# Drell-Yan Experiment: Studying Anti-quarks in the Proton

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The internal structure of the proton is one of the most vital topic in the present hadron physics. The proton in a low-energy (static) condition can be expressed with three valence quarks, namely two up quarks and one down quark. But the proton in a high-energy condition consists of a huge numbers of quarks ($q$), anti-quarks ($\bar{q}$) and gluons ($g$), where gluons and anti-quarks are dynamically created via $q \to q + g$ and $g \to q + \bar{q}$, respectively. The dynamics of the proton structure is being investigated in both experiment and theory.

The Drell-Yan process in proton+proton collisions is the reaction in which a quark in one proton and an anti-quark in the other proton annihilate into a virtual photon and then a muon pair is created: $q + \bar{q} \to \gamma^* \to \mu^+ + \mu^-$, as shown in Fig. 1. Usually a proton beam and a liquid-hydrogen target is used, where a beam energy is typically an order of 100 GeV. This process is suited to study the anti-quarks in the proton, and many experiments measuring the Drell-Yan process have been carried out in the past 20 years. The E906/SeaQuest experiment at Fermi National Accelerator Lab (FNAL) in USA is a Drell-Yan experiment being prepared now to explore a new kinematic region with very high statistics. Figure 2 is a schematic drawing of the E906 spectrometer. The main purpose of this experiment is to precisely measure the asymmetry of $\bar{u}$ and $\bar{d}$ distributions in the proton at the $x_{Bj}$ range from 0.25 to 0.45.

This presentation will summarize the current understanding of the proton internal structure and the past Drell-Yan experiments, and report on the status of the E906 experiment.

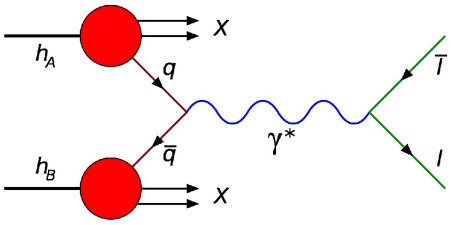


Figure 1: Drell-Yan Process.

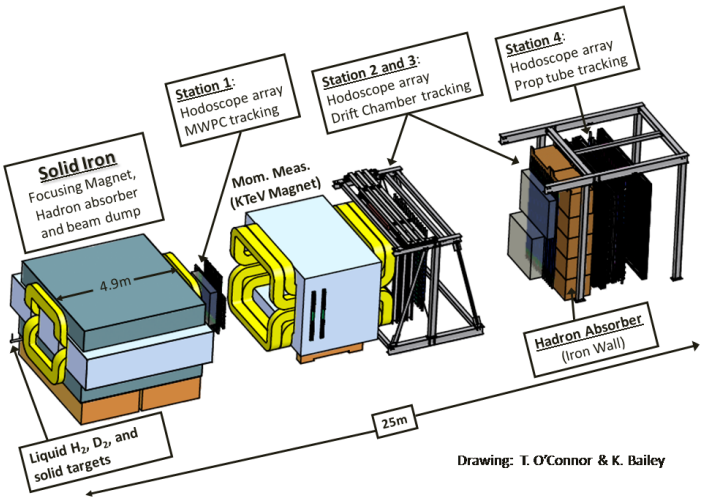


Figure 2: FNAL-E906 Spectrometer.