Contribution ID: **36** Type: **Poster**

Conceptual design of a laser integration scheme to the existing LUIS-beamline

A 120TW laser system called L2-DUHA is currently under development at ELI-ERIC. The laser system is designed to have a high repetition rate and high pulse energy, with the following parameters: 3J, 25fs, with a repetition rate from 50 up to 100Hz.

The L2-DUHA laser beam will be transported from the L2-hall to the E5-LUIS experimental hall using a dedicated L2-laser beam transport. Once it reaches the LUIS-target chamber, it will be focused to produce a high laser beam intensity of approximately 5x10^18 W/cm2 . This high intensity is necessary for the laser wakefield acceleration of the electron beam, required for the soft X-ray LPA-based Free Electron Laser. The goal is to achieve a high-quality electron beam with an energy of 1 GeV beam for the EuPRAXIA Phase-1.

To combine the L2-DUHA laser beam transport with the current LUIS local laser beam transport, a specialized telescope system will be needed. This system will be placed near the LUIS focusing optics and will use a Galilean telescope system. Key components of the LUIS local laser beam transport have been designed and tested at DESY in collaboration between UHH (Hamburg, Germany) and the Institute of Physics of CAS (Prague, Czech Republic). The updated version of the LUIS local laser beam transport, integrated with the telescope system, has been optimized using the Zemax software. The modeling of the laser beam propagation through the local laser beam transport shows that optical aberrations will be corrected using the LUIS off-axis parabolic mirror, in conjunction with flat mirrors to control the position of the laser beam focus inside the LUIS capillary in the target chamber. The proposed integration of the L2-laser beam transport with the LUIS local laser beam transport will be prepared in the second half of 2024 for upcoming experimental activities utilizing the L2-LUIS technologies.

Primary author: WHITEHEAD, Alex (ELI-ERIC)

Co-author: MOLODOZHENTSEV, Alexander (ELI-ERIC)

Presenter: WHITEHEAD, Alex (ELI-ERIC)

Session Classification: Poster Session & Industry Display