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Design and optimization of a 5 GeV beam-driven stage for EuPRAXIA

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At FLASHForward, the plasma wakefield is driven by a high-current-density electron beams extracted from the FLASH superconducting radiofrequency (RF) accelerator. Therefore, FLASHForward is in a unique position for studying and providing insight for the design study of next-generation light sources and high energy physics facilities such as EuPRAXIA, which aim to provide industrial beam quality and user areas. After completion of the start-to-end simulation for the initial base design—a 1 GeV case including one conventional RF stage and one electron beam driven plasma stage (PWFA)—the focus of the recent studies has been centered on the upgrade to the 5 GeV case which includes maximizing transformer ratio, staging and RF tolerance studies. Specific focus has been on the optimization of the drive electron beam, as well as the significance of the predicted tolerances from the RF stage on the outcome of the PWFA stage and the optimized case. Summary of these findings and their broader impact are discussed here.

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