3. Activities of Accelerator Group

3.1. Accelerator Research and Development

We fabricated an input coupler prototype for an ERL main SC cavity and performed the high power test under liquid nitrogen cooling. In the high power test, we could input the power up to 25 kW and also keep the input power to 20kW for 16 hours. After the high power test, a thermal cycle test of the cold window of the coupler prototype was performed. After 10-times thermal cycles between the room temperature and liquid nitrogen temperature, no leaks and cracks were observed in the cold window. From these results, this prototype coupler was confirmed to satisfy thermal and RF requirements.

An Yb fiber laser amplifier developed for an ERL photocathode gun was improved and its output power was increased up to 31 W from 10 W. A small part of the amplifier output was fed to a highly nonlinear photonic crystal fiber and, as a result, super-continuum light with a spectrum covering 800nm range was successfully generated. The super-continuum light will be used as seed light for an OPA(optical parametric amplifier), which amplifies the seed light by using as the excited light the second higher harmonic light generated from a large part of the amplifier output and an LBO crystal. The final goal is to generate 15 W output of the 800-nm laser at the photocathode of an ERL electron gun.

We demonstrated by measuring turn-by-turn stored beam profiles at the the Photon Factory(PF) ring that the pulse sextupole magnet(PSM) injection method dramatically reduces not only the coherent dipole oscillation but also the beam profile modulation during injection as compared with the conventional injection method using several kicker magnets. The top-up injection with the pulsed sextupole magnet will be used for user operation at the PF ring from January 2011.

A flipping coil system was fabricated and installed in the SOR building of ISSP for measuring DC integrated magnetic fields of magnets quickly. DC integrated magnetic field of an electromagnetic phase shifter prototype for the polarization-controlled undulator that installed at a 30-m long straight section of the SPring-8 storage ring was successfully measured with this flipping coil system.