First photon beam observation at LEPS2

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The construction of a new laser-electron photon beam line, LEPS2, has started at BL31LEP in 2010. Based on the experience in the LEPS experiments, the LEPS2 project aims to improve the beam intensity one order of magnitude and to enable the installation of the large acceptance detector with high resolution.

The LEPS2 project reached a milestone in 2013. On January 27, the first photon beam at BL31LEP was successfully observed in the measurements of energy spectrum, beam profile and beam intensity. In the beam commissioning, two 16-W lasers and a 24-W laser with the wave length of 355 nm were used and injected simultaneously. The energy spectrum measured with a BGO crystal calorimeter and beam profile measured by a position counter with scintillating fibers are shown in Fig. 1. The Compton edge of 2.4 GeV is clearly identified for the laser-Compton scattering (LCS) gamma rays and the small beam size (< 10 mm in RMS) was confirmed as expected. The Compton scattering rate was estimated to be about $7 \times 10^6 s^{-1}$ for the 100-mA storage electron current.

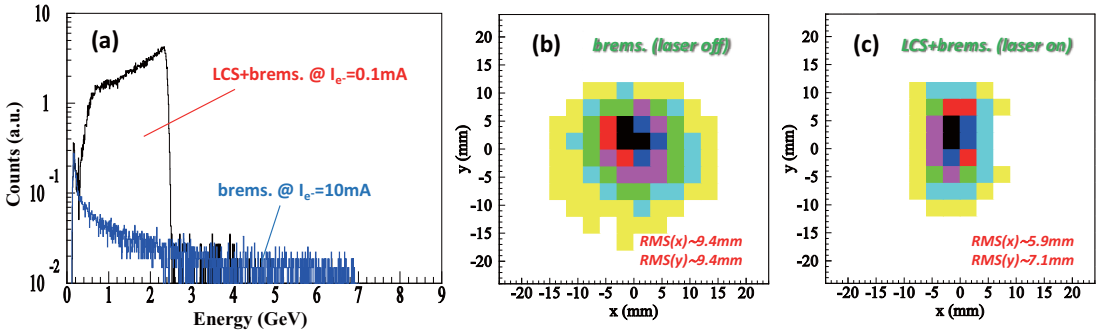

Figure 1: (a) Energy spectra of the photon beam in the case of laser ON and OFF, respectively. The vertical scale is normalized by the electron beam current. (b) Beam profile for the Bremsstrahlung photon only (laser OFF). (c) Beam profile in the case of laser ON.

In the LEPS2 experimental building, we have been preparing two detector systems. One is a large acceptance charged particle spectrometer using a large 1-T solenoid magnet transported from the Brookhaven National Laboratory (BNL) in U.S. Several chambers and counters which will be placed inside the solenoid are still under the construction. Another detector is an electromagnetic calorimeter, BGOegg, consisting of 1320 BGO crystals, which has been developed by the ELPH group in Tohoku University, and is now placed upstream of the solenoid magnet. A photograph of the inside of the LEPS2 experimental building is shown in Fig. 2. After many efforts for the setup of detectors and for the preparation of the data acquisition system, the commissioning run has been done with the BGOegg. The full-scale BGOegg experiment starts from April, 2014 to investigate the η' meson physics, etc.

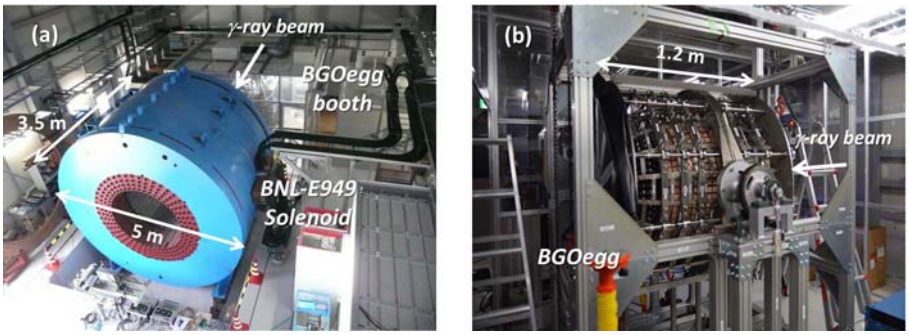

Figure 2: Photograph of the inside of the LEPS2 experimental building. (Left) The BNL/E949 solenoid magnet is installed around the center of the room. (Right) The BGOegg is placed in the clean booth upstream of the magnet.