

Uncorrelated Emittance Growth in the TTF-FEL Bunch Compression Sections Due to Coherent Synchrotron Radiation and Space Charge Effects,
M. DOHLUS, A. KABEL, T. LIMBERG - In the bunch compressing sections of the Tesla Test Facility Free Electron Laser [1] short bunches travel on trajectories with small bending radii. Thus, coherent synchrotron radiation will play a significant role in beam dynamics. The energy loss of the bunch will vary longitudinally as well as transversally across the bunch and will induce an emittance growth. This emittance growth will affect the projective as well as the slice emittance (i.e., the emittance of sub-ensembles of particles with equal longitudinal position). The computer simulation code WAKE calculates the fields in the bunch from first principles, thus taking into account radiative as well as space charge effects, which are inseparable on curved trajectories. In addition to dealing with longitudinal dynamics [2], this code has now been extended to handle the transversal dynamics of the bunch. We use it to study the behavior of the fields across the beam and the resulting slice and projective emittance growth. We study its dependence on bunch parameters such as charge and shape and investigate possible cures by shielding.

- [1] A VUV Free Electron Laser at the TESLA Test Facility at DESY. Conceptual Design Report. DESY Print TESLA-FEL 95-03
- [2] M. Dohlus, T. Limberg: NIM A 393, 494 (1997)