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Final Results from the Jefferson Lab Qweak Experiment and Constraints on Physics Beyond the Standard Model

Tuesday, 11 September 2018 11:30 (40 minutes)

The ep elastic scattering experiment used to extract a parity-violating asymmetry at Q2=0.0248 (GeV/c)2 will be described. The precision obtained on the final result is ±9.3 ppb- the most precise ep asymmetry ever measured. Some of the backgrounds and corrections applied in the experiment will be explained and quantified, and some of the experimental challenges will be described.

Several methods used to extract consistent values of the proton's weak charge Qw(p) from our asymmetry measurement will be outlined. From the proton's weak charge, a result for the fundamental standard model parameter sin^2 θw is obtained at the energy scale of our experiment. We compare that to the few other determinations of sin^2 θw available, as well as the predicted behaviour based on SM input.

We also show the multi-TeV mass reach for beyond-the-Standard-Model physics obtained from our determination of the proton's weak charge, and discuss our sensitivity to specifc examples of new particles like leptoquarks. We conclude by providing flavor-independent constraints on all new semi-leptonic parity-violating physics obtained from our result.

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