Abstract Submitted
for the APR14 Meeting of
The American Physical Society

Pulsed-Wire Method for Characterization of Undulator Magnet

ALEX D'AUDNEY, Colorado State University — The performance of a Free Electron Laser (FELs) depends in part on the integrity of the magnetic field in the undulator. The magnetic field on the axis of the undulator is transverse and sinusoidally varying due to the periodic sequence of dipoles. The ideal trajectory of a relativistic electron bunch, inserted along the axis, is sinusoidal in the plane of oscillation. Phase errors are produced when the path of the electron is not the ideal sinusoidal trajectory, due to imperfections in the magnetic field. The result of such phase errors is a reduction of laser gain impacting overall FEL performance. A pulsed-wire method can be used to determine the profile of the magnetic field. This is achieved by sending a square current pulse through the wire, which will induce an interaction with the magnetic field. Measurement of the displacement in the wire over time using a motion detector yields the first or second integrals of the magnetic field. Dispersion in the wire can be corrected using algorithms resulting in higher accuracy. Once the fields are known, magnetic shims are placed where any corrections are needed. This pulsed-wire method will be used to characterize an undulator which has 50 periods of 25 mm each. The undulator has a K value of 1 and a betatron wavelength of 300 nm for an electron beam of 6 MeV.

Alex D'Audney
Colorado State University

Date submitted: 14 Nov 2013 Electronic form version 1.4