

Orbit Correction by Dispersion Minimization in an Undulator with Superimposed FODO Lattice,
P. CASTRO, DESY - A procedure to align the beam in the FEL undulator of the TTF superconducting linear accelerator at DESY is presented. In order to achieve a high density electron beam, quadrupoles with a spacing of 0.5 m are integrated in the undulator. Due to quadrupole misalignment (about 50 microns), the spatial overlap of the electron bunch and photons being emitted will be perturbed, limiting the interaction between both beams and reducing the photon power amplification (or gain) of the FEL. These quadrupoles are made of permanent magnets and beam-based alignment techniques varying the quadrupole gradient can therefore not be applied. The procedure described in this paper consists of measuring the change of the orbit along the undulator and also at monitors outside the undulator for an electron beam energy change of about 20%. The orbit position and angle at the entrance of the undulator are kept constant in order to measure the dispersion created by quadrupole misalignments and field errors in the undulator. This dispersion is corrected using horizontal and vertical corrector magnets. Simulation results are presented, showing that a corrected orbit rms of 10 microns (in average over 1000 random seeds) can be achieved provided an orbit measurement resolution of about 1 micron.