

# Jefferson Lab Proposal Cover Sheet (Generic)

Experimental Hall: A

Days Requested for Approval: \_\_\_\_\_

Submission Date: 5/94

Other: PAC 8

New Proposal Title:

Update Experiment Number: 89-021

Letter-of-Intent Title:

(Choose one)

## Proposal Physics Goals

Indicate any experiments that have physics goals similar to those in your proposal.

Approved, Conditionally Approved, and/or Deferred Experiment(s) or proposals:

## Contact Person

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Receipt Date: 5/94

By: \_\_\_\_\_

Jefferson Lab Use Only

PR 94-025

May 1994 Update

CEBAF EXPERIMENT 89-21  
Elastic Electron  $^3\text{He}$ - $^4\text{He}$  Scattering  
at Large Momentum Transfers

Hall A Collaboration

Spokesperson: G.G. Petratos, Kent State University

This experiment was proposed to the CEBAF PAC4 in 1989 by a few Institutions. It was approved for one month of beam time. Since that time it has become a Hall-A Collaboration experiment.

The objectives of the experiment, as presented to the PAC4, are:

- To measure the magnetic form-factor  $F_m$  of  $^3\text{He}$  at the highest  $Q^2$  possible and improve the quality of the existing data around the first diffraction minimum by means of backward electron scattering.
- To provide precise data for the charge form-factor  $F_c$  of  $^3\text{He}$  at the highest  $Q^2$  possible by performing forward angle electron scattering. The original proposal assumed the use of existing forward angle cross section data from SLAC.
- To measure the charge form-factor  $F_c$  of  $^4\text{He}$  at the highest  $Q^2$  possible.

It is a single-arm experiment using the electron High Resolution Spectrometer of Hall-A with its standard detector package, presently under construction. The  $^3\text{He}$  measurements will require the high resolution capability ( $10^{-4}$ ) of the spectrometer. The  $^4\text{He}$  measurements can be done with a more modest resolution ( $10^{-3}$ ).

The experiment requires the Helium cryotarget of Hall-A, which at this time remains partially unfunded. Despite these funding limitations, a significant amount of work has been done by the California State University at Los Angeles group and the Hall-A staff in the design and construction of parts of the cryotarget (see report of Hall-A Experiment Integration Committee).

CEBAF Experiment 89-21  
May 1994 Update  
Page Two

There exists a detailed Monte Carlo simulation program for the experiment, used to optimize the running conditions. This program will be converted with a modest effort to an on-line and off-line analysis package.

The physics goals of the experiment remain unchanged. It should be noted though that a recent Saclay experiment has partially improved the quality of data around the first diffraction minimum of the magnetic form-factor of  $^3\text{He}$ .