Technical Advisory Committee Meeting, 12/12/03

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Technical comments regarding PAC25 Proposals submitted for experiments in Hall B.

PR-04-005 Search for New Forms of Hadronic Matter in Photoproduction

(P. Eugenio)

Description: The proposal seeks to study the structure of hadronic matter through the spectroscopy of mesons with the focus on the study of gluonic excitations (hybrids).

Requirements:

Beam time request 42 days

Beam energy: 5.8 GeV +

Beam polarization: None

Beam requirements: Standard Hall B photon beam operation

Photon Tagging System: Standard Hall B (with 100 MHz Master OR rate)

Target: Standard Hall B with a 40 cm long lH2 cell.

Moved upstream by 100cm.

Detectors: Standard CLAS

+ new Start Counter, to be constructed

Torus magnet 50% of full field

Comments:

1) The experiment wants to make use of the highest tagged photon rate currently possible with the CLAS. This is expected to be achieved by requiring 3-prong events in CLAS at trigger level 1. This will give an acceptable accidental rate in CLAS, however, at a 100MHz tagger rate, the coincidence CLAS*Tagger will have frequent multiple photon events. The proposal does not address what the effect of the remaining ambiguity will be on the process identification, although matching the tagger energy with the measured event energy should be sufficient to reduce the ambiguity to an acceptable level.

2) Proposal requires new Start Counter for CLAS with high segmentation, and length increased to accommodate a 40 cm target cell.

PR-04-010 Search for Exotic Cascades with CLAS using an untagged virtual photon beam. (E. Smith)

Description: The proposal aims to search for penta-quark strangeness = -2 cascade baryons. Candidates have been seen in CERN experiment NA49 at masses of 1862 MeV. The proposed experiment uses an electron beam impinging on a 5 mm long liquid deuterium target. The interacting electrons get scattered in very small angles close to the primary beam, and are not detected in CLAS. This excludes use of the usual missing mass techniques to reconstruct final state particles. Instead, the full final state particles must be detected. The proposed technique to identify the exotic X^{--} is to use reconstruction of the detached secondary and tertiary vertices.

Requirements:

PAC time request: 20 days

Beam energy: 5.8 GeV +

Beam current: 80 nA

Beam polarization: None

Beam requirements: Standard Hall B electron beam operation

Target: Standard Hall B, with 5 mm long lD2 cell.

Detectors: Standard CLAS

Torus magnet I = 2250 A, negative particles bend away from beam line.

Comments:

1) The experiment is breaking new ground in terms of the reconstruction of multiple detached decay vertices. The use of an electron beam with a small transverse size and a short (5 mm) target will aid in the vertex reconstruction. The experiment, although feasible with the current CLAS detector complement, would greatly benefit from improved vertex reconstruction of a new vertex tracker.

2) The experiments wants to use a 5mm long lD2 target cell. While such a cell has not been used before with, no serious technical problems are seen in constructing and operating such a cell.

PR-04-016 Search for the X^- penta-quark (J. Price)

Description: The proposal aims at a search for the penta-quark strangeness S = -2 cascade baryon in photo production from deuterium using the missing mass technique.

Requirements:

PAC time request: 10

Beam energy: 5.8 GeV *) +

Beam current: 50 nA **)

Beam polarization: None

Beam requirements: Standard Hall B photon beam operation

Target: Standard Hall B, with 18cm long lD2 cell.

Detectors: Standard CLAS + New Start counter with high segmentation***)

Torus magnet not defined ****)

Comments:

*) The experiment could run (with ~5-times reduced sensitivity to the X^-) parallel to the scheduled g10 run (E-03-113), if the beam energy for g10 is raised to 5 GeV from the currently scheduled 4 GeV, and the beam time is increased from 30 days to 40 days (to compensate for the expected lower production cross section for the Q^+, which is the focus of g10. The g10 group has agreed to such a change).

**) Beam current will be 15nA if the experiment were to run parallel to g10.

***) No new start counter required if experiment were to run parallel to g10.

****) Same as g10 if run parallel to g10

PR-04-017 A Comprehensive Study of Exotic Baryons with CLAS off a Proton Target (D. Weygand).

Description: The proposal seeks to study the production mechanism and measure cross sections for the Q^+(1540) production, and search for exotic and non-exotic penta-quark X^{--} that have recently been seen in CERN experiment NA49.

Requirements:

PAC time request: 40 (parallel to PR-04-005)

Beam energy: 5.8 GeV +

Beam polarization: None

Beam requirements: Standard Hall B photon beam operation

Photon Tagging System: Standard Hall B (with 100 MHz Master OR rate)

Target: Standard Hall B, with 40cm long lH2 cell,

To be moved upstream by 100cm.

Detectors: Standard CLAS

+ new Start Counter with high segmentation, to be constructed

Torus magnet I=1700 A , positive particles bend away from beam line.

Comments:

1) This experiment has the same running conditions as PR-04-005. The same comments applies as to PR-04- 005.

PR-04-021 Spectroscopy of Exotic Baryons with CLAS: Search for Ground and First Excited States (M. Battaglieri).

Description: This experiments seeks to study the $Q^+(1540)$ on proton targets, and to search for the first excited state.

Requirements:

PAC time request: 25 days

Beam energy: 4 GeV

Beam current: 40 nA

Beam polarization: None

Beam requirements: Standard Hall B photon beam operation

Target: Standard Hall B, with 40cm long lH2 cell.

Detectors: Standard CLAS + New Start counter with modest segmentation *)

Torus magnet current 3375 A

Comments:

1) In order to reach the luminosities needed for this experiment a new start counter is required with higher segmentation than the existing one but with considerably less than the other proposed photon experiments require. A design is under consideration that could be available at the earliest possible date when this experiment could run.