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Stabilization of Transverse Beam Parameters at the S-DALINAC*

A new setup for Laser-Compton back-scattering has been installed at the S-DALINAC. Here, the laser beam and the electron beam of the S-DALINAC, both with a width of equal or less than 100 µm, must be stably superimposed over long periods of time. Three systems have been developed, implemented and interconnected to monitor and improve the transverse stability of the electron beam [1]: (i) A beam position monitoring system based on high-speed cameras provides transverse beam parameters with micrometer resolution at a kilohertz rate. (ii) A newly designed compensator device mitigates longitudinal and transversal perturbations from the mains frequency on the electron beam. (iii) Lastly, an active beam-stabilization system ensures high beam stability at the intended interaction point of the electron beam and laser beam. A brief overview of the design and implementation of these systems as well as performance measurements will be presented in this contribution.

[1] D. Schneider, M. Arnold, J. Birkhan, U. Bonnes, A. Brauch, M. Dutine, R. Grewe, B. Hesbacher, L. Jürgensen, I. Jurosevic, N. Pietralla, T. Ramaker, M. Rech, F. Schliessmann and G. Steinhilber, Stabilization of Transverse Beam Parameters at the S-DALINAC, Nucl. Instrum. Methods Phys. Res. A. Vol. 1077. P. 170540, 2025.
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