PROPOSAL SUMMARY

1. Title of Experiment: ELECTRON-PROTON ELASTIC SCATTERING

2. a. Spokesman (1.) John Litt (2.) R. Taylor

b. Experimenters:

(Name)	Gp. or Institution	Name	Gp. or Institution
W. K. H. Panofsky	SLAC - Gp A	J. I. Friedman	MIT
D. Coward	SLAC - Gp A	H. W. Kendall	MIT
H. De Staebler	SLAC - Gp A	L. Van Speybroeck	MIT
J. Litt	SLAC - Gp A	C. Peck	CIT
L. W. Mo	SLAC - Gp A	J. Pine	CIT
R. E. Taylor	SLAC - Gp A		

c. Students Name Gp or Institution

MIT Graduate Student will be assigned to this experiment.

3. Summary of Experiment

The 8 BeV/c spectrometer will be used to obtain the energy spectrum of electrons elastically scattered from a liquid H_2 target. At each of several values of q^2 between $2(BeV/c)^2$ and $16\ (BeV/c)^2$ measurements are taken at five different angles, allowing good separation of form factors G_E and G_M for all but the highest momentum transfers. Accuracy aimed for is limited but the experiment should give considerably improved data over that available now at the lower q^2 and of course new information at the higher transfer. No serious background troubles are expected.

4. a. SLAC Equipment Required for Experiment:

8 BeV/c spectrometer installation, Energy calibration better than 1%
"A" Counting house including SDS 9300 Computer.
Up to 200 Tons of steel and concrete shielding.
1% Beam monitor
Liquid H_2, fill and vent systems

b. Major Items of Equipment to be Furnished by the Group:

	Date Available
Detection system up to computer interface	Aug. 66
H_2 target	Aug. 66
Computer software	Jul.-Sept. 66

5. Beam Requirements

Electron beam in end station "A". BSY calibration to better than $\frac{1}{2}$%.
Stability of .1%.
Energy: Variable, up to maximum
Energy Spread: Variable, ± .1% for small fraction of running time
up to ± .25%.
Current: Variable, majority of running at 2×10^{13} electrons/sec.
Spot Size: 3 mm vert. x 1 cm horiz. (including instability).
Halo < 10^{-5} central density
Angular Divergence: Less than 10^{-4} in horizontal plane (implies 10^{-3} stability for pulsed magnet in split beam operation).

Time structure: Flat top, maximum length
Dump: Beam dump East
Some runs are low energy, requiring quadrupole focussing to transport beam to dump.
Rep. Rate: Small fraction of running time requires high repetition rate. Majority of run does not require high rep. rate, but high rep. rate may be necessary to provide current.

6. Estimated Time Required: 75 hours - to debug data system, check backgrounds test target with high beam, etc.

275 hours - Data collection, including set up time for changes in angle and/or energy.

De-bug time is more useful if run consists of several small parts. Once equipment is collecting data, solid time is preferable, but not essential.

7. Data Analysis: The data analysis is not expected to be very time consuming or difficult. We expect that most of the analysis will be done using the SDS 9300 computer, or campus computers. We would expect to complete the experimental analysis within 3-6 months of the completion of running.

PROPOSAL SUMMARY

1. Title of Experiment: ELECTRON-PROTON INELASTIC SCATTERING

2. a. Spokesman (1.) L. W. Mo (2.) R. E. Taylor

b. Experimenters:

(Name)	Gp. or Institution	Name	Gp. or Inst.
W. K. H. Panofsky	SLAC-Gp A	J. I. Friedman	MIT
D. Coward	SLAC-Gp A	H. W. Kendall	MIT
H. DeStaebler	SLAC-Gp A	L. Van Speybroeck	MIT
J. Litt	SLAC-Gp A		
L. W. Mo	SLAC-Gp A	C. Peck	CIT
R. E. Taylor	SLAC-Gp A	J. Pine	CIT

c. Students (Name) Gp. or Institution

MIT Graduate Student will be assigned to this experiment.

3. Summary of Experiment

The 20-BeV/c spectrometer will be used to measure the momentum spectrum of electrons inelastically scattered from a liquid hydrogen target. A search will be made for new nucleon isobars up to the maximum energy available. In addition the q^2-dependence of the form factor at each γ-p-N* vertex will be measured from $q^2 \sim 0.4(\text{BeV/c})^2$ to $\sim 16(\text{BeV/c})^2$. To separate the inelastic longitudinal and transverse form factors, measurements will be made at several angles for the same q^2.

4.a. SLAC Equipment Required for Experiment:

20-BeV/c spectrometer installation, energy calibration better than 1%
"A" counting house, including SDS 9300 computer
Up to 400 tons of steel and concrete shielding
1% beam monitor
Liquid hydrogen filling and ventillation systems

b. Major Items of Equipment to be Furnished by the Group:

	Date Available
Detection system up to computer interface	Aug. 66
Liquid Hydrogen target	Aug. 66
Computer Software (Radiative correction programs)	Jul. ~ Dec. 66

5. Beam Requirements

Electron beam in End Station "A". BSY calibration to better than 0.5%
Stability of 0.1%.
Energy: Variable, up to maximum
Energy Spread: $\leq \pm 0.15\%$
Current: Variable, majority of running at 2×10^{13} electrons/sec.
Spot Size: 0.5 cm (vert.) x 1cm (horiz) (including instability)
Halo $< 10^{-5}$ central density
Angular Divergence: For some particular angles we require $\sim 10^{-4}$ in horizontal plane (implies $\sim 10^{-3}$ stability for pulsed magnet in split beam operation)
Time Structure: Flat top, maximum length
Dump: Beam dump east
Repition Rate: High enough to provide the required current 2×10^{13} electrons/sec.

6. Time Required:

50 Hours - System checking, background measurement, etc.

200 Hours - Data collection, including set up time for changes in angle and/or energy

7. Data Analysis:

The data analysis is quite complicated because of the necessity of subtracting radiative tails and other backgrounds. We expect that most of the analysis will be done using the SDS 9300 computer and a campus computer. We would expect to complete the experimental analysis within 6 to 9 months upon completion of running.

PROPOSAL SUMMARY

1. Title of Experiment: COMPARISON OF POSITRON-PROTON AND ELECTRON-PROTON ELASTIC SCATTERING

2. a. Spokesman (1.) H. DeStaebler (2.) J. Pine

b. Experimenters:

(Name)	Gp. or Institution	Name	Gp. or Inst.
W. K. H. Panofsky	SLAC - Gp A	J.I. Friedman	MIT
D. Coward	SLAC - Gp A	H.W. Kendall	MIT
H. DeStaebler	SLAC - Gp A	L.Van Speybroeck	MIT
J. Litt	SLAC - Gp A		
L. W. Mo	SLAC - Gp A	C. Peck	CIT
R. E. Taylor	SLAC - Gp A	J. Pine	CIT

c. Students

CIT Graduate Student will be assigned to this experiment.

3. Summary of Experiment

The 8-BeV/c spectrometer will be used to obtain the momentum spectrum of positrons (and electrons) elastically scattered from a liquid hydrogen target. About ten cross section measurements (to about 2% accuracy) will be made for a range of angles at q^2 values less than $4(\text{BeV/c})^2$. A comparison of the cross sections for e^+-p and e^--p scattering will provide information which is sensitive to about a two percent two-photon exchange effect. Further measurements will be made up to q^2 values of $\sim 12(\text{BeV/c})^2$ but with decreasing accuracy.

4. a. SLAC Equipment Required for Experiment:

8-BeV/c spectrometer installation, Energy calibration better than 1%
"A" Counting House including SDS 9300 Computer.
Up to 200 tons of steel and concrete shielding.
1% Beam monitor
Liquid H_2, fill and vent systems

b. Major Items of Equipment to be Furnished by the Group:

	Date Available
Detection system up to computer interface	Aug. 66
H_2 target	Aug. 66
Computer software	Jul.-Sept. 66

5. Beam Requirements

Electron or positron beam in end station "A". BSY calibration to better than 1/2%. Stability of .1%.
Energy: Variable up to ~ 12 BeV positrons
Energy Spread: Generally $\pm$ 0.5%, but $\pm$ 0.2% will be needed for some runs.
Current: The intensity of the electron beam is to be approximately matched to that of the positron beam. The current will be variable up to the positron beam design intensity (~ 1μA), but for the majority of the runs about 10% will be sufficient.

Spot Size: 0.5 cm vertical x 1.5 cm horizontal (including instability)
Halo < 10^{-5} central density
Angular Divergence: ~ 10^{-4} in horizontal plane (implies 10^{-3} stability for pulsed magnet in split beam operation).
Time Structure: Flat top, maximum length
Dump: Beam dump East
Some runs are low energy, requiring quadrupole focussing to transport beam to dump.
Rep. Rate: Small fraction of running time requires high repetition rate. Majority of run does not require high rep. rate, but high rep. rate may be necessary to provide current.

6. Estimated Time Required:

75 hours - with the electron beam at 60 cycles/sec and low intensity to debug data system, to check backgrounds, etc.

200 hours - Data collection time

De-bug time is more useful if run consists of several small parts. Once equipment is collecting data, solid time is preferable, but not essential.

7. Data Analysis:

The data analysis is not expected to be very time consuming or difficult. We expect that most of the analysis will be done using the SDS 9300 computer, or campus computers. We would expect to complete the experimental analysis within 3-6 months of the completion of running.