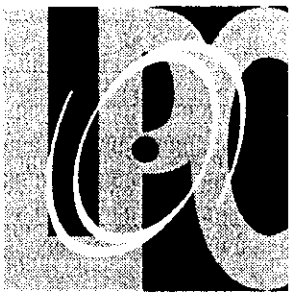

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DVCS Test Run Proposal

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1 Introduction

The P00-110 proposal for Jefferson Lab Hall A plans to measure the process $H(e, e'p\gamma)$ in triple coincidence [1]. This experiment requires the use of the Real Compton Scattering E99-104 electromagnetic calorimeter and a dedicated recoil proton detector, consisting of a ring of scintillator elements. Both detectors will have to sustain high levels of background and high counting rates:

- the calorimeter will be located at low angles, as low as 15° relative to the beam direction, and close to the beamline,
- the recoil proton detector will be placed between 13° and 23° relative to the beam direction, approximately 60 cm from the target.

Both detectors will be in direct view of the target.

2 Goals

What limits the luminosity of the DVCS experiment is the counting rates in the calorimeter and the recoil proton detector. The design of the proton detector depends strongly on the maximum rate it will have to sustain. Therefore we need to carry out measurements to determine counting rates in both detectors and optimize our experimental setup, allowing us to reach the highest possible luminosity.

3 Setup

We will measure counting rates in a scintillator telescope and a Pb-glass block:

- The scintillator telescope consists of 3 scintillator blocks shielded by a $\approx$2 g/cm^2 Aluminum absorber. The frontmost scintillator block has dimensions $4 \times 4 \times 2$ inch^3. The two other blocks have dimensions $8 \times 8 \times 2$ inch^3. The recoil protons from the DVCS process have a momentum between 400 MeV and 1 GeV. The proton detector will be placed on a platform that can be moved around easily since the telescope will not weight more than 100 kg. The platform will be located 3 m from the target, corresponding to the same solid angle as the real setup which will use smaller elements. This platform will be moved in the angle range 20–60° relative to the beamline. The physicists responsible for this test will take care of moving this platform, since it doesn't require any lifting device.
- The Pb-glass block measures $15 \times 15 \times 35$ cm^3, and will be placed on the "magnet stand", 10° relative to the beamline, 10 m from the target. For calibration purposes, we will move the stand to higher angles to match the elastic kinematics with the proton detector.

High voltages for both the scintillator telescope and the Pb-glass block will be provided by the Hall A high voltage crate. The analog signals will be sent to the second floor of the counting house, using already existing long cables. We will use the DAQ testbench located on the second floor of the counting house. We plan to instrument those detectors with both ADC's and TDC's.

4 Run plan

- Calibration of scintillator telescope and Pb-glass block using elastic scattering. This will give us the relation between the threshold value in mV and the corresponding threshold energy in MeV. Several accesses will be needed to change the location of the detectors to match the elastic kinematics.
- Measurement of the counting rates in the scintillators for various beam intensities with the threshold set at 50% of the minimum ionization energy.
- Measurement of the counting rates in the scintillators for various threshold values.
- Measurement of the Pb-glass counting rates for various threshold values.

The counting rates measurements will be performed at several different angles for both the scintillator telescope and the Pb-glass block. We estimate that about 5 accesses will be needed during this test run.

5 Requirements

- Beam energy as high as possible, preferably greater than 5 GeV.
- Beam current from 1 to 10 μA for luminosity scans.
- 15 cm LH2 target.
- One of the HRS located at more than 90° relative to the beamline.
- The other HRS located at more than 45° relative to the beamline.
- Scintillator telescope platform between 20 and 60°, 3 m from the target. We will need to use the crane at setup time and at the end of the test run to move the scintillator platform on either side of the spectrometer such that it does not interfere with spectrometer motion.
- Pb-glass stand at 10°, 10 m from the target.

We estimate that we need 2 shifts to perform the test run including setup time and required accesses in the Hall.

References

[1] Y. Roblin, F. Sabatié *et al*, Deeply Virtual Compton Scattering at 6 GeV, **P00-110**, Jefferson Lab Hall A proposal P00-110. *http://www.jlab.org/~sabatie/dvcs/index.htm.*