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Few-Body Systems


# Beam Polarisation Asymmetries in Meson Photoproduction at Graal

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Meson photoproduction on the nucleon has been a major source of information on the N and $\Delta$ resonances and the transition matrix elements from the nucleon ground state to its excited states.

Polarisation observables have enhanced the sensitivity to the contributions of the less pronounced resonances since they depend mostly on the interference terms among the four helicity amplitudes [1, 2]. In particular the beam asymmetry for linearly polarised photons is given by:

$$\Sigma \sim \mathrm{Re}(H_1 H_4^* - H_2 H_3^*). \tag{1}$$

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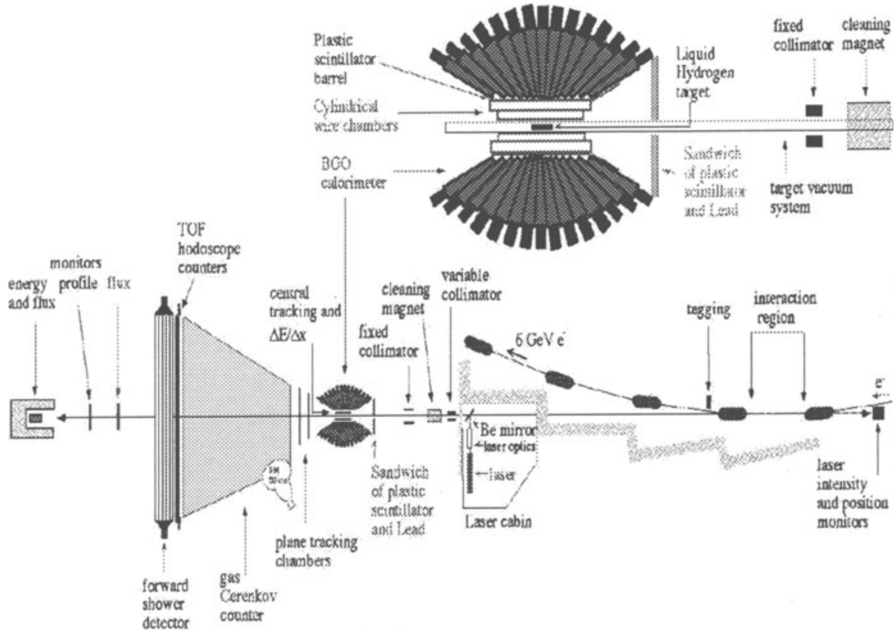


NOT IN SCALE

**Figure 1.** The Graal experimental layout (not in scale). The gas Cerenkov counter is still under construction.

The Graal facility provides a polarised and tagged photon beam by the backward Compton scattering of laser light on the high energy electrons circulating in the ESRF storage ring [3]. Using the UV line (350 nm) of an Ar-Ion laser we have produced a gamma-ray beam with an energy from 550 to 1470 MeV. Its polarisation is 0.98 at the maximum photon energy and the energy resolution has been measured to be 16 MeV (FWHM). Using the green line of the same laser we have measured the beam polarisation asymmetries in the photoproduction of $\eta$ [4] $\pi^o$ and $\pi^+$ in the energy region 550-1100 MeV.

The experimental apparatus is indicated in Fig. 1. Electrons, scattered by the photons, are momentum analysed by the first dipole of the ring lattice and their position, relative to the circulating electron beam, is measured by the tagger. The tagging detector is located inside a rectangular box with one side parallel to the electron beam at a distance of 10 mm from it. Inside this vacuum box are located a Densimet shielding box and inside it 10 plastic scintillators and a solid state Silicon microstrip detector with 128 channels and a pitch of 0.3 mm. The position of the microstrip traversed by the scattered electron, gives the energy lost by it and therefore the energy of the gamma-ray.

The gamma-ray beam traverses the Beryllium mirror, used to reflect the laser beam, exits the accelerator vacuum system and is collimated in air by four remotely controlled Lead blocks. Then it enters the vacuum system of