude increased tolerances of this method to emittance, energy spread and pointing jitter compared to a plasma-driven XFEL starting from noise. We present recent experimental developments in the process of demonstrating this concept at FACET-II and discuss potential extensions of this method to scale towards shorter wavelengths in the future.

[1] W. Wang et al Nature 595, 516 (2021)
[2] R. Pompili Nature 605, 659–662 (2022)
[3] C. Emma et al High Power Laser Science and Engineering, 2021, Vol. 9, e57 (2021)
[4] C. Emma et al APL Photonics 6, 076107 (2021)

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