Contribution ID: **60** Type: **Poster presentation**

Status of COBRA: The Laser Compton Backscattering Source at the S-DALINAC*

The advent of intense beams of quasi-monochromatic polarized photons from laser Compton backscattering in the MeV energy range has revolutionized the field of photonuclear reactions [1]. A fourth generation light source comprising laser Compton backscattering from a multi-turn energy-recovery electron linac (ERL) is considered the next technological step. Such a system has not been realized, until now. We report on our developments toward this goal. The experiment for COmpton Backscattering at a Recirculating Accelerator (for short COBRA [2]) utilizes a high-power laser beam, which is well synchronized to the electron beam of the Superconducting DArmstadt LINear ACcelerator (S-DALINAC). The two beams will meet head-on at an almost 180-degree angle. The backscattered high-energy photons can be used for diagnostic and nuclear-photonic applications. A stable and precise laser beam transport to the interaction point in an evacuated beamline is ensured before COBRA will be used during an upcoming measurement campaign. The operation of COBRA in Energy Recovery Linac (ERL) mode is foreseen for the future. Therefore, a first focus in commissioning lies on the laser and its transport. The stability of the laser beam with and without stabilization system will be evaluated at various power levels as well as over time. This contribution presents an overview of the experimental setup with current measurements from commissioning.

[1] A. Zilges, D.L. Balabanski, J. Isaak, N. Pietralla, “Photonuclear reactions—From basic research to applications”, Prog. Part. Nucl. Phys. 122, 103903 (2022);
doi: 10.1016/j.ppnp.2021.103903
[2] M. Meier, dissertation, (TU Darmstadt, 2023)

*This work is supported by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – Project-ID 499256822 –GRK 2891 ‘Nuclear Photonics’ and
INST 163/308-1 FUGG

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Session Classification: Poster Session