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Tomography module for transverse phase-space measurements at PITZ

The Photo-Injector Test Facility at DESY in Zeuthen, PITZ, is used to test and optimize high brightness electron sources for free electron lasers. A key issue for such studies is the accurate determination of the beam emittance on which dedicated measurements take place.

The development of a tomography module at PITZ aims to measure the phase-space distribution of the electron beam for the two transverse planes simultaneously with improved signal-to-noise ratio. Specific features of the produced electron beam - low emittance, high charge density, moderate energy - and limited linac length, require a special design and operation. A dedicated quadrupole setup is used for FODO structures able to provide the needed for the tomographic procedure rotations of the beam in the phase space and for matching of the necessary beam parameters at the entrance of the FODO lattice. Measurement of the wanted projections is possible using a system of YAG/OTR screens and a readout system. Further processing of the acquired data using basic tomographic principles allows then reconstruction of the transverse phase-space distribution.

This work presents the final design of the tomography module installed and operated at PITZ.

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