

MAR07-2006-002110

Abstract for an Invited Paper
for the MAR07 Meeting of
the American Physical Society

New x-ray sources illuminate hidden corners of space and time – revolutionary solid-state science and how we'll get there through the Advanced Photon Source upgrade¹

J. MURRAY GIBSON, Argonne National Laboratory

Third-generation x-ray storage ring sources have major impact in condensed-matter and materials physics. Many cutting-edge experiments, including nanoscale imaging and studies of fast dynamics, demand shorter and more spatially coherent x-ray pulses. Unfortunately, these parameters are intrinsically limited by the physics of storage rings. Many experiments at sources such as the Advanced Photon Source (APS) could benefit from revolutionary performance that is promised by fourth-generation capabilities. The key element which makes fourth-generation sources better in these respects is that the electron beam does not travel long enough (is not “stored”) for the pulse to come to equilibrium. We are proposing to introduce such a beam into the APS storage ring through an Energy-Recovery LINAC concept, as part of a major upgrade. I will describe some of the research in condensed matter and materials physics which demand this upgrade, and outline the technical performance and our plans to realize the upgrade.

¹Work supported by U.S. Department of Energy, Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.