0.1 E97-110

Progress report on E97-110: The GDH Sum Rule, the Spin Structure of ^{3}He and
the Neutron using Nearly Real Photons

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and
the E97-110 Collaboration.

The goal of the experiment is to measure the generalized Gerasimov-Drell-Hearn integral (GDH) and moments of spin structure functions at low Q^2 on the neutron and ^{3}He. A brief description of the physics goal and of the running of the experiment was given in the 2003 Hall A report.

The experiment   The experiment ran in April-May and July-August 2003. The first part of the experiment (low Q^2, April-May 2003) acquired data with a mis-wired septum magnet. The septum was fixed in June and the experiment was completed in July-August.

Present state and outlook   Data analysis efforts have been concentrated on the second period which contains the bulk of the data and is easier to analyze:
The optic study of the spectrometer-septum combination is completed (V. Sulkosky, Col. of William and Mary). The acceptance study and SNAKE-modeling of the magnetic transport for 6° is completed (V. Sulkosky). It has been tested using data taken on carbon foils in the elastic regime, see fig. 1 which shows an absolute comparison of simulated data and experimental on the Carbon elastic peak. All in all, the agreement between the simulated and experimental carbon elastic cross sections at the present stage of the analysis is typically about 2-3%. The same analysis will be carried out for 9 degrees. Particle Identification (PID) analysis, which comprises the calibration of preshower and shower detectors and Cerenkov counters, and PID efficiency analysis, is completed (H. Lu et al, USTC: University of Science and Technology of China). A parallel analysis has been conducted (J. Yuan, Rutgers). Preliminary detectors and DAQ efficiencies have been determined. A remaining task is to develop an algorithm to deal with multitrack events for the high rate settings and compare its result to the efficiency extracted from the data (J. Yuan, Rutgers). The nitrogen analysis that determines the dilution of the ^{3}He asymmetry is done (X. Zhan, MIT). Beam characterization for the two run periods is done (T. Holmstrom, Col. of William and Mary). The C++ analyzer was adapted for the experiment and batch analysis codes are available (V. Sulkosky), with the exception of a possible helicity misdecoding when deadtime is high. This will be investigated by R. Fuerbach (W&M). A database recording the characteristics and quality of runs is available

for both first and second periods (J. Singh, UVa). Analysis of the target polarimetries (NMR and EPR) as well as other target characteristics is well under way (J. Singh). Preliminary numbers are available.

Preliminary inelastic Asymmetries are available for both 6 and 9 degrees, see e.g. the E=2.23, 9 degrees asymmetries in Fig. 2. Preliminary inelastic cross sections are also available for 6 degrees. The two remaining major items before obtaining a preliminary GDH sum are: 1) radiative correction, on which J. Singh is presently working, and 2) background estimates, which is being studied by T. Holmstrom.

The data analysis for the first period is also under way, mostly done by our Chinese collaborators of USTC.

Near term plan is to obtains 9 degrees acceptance function and inelastic cross sections (V. Sulkosky). Then V. Sulkosky will form preliminary GDH sum results. The remaining of the analysis includes: complete analysis of the elastic cross sections and asymmetries for the various targets available; finalization of inelastic cross section and asymmetry analysis; finalization of radiative corrections, analysis of the experimental uncertainties (J. Singh) and final estimate of the background.

Completion of the data analysis for the first period will be done by Chinese collaborators of USTC.
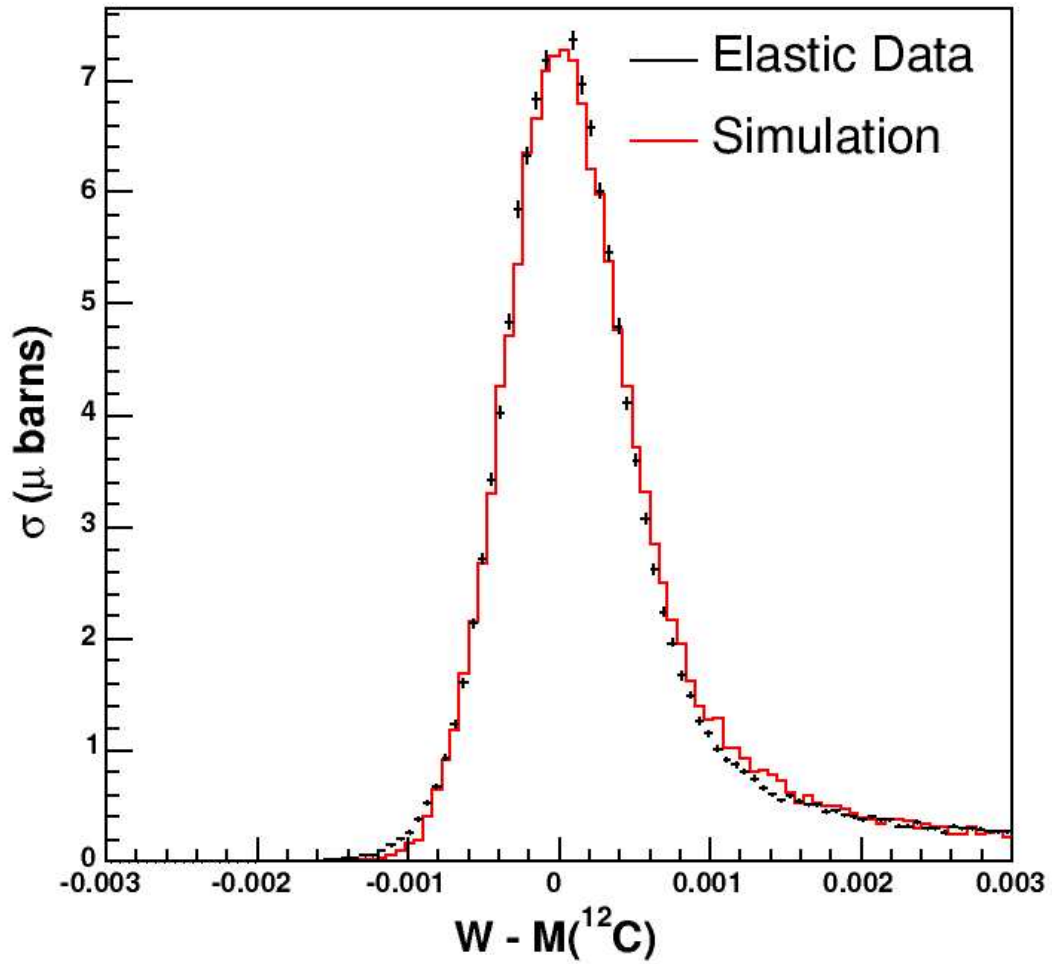
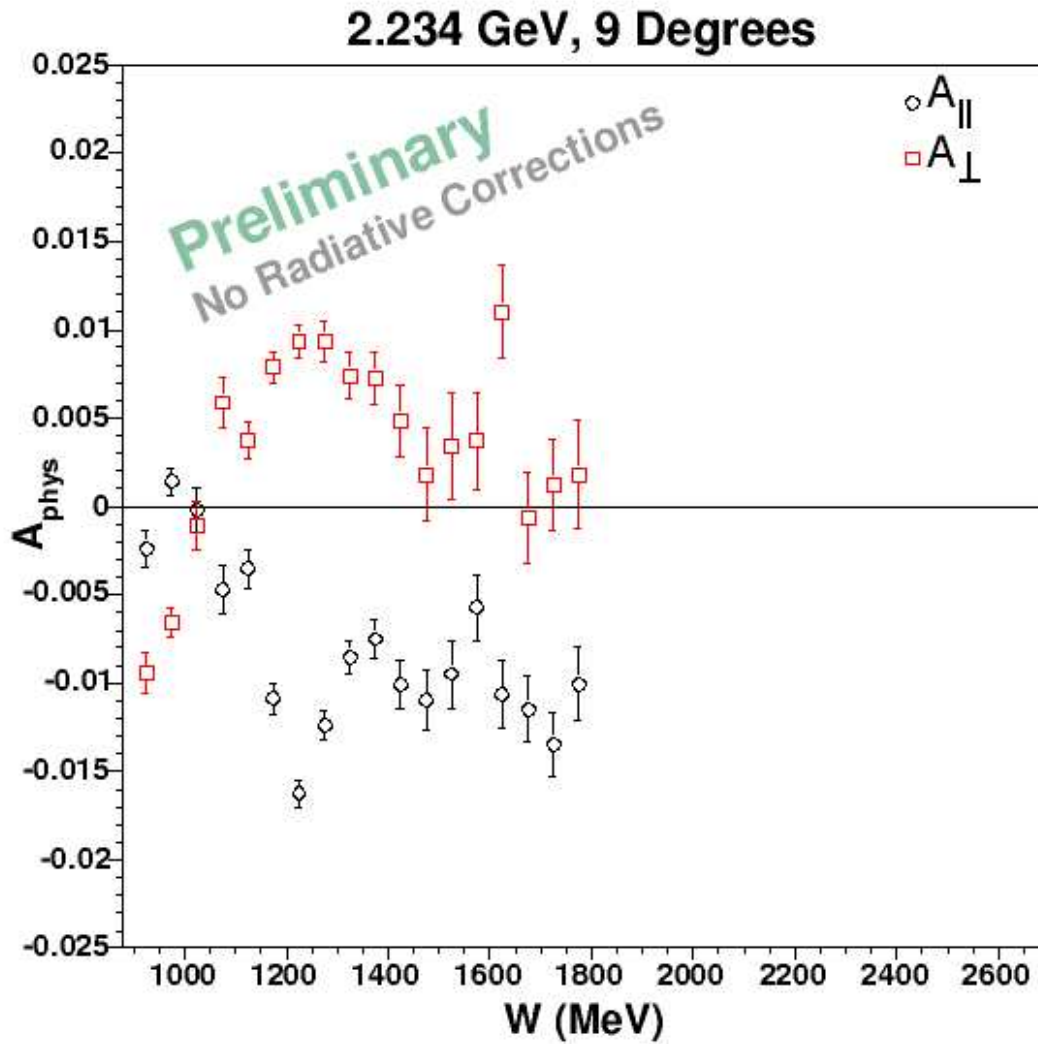Figure 1: Preliminary Carbon elastic cross section. In red: simulation. black symbols: experimental data

Figure 2: Preliminary inelastic asymmetries for 9° scattering angle and beam energy of 2.23 GeV. The transverse asymmetry is shown in red and the longitudinal one is shown in black. Radiative corrections, correction for finite binning and corrections for unpolarized material and background dilution are not applied yet.