

BL33LEP Laser-Electron Photon

Backward Compton scattering of ultraviolet laser photons off circulating 8-GeV electron beam in the SR ring produces a GeV energy polarized γ beam (laser electron photon). At usual operation, 350-nm Ar laser photons are injected from the Laser Hutch into the straight section between the BM1 and BM2 bending magnets of the SR ring. By transferring momentum from an 8-GeV electron to a laser photon via the Compton scattering, the energy of the scattered photon becomes 2.4 GeV at the maximum. The scattered electron goes through the BM2 magnet and is detected with a tagging counter placed besides the CR2 chamber. By measuring the position of the electron at the tagging counter, using the BM2 magnet as a magnetic spectrometer, we can tag the energy of corresponding photon. Due to the limitation for the distance between the tagging counter and the 8-GeV orbit, the lowest energy of the tagged photon is 1.5 GeV. When the laser beam is polarized, the scattered γ beam is also polarized and the polarization is almost 100 % at the maximum energy point. The laser electron photon beam is transported to the Experimental Hutch and utilized for particle and nuclear physics experiments. The LEPS (Laser Electron Photon at SPring-8), which consists of a large dipole magnet, several position detectors, and time-of-flight counters, measures the momentum and the speed of charged particles.

Area of research

Meson photoproduction from nucleon and nucleus
 Photoexcitation of hyperons, nucleon resonances, and other exotic states
 Photonuclear reactions
 Beam diagnoses
 Test and calibration of detectors with GeV photon beam

Keywords

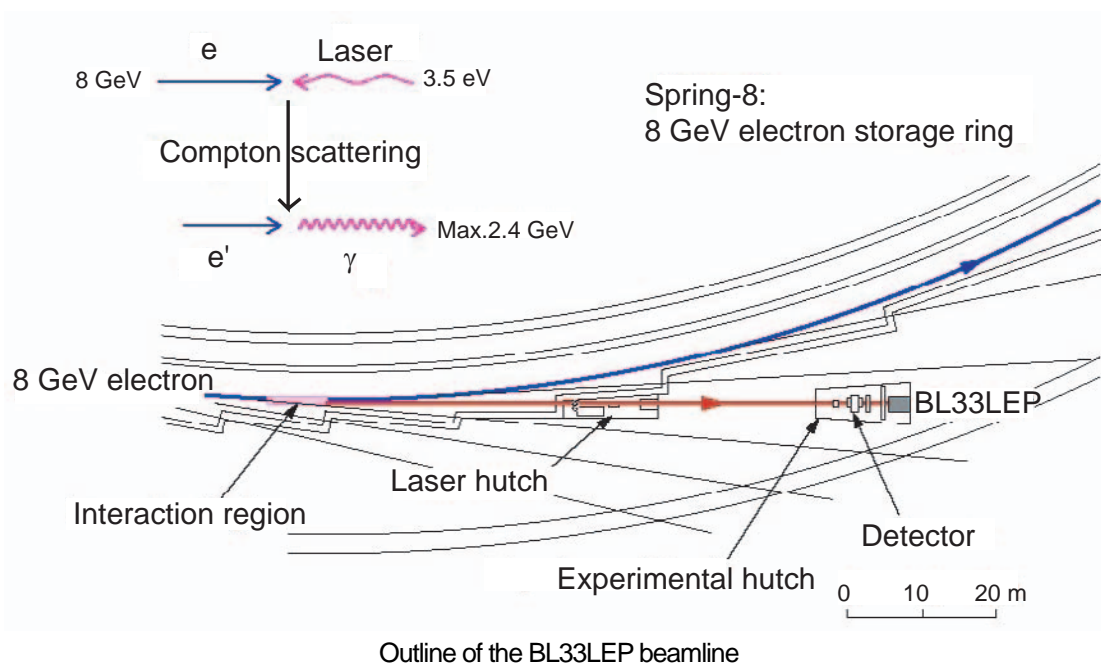
Scientific field

Quark nuclear physics, Exotic states, Baryon spectroscopy, Photoproduction, Laser-electron photon, Polarization

Equipment

Laser, Tagging, Calorimeter, Time projection chamber, Charged particle spectrometer, Polarized photon, Polarized target, Data acquisition system, SSD

Source and optics



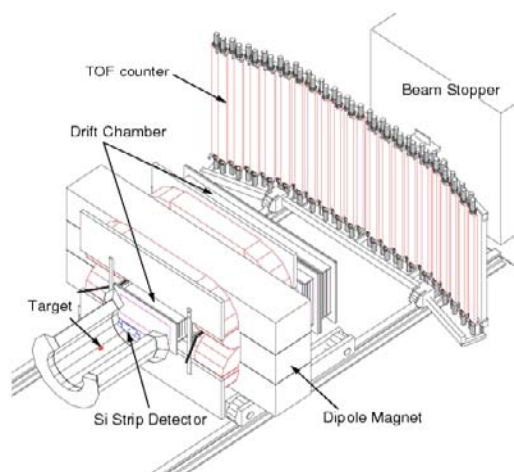
Experimental stations

Beam

Energy range (tagged photon) 1.5 ~ 2.4 GeV (350-nm Ar laser)

Typical intensity ($0 \sim E_{\max}$) 3×10^6 photons/sec

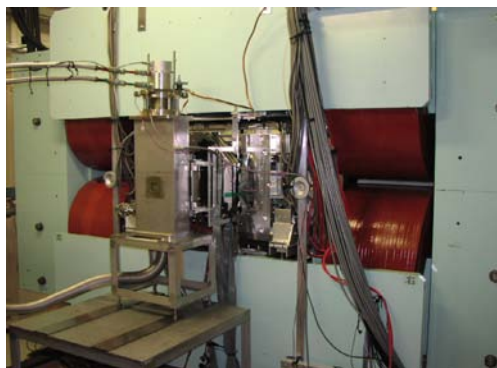
Detectors



The LEPS spectrometer

Charged particle spectrometer

The design of the LEPS detector is optimized to measure the ϕ -photoproduction reaction at the forward angles. The detector consists of a plastic scintillator to detect charged particles after a target, an aerogel Cherenkov counter, silicon-microstrip detector, drift chambers, a dipole magnet, and a time-of-flight TOF counters. The detector measures the momentum of the charged particles produced at the target. The particle identification is performed by measuring the time of flight of momentum analyzed particles from the target to the TOF wall. The first physics run with a liquid hydrogen target was started in December, 2000.

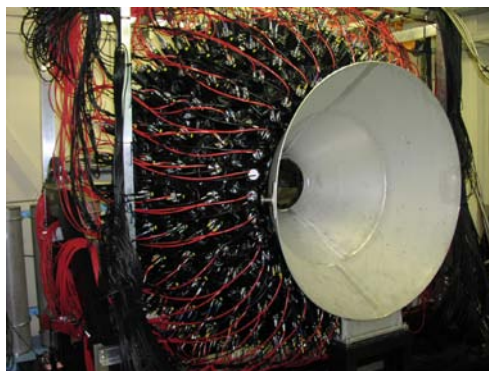


Upstream side of the LEPS spectrometer

Gamma counter

Pb-Scintillating fiber counters are used for the measurement

of mesons decaying into photons. The backward counter consists of 252 Pb-SciFi counters and covers from $\theta = 30$ to 100 degrees.



The LEPS backward gamma counter

Time projection chamber

A time projection chamber has been built for measuring Σ^\pm hyperon decaying within a few cm from the target. The detector have large acceptance for charged particles at large angles, which cannot be covered by the forward LEPS spectrometer.



Time projection chamber tested beside BL33LEP

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