1 ERL Project Overview

KEK established the ERL (Energy Recovery Linac) Project Office in April 2006. Because a GeV-class ERL machine had not been constructed anywhere in the world, it was necessary to first construct a compact ERL (cERL) with an energy of 35 MeV that could be used for the development of several critical accelerator components such as a high-brilliance DC photocathode electron gun and superconducting cavities for the injector and main accelerator. In the 2013 fiscal year, the cERL were successfully installed in an ERL test facility and the energy recovery beam operation has been successfully demonstrated.

In 2013 fiscal year, the commissioning of the cERL has been done by two-steps. The first step is the commissioning of the injector part; the high-brightness DC electron gun and superconducting cavity for injector and other component to examine the electron beam qualities. The beam test successfully has been completed from April to end of June. Then, during the period of July to November, the recirculation loop; electric magnets, beam monitors and vacuum components, has been installed, and we could start the commissioning of the whole energy recovery Linac from the end of December. The commissioning has successfully progressed and the ERL operation as shown in Fig. 1 has been confirmed at 12th of March with the following machine parameters. The electron beams are accelerated up to 390 keV by the DC electron gun, then up to 2.9 MeV by the injector super-conducting cavity, and finally up to 20 MeV by the main linac super-conducting-cavity. Then, the return electron beams are decelerated by the superconducting cavity down to 2.9 MeV and go to a beam dump. The beam current is 6 μA. The beam current will be increased up to 10 mA at least in a step-by-step manner for several years and also we will install laser-Compton-Scattering (LCS) X-ray beamline at next fiscal year 2014.

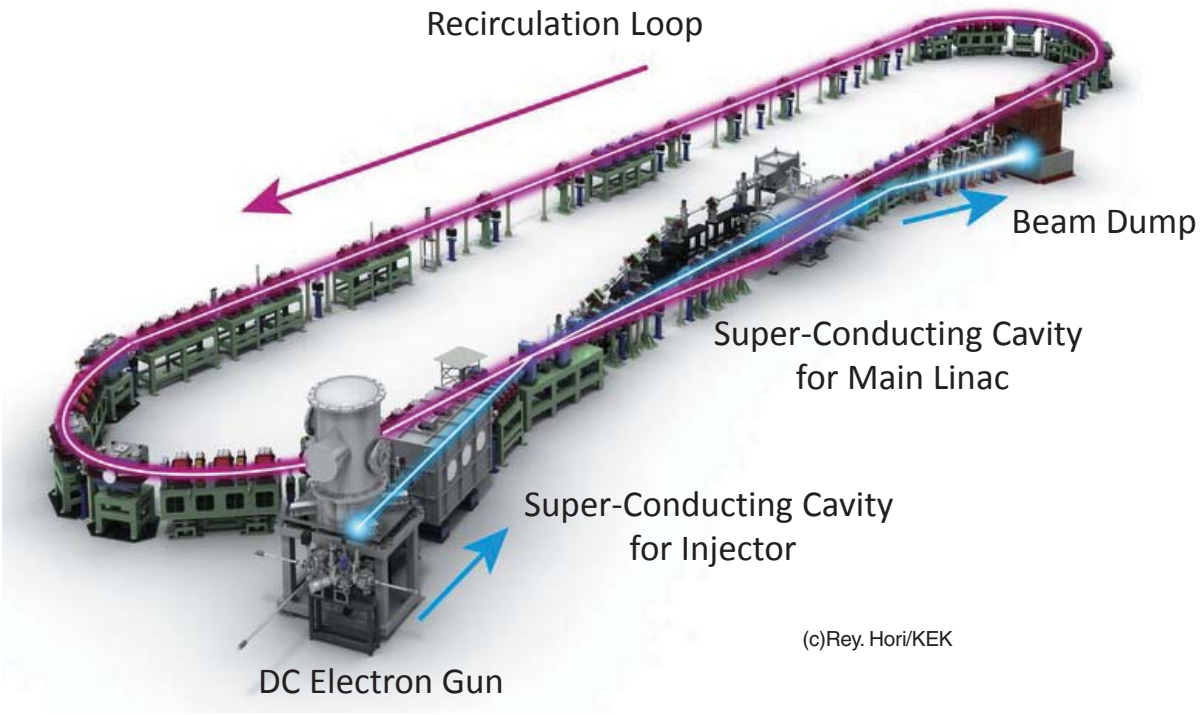

Figure1: Bird view (CG) of the cERL. The energy of the electron beam from the injector to main linac is 2.9 MeV(blue color), then the electron beams are accelerated up to 20 MeV (red color) by the super conducting cavity for main linac. The electron beams return back to the cavity with energy of 20 MeV and are decelerated down to 2.9 MeV, then go to a beam dump.