

1 Overview

1.1 Introduction

This proposal has been prepared for the review of the G^0 experiment by the Jefferson Lab Program Advisory Committee. The G^0 experiment was previously approved as experiment 91-017 with A priority in December 1993. This proposal has been prepared in accordance with the “jeopardy” rules of Jefferson Lab.

In this experiment, the parity-violating asymmetry in elastic electron scattering from the proton will be measured at both forward and backward angles and over a range of momentum transfers from about 0.1 – 1.0 GeV^2 . A single measurement of the backward angle parity-violating quasi-elastic scattering from the deuteron will be measured*. The primary purpose of the experiment is to separate the s quark contributions to the overall charge and magnetization densities of the nucleon using these measurements. No other proposed experiment will perform directly this separation. A special purpose, superconducting toroidal spectrometer with large azimuthally symmetric angular acceptance is being constructed for these measurements.

There has been a great deal of progress in development of the experiment as will be summarized in this report:

- funding of \$2.25M from NSF, October 1995 for the magnet and target subsystems;
- magnet RFP, May 1996;
- magnet contract signed, May 1997;
- Cost and Schedule Review, February 1998;
- G^0 Management Plan, November 1998;
- agreement on funding \$0.952M from DOE, \$2.194M from Jefferson Lab, \$0.493M additional funding from NSF, \$0.229M from ongoing grants, December 1998
- target Preliminary Design Review, December 1998; and
- expansion of collaboration from about 40 to about 80 members, including addition of large groups from Canada and France (Table 1.1)

We request at this time that the PAC approve the original 46 days (1100 hours) for commissioning the experiment (see Section 6 at the end of this proposal). The commissioning plan is, at this time, basically unchanged from what was envisioned at the time of the original approval. The recent decision (October 1998) to locate the experiment downstream of the standard Hall C pivot may preclude breaking the commissioning run into three pieces; nevertheless the same jobs must be completed. At a future date we will request approval for the first physics running.

A summary of the experiment is provided in the following subsection. This is followed by a more detailed discussion of the physics, presentation of the management and schedule

*The deuterium measurement is used to determine the axial radiative correction