

# Magnetic field imperfections of in-vacuum undulator on PLS-II beam dynamics

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Many research applications in basic sciences and biology such as protein crystallography require hard x-rays in the range of 3-20 keV with high brightness. A medium energy storage ring as PLS-II with a beam energy of 3 GeV can meet such high photon energies. In-vacuum undulators (IVU) with a period length of 20 mm and a peak field of 0.97 T are used in the PLS-II ring to produce such X-rays in the fundamental or higher harmonics. Due to the many poles and high fields, insertion devices like wigglers and undulators have a significant impact on the stability of the electron beam with potential degradation of beam quality and life time. Therefore, nonlinear fields must be determined by measurement and evaluated as to their impact on beam stability. Specifically, transverse field roll-off can be a serious detriment to injection in top-up mode and must be corrected. We use magnetic field measurement data to evaluate beam stability by tracking particles using an explicit symplectic integrator in both, transverse and longitudinal planes.

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