



Contribution ID: 88

Type: Talk

Measurement of the ratio of the nucleon structure functions, F_2n/F_2p , from electron deep inelastic scattering off the $A=3$ mirror nuclei.

Monday, 2 September 2019 14:30 (20 minutes)

Preliminary results from a Jefferson Lab (JLab) experiment on electron deep inelastic scattering (DIS) from the ^3H and ^3He mirror nuclei will be presented. The experiment (MARATHON, “MeAsurement of the F_2n/F_2p , d/u RATios and $A=3$ EMC Effect in Deep Inelastic Electron Scattering Off the Tritium and Helium MirrOr Nuclei”) took data for 70 days in the period January-April 2018 in the Hall A Facility of JLab, using an 11 GeV electron beam, two High Resolution Spectrometers, and a high-pressure $2\text{H}/3\text{H}/3\text{He}$ target system. The experiment has measured DIS cross section ratios for 2H , 3H and 3He . It will determine, using a new novel method, free of theoretical uncertainties present in previous SLAC measurements, the ratio of the F_2n/F_2p structure functions of the neutron and proton, and extract the d/u ratio of the up and down quark probability distributions in the proton. The results from the experiment are expected to test predictions of the quark model of the nucleon and of perturbative quantum chromodynamics, and to constrain the nucleon’s parton distribution function parametrizations needed for the interpretation of high energy collider data. The experiment will also determine precisely the EMC effect of the two $A=3$ mirror nuclei. The results are considered essential for the explanation of the EMC effect, which describes the modification of the nucleon structure functions in the nuclear medium.

(Work supported by the United States National Science Foundation Grant PHY-1714809)

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Session Classification: Parallel Session Monday: Short-range Correlations in Nuclei

Track Classification: Hadrons and Particles