

LEPS upgrade and LEPS2

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The Laser-Electron Photon facility at SPring-8 (LEPS) is a unique facility with the cleanest photon beam in the world at multi-GeV energies. The photon beam produced by means of laser-induced backward Compton scattering from 8 GeV electrons has rather flat energy distribution with small spreading angles. The LEPS experiments have been carried out since 2000 mainly using the forward charged-particle spectrometer to search for the pentaquark, and to study the ϕ -meson production, hyperon photoproduction, etc. However, the low beam intensity and limited acceptance have restricted the further investigation, especially for concluding the Θ^+ existence. Therefore we have been upgrading the LEPS facility since 2004.

The sideway acceptance has been covered by newly constructing a Time Projection Chamber (TPC) which is inserted in a 2-T solenoid magnet with the inner bore size of 60-cm diameter. A hyperon resonance of $\Lambda(1405)$ was firstly studied with this TPC. A simultaneous injection system of two 355-nm quasi-CW solid-state lasers have successfully increased the beam intensity about twice. And the maximum beam energy has been upgraded from 2.4 GeV to 2.96 GeV by introducing a deep-UV (257 nm) laser. A polarized solid HD target is now under development and will be used for the double polarization measurement at LEPS in near future.

Unfortunately the momentum resolution and particle identification in the TPC are insufficient due to its small size which is restricted by the size of the experimental hutch. Multiple laser injection more than two is also impossible in the present beam line due to its small aperture. Then we have started a new project to construct the second beamline at SPring-8 (LEPS2). The project aims to improve both the intensity and maximum energy of the photon beam and expand the detector acceptance with high momentum resolution by adopting the BNL-E949 detector, which is a hermetic detector in a large 1 T solenoid. The central region of tracking chambers will be upgraded for LEPS2. A large experimental hutch will be constructed outside the SPring-8 experimental hall by employing a beam line with a 30-m straight section, which has the best beam emittance. A schematic view of the LEPS2 facility is illustrated in Figure 1.

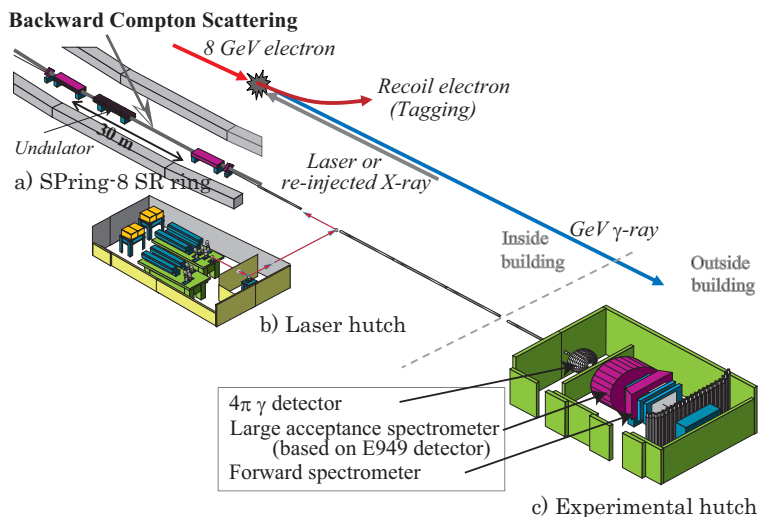


Figure 1: Schematic view of the LEPS2 facility.