innovative biological research. However, there is a gap in the life sciences between the detailed molecular information that can be obtained with the above methods and the precise location of such complexes in functioning cells. There is scope for new imaging technologies. At Diamond we are exploring new beam lines that exploit coherent diffraction imaging and soft X-ray microscopy and the possibilities of new light sources.

Keywords: diamond light source, life sciences research, macromolcular complexes

MS.90.2

Acta Cryst. (2008). A**64**, C151

A compact X-ray free electron laser at SPring-8

Tetsuya Ishikawa
RIKEN, SPring-8 Center, Kouto 1-1-1, Sayo, Hyogo, 679-5148, Japan, E-mail：ishikawa@spring8.or.jp

Japan launched a construction project of x-ray free electron laser (XFEL) in 2006, as one of five Key Technologies of National Importance, to complete in 2010 fiscal year. The XFEL emits coherent hard x-rays which will be extremely useful for exploring the nano-world. The operation principle of the Japanese XFEL at the initial phase will be self-amplified spontaneous emission (SASE), as the precedent two projects in the U.S. and Europe. The XFEL will be composed of a linear accelerator and a long undulator in which electrons interact with photons to form micro-bunches with the period of emitted radiation. The micro-bunched electrons radiate coherent photons when they run through the undulator. The unique feature of the Japanese XFEL is the use of in-vacuum undulator. This makes the magnetic period of the undulator shorter than that of conventional out-of-vacuum undulators, leading to the reduction of the electron energy to produce certain energy of x-ray photons. Therefore, the length of the linear accelerator will be shorter, and the whole facility will be more compact. However, lower electron energy requires higher beam quality to produce lasing than is realized by a conventional laser-RF gun system. We have developed a new injector system, instead, which was fully proven in the operation of a prototype ultraviolet FEL. The present status of the project will be reported together with scientific programs using the XFEL, synergetic use of XFEL and SPring-8, and the second phase program for seeded XFEL. Some recent result from the prototype FEL will be introduced as well.

Keywords: X-ray free electron laser, coherent radiation, accelerator based x-ray source

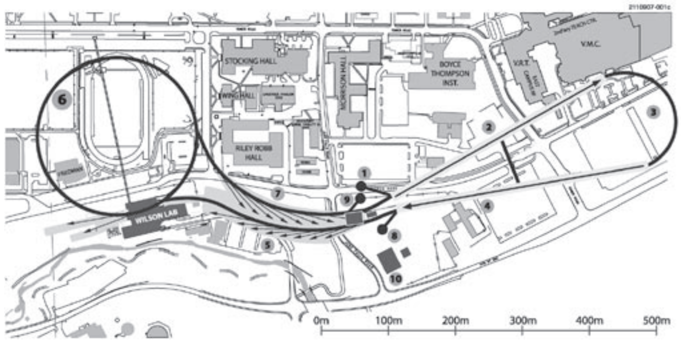
MS.90.3

Acta Cryst. (2008). A**64**, C151

Status of the Energy Recovery Linac (ERL) project at Cornell University

Sol M Gruner
Cornell University, Physics Dept. & CHESS, 162 Clark Hall, Ithaca, NY, 14853-2501, USA, E-mail：smg26@cornell.edu

The status of the Energy Recovery Linac (ERL) project at Cornell University is summarized. ERLs are being developed as next generation synchrotron light sources. The fundamental x-ray beam properties from storage ring sources, such as the source size, spectral brightness, and pulse duration are limited by the dynamic equilibrium characteristic of the magnetic lattice that is the storage ring. Advances in laser-driven photoelectron sources and superconducting linacs allow the acceleration of electron bunches with superior properties for synchrotron radiation, and superconducting linac energy recovery allows the development of an x-ray ring without the need for electron storage. Relevant properties include x-ray beams of extraordinary spectral brightness and small source size, with concomitant high transverse coherence, sub-picosecond x-ray pulse durations, and flexibility of operation. ERLs are capable of hosting practically all experiments now being carried out at storage rings while also enabling new types of experiments. Progress is reported on development of the required high-spectral brightness photo-injector and superconducting linac. X-ray applications are discussed.



Keywords: X-ray synchrotron radiation, technology, instrument development

MS.90.4

Acta Cryst. (2008). A**64**, C151-152

Electron storage ring based tabletop light source named MIRRORCLE for protein crystallography

Hironari Yamada[1,2], Masaki Morita[2], Takayasu Hanashima[2], Ahsa Moon[1], Tuyoshi Shirai[3]
[1]Ritsumeikan University, Synchrotron Light Life Science Center, 1-1-1 Nojihigashi, Kusatsu, Shiga, 525-8577, Japan, [2]Photon Production Laboratory Co. Ltd., [3]Nagahama Institute of Bio Science and Technology, E-mail：hironari@se.ritsumei.ac.jp

Light source based on a 20 MeV storage ring has been commissioned. The average stored beam current was more than 2A at 400Hz beam injection. We have observed an extremely short 15 ms damping time, a small 3 mm diameter beam size, and a long 1 min lifetime to this low energy and 15cm orbit radius electron storage ring. We generate X-rays by a 10 micron size target placed in this storage ring. The observed X-ray density is more than that of 1kW X-ray tube, but the spectrum is polychromatic. The X-ray energy extends up to 20 MeV and the total power is 100W when an accelerator power is applied. We have commissioned a crystal monochrometer beam line. A special configuration enabled extracting tunable monochromatic X-rays onto the fixed sample position. The 10 to 30 keV rage x-rays is extracted. We have carried out EXAFS and found that the energy resolution is satisfactory for the protein crystallography (see fig.). Due to a background radiation around the beam line and a poor performance of CCD camera, diffraction pattern is