

Linear Accelerator Based X-Ray Sources: Temporal and Spatial Coherence

J. B. Hastings

SSRL

Stanford Linear Accelerator Center

Accelerator based synchrotron radiation (SR) sources are now commonplace in the world with the USA (APS), Japan (Spring-8) and Europe (ESRF) each operating storage ring sources in the hard x-ray energy range that provide unique radiation for studies in the chemical, biological and materials sciences. These sources are critical to the understanding of complex static structures and through inelastic x-ray scattering the dynamics. They have also been applied to time resolved diffraction on the scale of the photon pulse length ~ 100 psec. Photon beams with all the properties of SR but with pulse lengths of ~ 100 fsec are now available from linear accelerator based sources, for example the Sub-Picosecond Pulse Source (SPPS) at the Stanford Linear accelerator Center (SLAC). X-ray free electron lasers providing unprecedented pulse intensities, full transverse coherence, and pulse lengths of ~ 100 fsec. are operating in the 100nm wavelength range and are in various stages of planning to reach the 0.1 nm range. The FEL process and the unique properties of these sources will be discussed.