PR12-18-005

Timelike Compton Scattering off a transversely polarized proton

Proton Detection with hodoscope

- Figure 25 shows the expected rates in the hodoscope and even for paddles furthest away from the beam line the expected rates are at about 15 MHz which is an order of magnitude higher than the capability of such detector. Reducing the geometrical size of the individual scintillator paddles to reduce the rates (as mentioned on page 41) is not sufficient at all, in particular for paddles closer to the beam line where the rates reach over 100 MHz.
- The identification of protons relies on measuring energy loss (dEdx) and the proton momentum, however, the momentum is not measured only inferred from the hit position.

Calorimetry

- The proposed calibration similar to the PrimEx experiment (as mentioned on page 37) is not possible because they had a tagged photon beam where they could move each individual calorimeter block into the photon beam at low intensity.
- The quoted expected energy resolution and position resolution (on page 37) can not be achieved with a readout threshold for the individual block of 200 MeV as suggested in figure 24 due to the high rates. The PrimEx readout threshold was about 2 MeV in phase one. In PrimEx II there was no threshold and hence no sparsification. This approach is certainly not viable for this experiment.

- The separation between π and $e^{\pm}$ is listed in table 2 to be of order 10^2 and the combined rejection factor for two pions is quoted to be between 10^3 and 10^4 (see page 52). This is not possible with a simple energy cut on the calorimeter data as stated on page (41) together with xy-position cut (see page 37). In order to achieve rejection factors as quoted above, separate particle momentum determination is necessary.

Electronics and Trigger

- The statement on page 42 "These detectors will be combined Hall C basic electronics and DAQ." is very vague.

- The DAQ trigger is quoted to be easy to implement (page 14). This is not necessarily the case. In particular creating position weighted energy sums will require dedicated electronics hardware that HallC needs to procure. In addition firmware and other software needs to be developed for this purpose.

- The collaboration should develop an schematic of the DAQ layout including an estimate of the cables and electronics they will require as well as a rough timing diagram.

Polarized Target

The high photon flux beam from the CPS is equivalent to a 100 nA electron beam. This is sufficient to degrade the target polarization in a very short time. A rotation system of the polarized target cell is mentioned (page 36) but no details of its functionality, its impact on the target polarization and its determination are not provided.

It is not clear what the distance between the CPS and the polarized target is. The impact of the stray field from the target solenoid on the CPS and its beam dump needs to be investigated. And conversely does the presence of the CPS with its material cause any adverse effect on the polarized proton target or the magnet?