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Optimizing beam-matching optics for MITHRA plasma injection studies: simulation and experimental alignment

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This study focuses on developing beam-matching optics for the transport of the MITHRA beam into plasma to study long range plasma effects. To ensure successful injection into the plasma chamber, matching conditions are crucial at the entrance. A dedicated focusing system, comprising beam-matching optics, is designed to transport the beam from the 1.5-meter linear accelerator (linac) and align the necessary parameters at the plasma entrance. Optimization simulations employing Elegant and General Particle Tracer (GPT) codes, based on MITHRA gun data, have been conducted with promising results that align with our expectations. Further investigations involve simulating the PWFA interaction using advanced, fully relativistic, three-dimensional Particle-in-Cell (PIC) codes, namely OSIRIS and QuickPIC.

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