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KAIO-Beamline –a modular high-repetition rate laser-plasma electron accelerator for a broad range of applications

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The novel KAIO-Beamline was designed to address the use of laser-plasma accelerators (LPA) for scientific and societal applications. Its modular design incorporates (i) an industrial-grade high average power laser system, (ii) an efficient temporal post-compression stage, based on multi-pass cell technology [1], to reach optimal electron acceleration conditions in the few-cycle [2], and (iii) a compact electron accelerator module with integrated user interface and data management system. The KAIO-Beamline approach is compatible with a wide range of commercial laser platforms.

Here we will present the first performance results of the KAIO-Beamline using a commercial ASTRELLA Ti:Sapphire laser (Coherent Inc.), delivering 40 fs pulses at 1 kHz repetition rate with energies up to 7 mJ. The laser pulses are comprehensively characterized with novel spatio-temporal metrology tools, such as INSIGHT [3] and TIPTOE [4] techniques.

References

- [1] L. Daniault, et al., Opt. Lett. 46, 5264 (2021)
- [2] D. Guénot et al., Nature Photonics 11(5), 293-297 (2017)
- [3] A. Borot and F. Quéré, Opt. Express 26, 26444 (2018)
- [4] W. Cho et al., Sci Rep 9, 16067 (2019)

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