



Soft X-Rays and Extreme Ultraviolet Radiation

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AST210 / EE213
Fall 2005, Tu-Th 2:00-3:30 pm
cc #03602 (AST), #25715 (EECS)

□□ This course explores modern developments in the physics and applications of soft x-rays and extreme ultraviolet radiation. Following a brief review of atomic physics and relevant absorption edges, the lectures consider electromagnetic radiation at short wavelengths, including dipole radiation, scattering and refractive index using a semi-classical atomic model. Subject matter includes the generation of x-rays with synchrotron radiation (bending magnet, undulator, and wiggler radiation), laser-plasma sources, high harmonic generation, x-ray/EUV lasers, and black body radiation. Concepts of spatial and temporal coherence are described, along with applications to interferometry, scattering, and imaging. Topics in x-ray optics include total external reflection, multilayer coatings, Kirkpatrick-Baez focusing, zone plate (diffractive) lenses, microscopes and EUV telescopes. Applications include high resolution (15 nm) soft x-ray microscopy, examples in the life and physical sciences, generally with elemental and chemical sensitivity. Recent progress with three-dimensional imaging of biological samples using high resolution nano-tomography will be presented, as well as studies of magnetic nanostructures and operational electronic devices. Extreme ultraviolet lithography for future (2009) 19 GHz nanoelectronic devices, with sub-20 nm features, is also discussed. Prerequisite: knowledge of Maxwell's equations, undergraduate modern physics, vector calculus. All majors welcome. First lecture August 30, 2005.

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