Summary of JLAB Experiment 97-101

Baryon Resonance Electroproduction at High Momentum Transfer

The inelastic nucleon transition amplitudes to the $\Delta(1232)$ and $S_{11}(1535)$ baryon resonances, via the reactions $p(e,e'p)\pi^0$ and $p(e,e'p)\eta$ respectively will be measured at previously unaccesible momentum transfers range Q^2 up to 7.5 $\mathrm{GeV}^2/\mathrm{c}^2$. This experiment is an extension of experiment 94-014, which measured the same reactions in the momentum transfer range $\mathrm{Q}^2 = 2.4$ and 4 $\mathrm{GeV}^2/\mathrm{c}^2$. Results of experiment 94-014 were published in refs. [Fr-99] and [Ar-99].

The physics goals of this experiment are to assess the relevant degrees of freedom appropriate to describe baryon excitation as Q^2 varies beyond the validity of the constituent quark model (CQM), and to search for evidence of PQCD for an exclusive reaction. In the case of the $\Delta(1232)$ the breakdown of the (CQM) is signaled by a significant departure of the ratio E_{1+}/M_{1+} from 0, and the evolution toward PQCD by $E_{1+}/M_{1+} \rightarrow +1$. For the $S_{11}(1535)$ the appropriate signature is the approach to constituent scaling, ie. $A_{1/2} \rightarrow 1/Q^3$. The normalized amplitudes of both reactions will be measured and also serve as important constraints on theory.

The experiment will be performed in Hall C. The electron beam will be fixed at the highest available energy (6 GeV), at a current of 100 uA. As in experiment 94-014 the scattered electrons will be detected by SOS in coincidence with recoil protons detected by HMS. The SOS central momentum and angle will be fixed at 1.6 $\mathrm{GeV}^2/\mathrm{c}^2$ and $\sim 50^\circ$ throughout the experiment, while the HMS momentum and angle will be varied to cover the resonance decay cone and outgoing proton momentum range. The maximim HMS momentum setting will be 5.1 $\mathrm{GeV}^2/\mathrm{c}^2$, and the minimum angle will be $\sim 13^\circ$.

References:

Ar-99 C.S. Armstrong et al., Phys. Rev. , **D60**, 052004-1 (1999)

Be-97 V. Frolov et al., Phys. Rev. Lett., **82**, 45 (1999)