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FAST Low Energy Beamline Studies: Toward High Peak 5-D Brightness Beams for FAST-GREENS

The FAST beamline is the injector for the under-construction Gamma-Ray Electron ENhanced Source (GREENS), which promises numerous scientific advances [1]. FAST-GREENS requires high 5-D peak brightness; transverse normalized projected emittances of 3 mm-mrad and a peak current of 600 A are the minimum nominal beam requirements for the FEL to lase. In this work, studies of the low energy section of the FAST beamline are presented toward these ends, including preliminary measurements of beam compression. Further, an effort toward a high-fidelity simulation model and studies of it are presented in order to optimize the beam for FAST-GREENS. FAST is also the injector for IOTA; IOTA and future experiments also stand to benefit from a high-fidelity simulation model.

[1] P. Musumeci et al. FAST-GREENS: A High Efficiency Free Electron Laser Driven by Superconducting RF Accelerator, in Proc. of IPAC 2022, Bangkok, Thailand

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