Measurement of $R = \sigma_L/\sigma_T$ in the Resonance Region

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High precision measurements of $R(x,Q^2) = \sigma_L/\sigma_T$, the ratio of longitudinal to transverse cross sections for inclusive electron-proton scattering, have been available for over a decade in the DIS region. However, the current world's data on $R(x,Q^2)$, and therefore, the longitudinal and transverse structure functions, $F_L(x,Q^2)$ and $F_1(x,Q^2)$, in the resonance region has been both sparse and of low quality. Recently, experiment E94-110 was performed in Hall C at JLAB to provide high precision data on $R(x,Q^2)$ in the kinematic range defined by $W^2 < 4\ GeV^2$ and $0.5 < Q^2 < 4.0\ (GeV/c)^2$. A global fit of $R(x,Q^2)$ in the resonance region has been obtained, in addition to over 150 Rosenbluth separations to extract $R(x,Q^2)$. One of these separations is shown in Figure 1 and illustrates the quality of the data and the precision of the corresponding separation. The behavior $R(x,Q^2)$ in the nucleon resonance region is found to be, on average, surprisingly similar to what one would expect from high-energy experiments. Results of the analysis of this new data will be presented, including calculations of QCD moments and studies of quark-hadron duality of both $F_L(x,Q^2)$ and $F_1(x,Q^2)$.

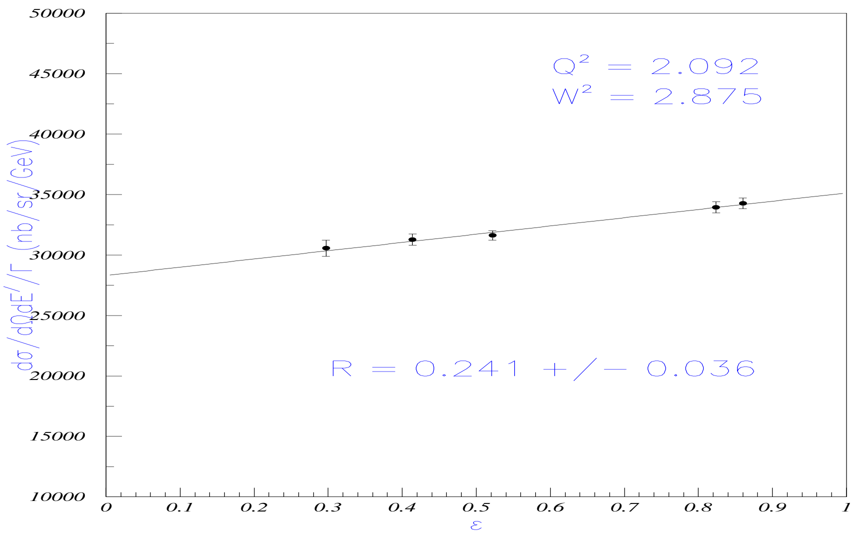

Figure 1: Example of one of the 150+ Rosenbluth separations performed for E94110.