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Bunch shape and longitudinal measurements for non-relativistic beams at GSI LINAC

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At the heavy ion LINAC UNILAC at GSI in Darmstadt, longitudinal beam diagnostics were performed using a Bunch Shape Monitor (BSM) and a Fast Faraday Cup (FFC). These diagnostic tools allow for detailed time-resolved measurements of the longitudinal bunch structure of non-relativistic particle beams. The FFC employs a destructive measurement technique to assess the bunch-by-bunch longitudinal beam profile with a bandwidth of up to 10 GHz. In contrast, scanning the BSM integrates over multiple bunches based on the analysis of secondary electrons for an intersecting thin wire. The bandwidth of the BSM is higher than the FFC, but a scan needs several hundred beam pulses. Both devices contribute to a comprehensive understanding of the LINAC's longitudinal phase space. Furthermore, they are essential for the optimization of beam quality and stability. The working principles of the devices, measurement procedures, and results, relevant for the beam dynamics models, are presented.

Summary

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