Potential applications of Plasma-Modulated Plasma Accelerator (P-MoPA)

Science and Technology Facilities Council

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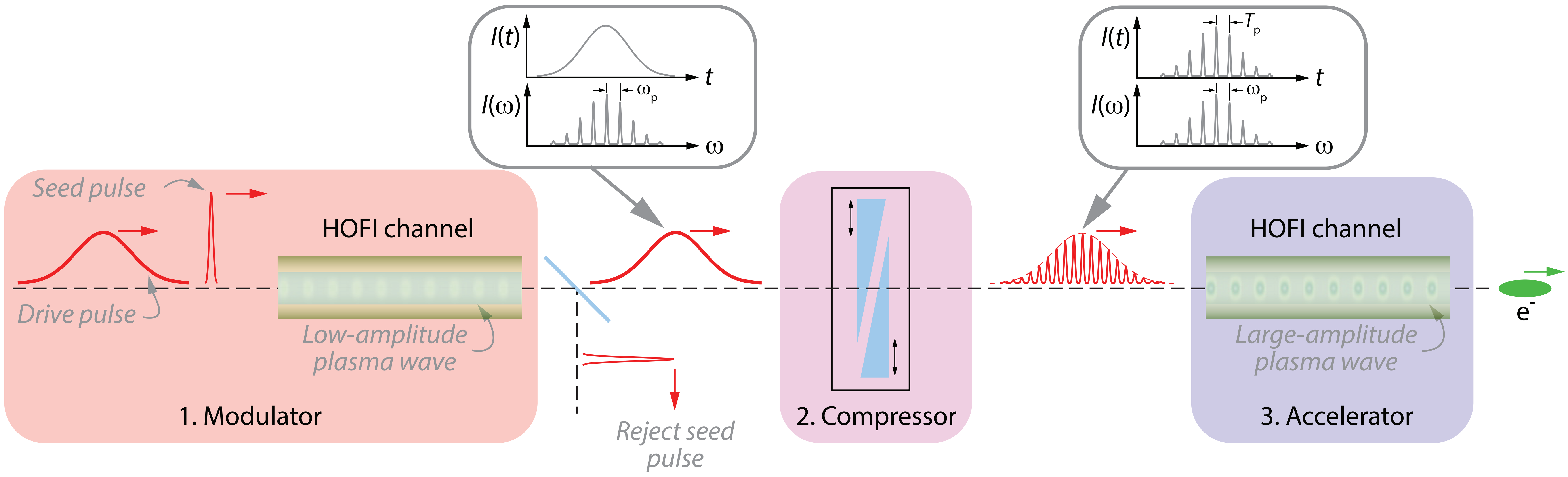
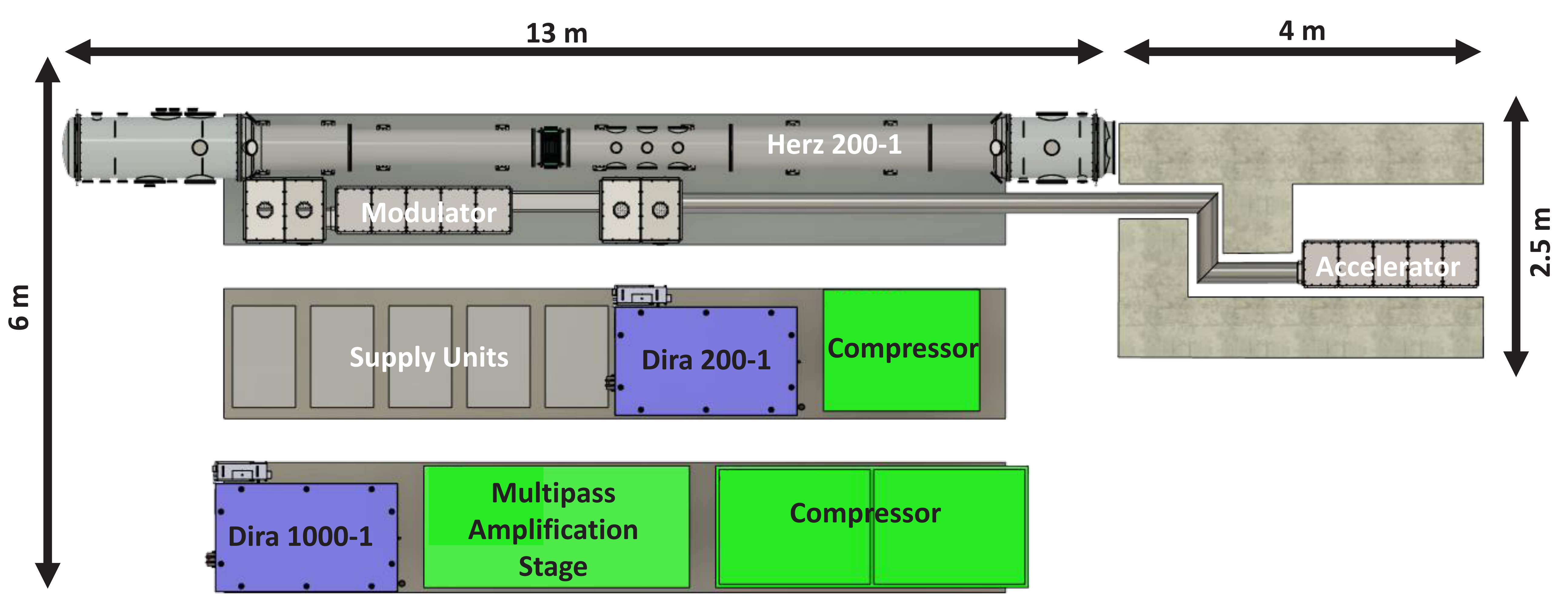


Schematic diagram of the P-MoPA concept. Jakobson et al. PRL 127, 184801 (2021).



Layout for 600 MeV accelerator (the same footprint for 1 GeV).

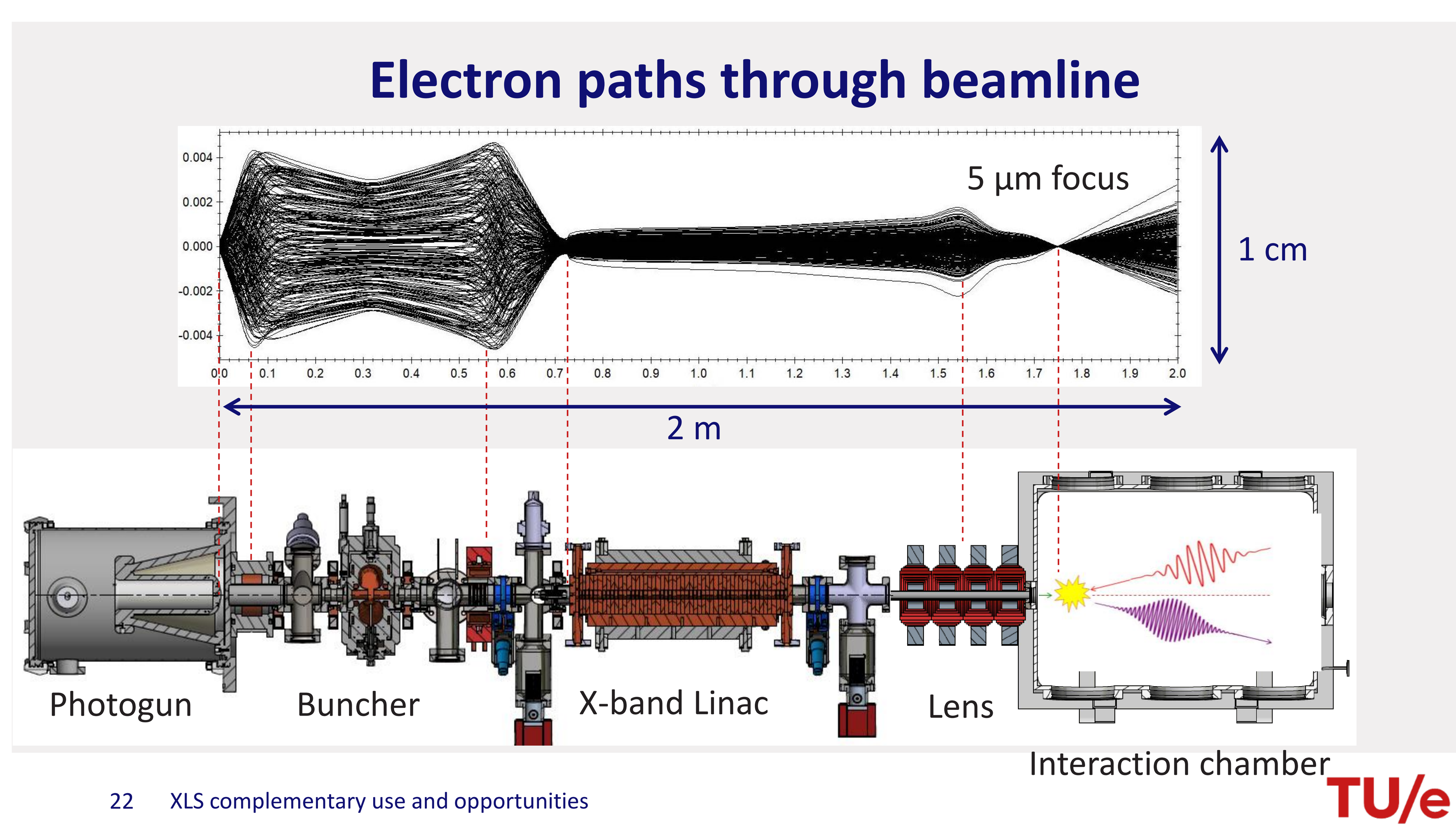
Assumptions: Works as predicted by simulations: charge 5 pC, energy spread < 1%, transverse emittance 1 µm, commercially available laser systems and optics.

Emerging directions:

Long term: Water window FEL @ kHz.

Mid term: Compton source: MeV to GeV electrons, >100 mJ @ 1030 - 515 nm, keV X-rays to MeV gammas @ kHz.

Short term: Narrowband (<10%) THz radiation source driven by a train of laser pulses propagating along a plasma density geradient. THz pulses ps long with tens of µJ energy @ kHz. Kumar et al. PRL **134**, 015001 (2025).



A competitor: Smart*Light phase 1: 30 MeV electrons, 6-12 mJ @ 400 - 800 nm, 40 keV X-rays @ 1 kHz.

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