Future Light Source based on Energy Recovery Linac at Japan

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Even though there have been many synchrotron radiation facilities in Japan including a 3rd generation light source like Spring-8, it is necessary to progress the new project for future light source because of the increasing demand of further sophisticated synchrotron radiation research based on sub-ps X-ray pulses and spatially coherent X-ray beams . For example, the sub-ps X-ray pulses make it possible to investigate phenomena in non-equilibrium states of materials and the atomic and electronic structural changes of materials. The investigation is one of the key points to understand the activities of the related materials, chemical reaction, and phase transition and so on. Spatially coherent X-rays are necessary to enable several new experimental techniques including coherent X-ray imaging to investigate the structure of non-crystalline materials. In particular, X-ray photon correlation spectroscopy using the so-called dynamical speckle patterns can be employed to investigate the fluctuation of domain formations in materials.

Another reason is that the Photon Factory at KEK, which is one of the important synchrotron radiation facilities at Japan, is more than 20 years old and it is necessary to settle the renewal of the light source. Actuary, last year (2005), the necessity to build a new light source at the Photon Factory has been discussed with users and accelerator scientists all over Japan. After extensive discussions, it has been concluded that a 5 GeV energy recovery linac (ERL) should be the most suitable candidate as the future light source to foster cutting edge experiments and support a large variety of user needs from VUV to X-rays.

Japan Atomic Energy Agency (JAEA), which has already built a low energy (17 MeV) ERL, and KEK proposed each own 5-6 GeV ERL project for the future light source. Thereafter, these institutes with a participation of the members of Institute for Solid State Physics, University of Tokyo (ISSP) agreed to promote an ERL-based next-generation synchrotron light source in Japan based on their stimulated technologies. Given the state of the ERL developments worldwide, it is necessary to construct a prototype ERL, with the energy of ~200 MeV to develop several critical components such as electron guns and superconducting cavities. We are planning to construct together the prototype ERL at the KEK site. To this end, the official organization of the ERL project office has started at KEK from 1st of April 2006. An R&D team for the prototype ERL is going to be organized in collaboration with accelerator scientists from the other facilities, UVSOR and SPring-8.

We present the outline of the ERL project including the scientific case, and the detail of the present status of R&D of the accelerator will be appear in another poster.