CEBAF Center Auditorium
Monday, January 10, 2005

PAC27 12 GeV Review I
The Science of the 12 GeV Upgrade

12:00 – 13:00	Executive Session with Lunch	
	The Science of the 12 GeV Upgrade	
13:00 – 13:30	Charge and Overview: What are we trying to accomplish during this review	L. Cardman
13:30 – 14:00	Overview of 12 GeV Upgrade Science	A. Thomas
14:00 – 14:45	The GlueX program (hybrids and light meson spectroscopy)	A. Dzierba
14:45 – 15:00	Coffee Break	
15:00 – 16:00	Hadron Structure	X. Ji
16:00 – 17:00	The Physics of Nuclei	W. Brooks
17:00 – 17:30	Symmetry Tests in Nuclear Physics	K. Kumar
	Presentation and discussion of two physics programs proposed for an expanded role in the CDR:	
17:30 – 18:00	Hadron Spectroscopy	S. Stepanyan
18:00 – 18:30	SIDIS	H. Avakian
18:30	Executive Session and Dinner	

CEBAF Center Auditorium
Tuesday, January 11, 2005

PAC27 12 GeV Review II
Review of Base Plan for Experimental Equipment

8:30 – 9:30	Executive Session	
	Review of Base Plan for Experimental Equipment	
9:30 – 10:15	Review of Base Equipment Plans, and Summary of Alternate Equipment Options Considered and Under Consideration	L. Cardman
10:15 – 10:45	Spectrometer Options: Comments from the Mini-Review	R. Holt
10:45 – 11:00	Coffee Break	
11:00 – 11:30	Upgrade Physics in Hall A	K. de Jager
11:30 – 12:00	Upgrade Physics in Hall C	R. Ent
12:00 – 14:00	**Executive Session with Lunch**	
14:00 – 15:00	CLAS12: Options and Physics	V. Burkert
15:00 – 15:45	GlueX: Options and Physics	C. Meyer
15:45 – 16:00		
16:00 – 17:30	Executive Session for PAC Discussion	

Background:

The PAC27 is asked to review any significant modifications and/or additions to the science program that are proposed for inclusion in the Conceptual Design Report for the Experimental Equipment that is in preparation. The structure of the pCDR Executive Summary and a working draft (which is clearly a work in progress) of the proposed revised structure of the new CDR Executive Summary are attached. Following the review of the science and structure of the pCDR, the PAC will then continue the review the overall instrumentation plans for the Upgrade that began at PAC23.

Charge

- **Comment on the intellectual framework presented for the revised outline for the 12 GeV CDR.**
  Is this the best way to present the science case to DOE and to the larger nuclear physics community? Are there flaws or omissions in the framework? Is the new framework an improvement over that of the pCDR?

- **Review the new research programs that are under consideration for being highlighted in the executive summary of the CDR**
  Do they represent compelling science that must be done to advance our understanding of nuclear physics? Have we omitted key science initiatives that should be used as primary motivations for the Upgrade?

- **Is the experimental equipment proposed in the pCDR and enhanced by further design work since the publication of that document well matched to the key physics experiments motivating the upgrade?**
  In cases where an experiment or program is proposed for more than one set of equipment, are the differences in capability and physics reach of the equipment essential for getting all of the physics, important for getting as much physics as possible, or simply useful in that, for example, an experiment could be done somewhat faster with one hall equipment compared to another?

- **Comment on the merits and drawbacks of possible alternate equipment configurations.**
  A variety of possible alternate equipment configurations under consideration will be presented. For each of these configurations, identify the essential physics programs that it can support roughly at the level of the equipment presented in the pCDR (as enhanced by further design work since the publication of that document), and for each identify critical physics "reach" that will be lost relative to the design-enhanced pCDR equipment.

- **Comment on the Letter of Intent received on a dedicated DVCS detector.**

Outline Structure of the pCDR

1.A Physics Overview

- 1.A.1 Gluonic Excitations and the Origin of Quark Confinement

- 1.A.2 The Fundamental Structure of the Nuclear Building Blocks
  - Form Factors - Constraints on the Generalized Parton Distributions
  - Valence Quark Structure and Parton Distributions
  - The Generalized Parton Distributions as Accessed via Deeply Exclusive Reactions
  - Other Topics in Hadron Structure
    - Transverse parton distributions
    - The extended GDH integral and sum rule
    - Duality: the transition from a hadronic to a quark-gluon description of Deep Inelastic Scattering

- 1.A.3 The Physics of Nuclei
  - The Short-Range Behavior of the $N-N$ Interaction and Its QCD Basis
    - Color transparency
    - Learning about the *NN* force by the measurement of the threshold N cross section and by searching for -nucleus bound states.
    - Quark propagation through cold QCD matter: nuclear hadronization and transverse momentum broadening.
    - Short-range correlations in nuclei: the nature of QCD at high density and the structure of cold, dense nuclear matter.
  - Identifying and Exploring the Transition from the Meson/Nucleon
  - Description of Nuclei to the Underlying Quark and Gluon Description..
    - The onset of scaling behavior in nuclear cross sections
    - Helicity conservation in nuclear reactions
    - The charged pion form factor
    - Pion photoproduction from the nucleon and in the nuclear medium

- 1.A.4 Symmetry Tests in Nuclear Physics
  - Standard Model Tests
  - Properties of Light Pseudoscalar Mesons via the Primakoff Effect

1.B Upgrade Project Summary

- 1.B.1 The Accelerator

- 1.B.2 The Experimental Equipment
  - Hall A and the Medium Acceptance Device (MAD)
  - Hall B Upgrade and CLAS++
  - Hall C and the Super High Momentum Spectrometer (SHMS)
  - Hall D and the GlueX Experiment

Proposed Revised Structure of the CDR
(Draft, with proposed changes in bold italics – detailed titles and some details of flagship experiments may still change before PAC27)

1.A Physics Overview
- 1.A.1 ***QCD in the Confinement Regime***
  - Gluonic Excitations and the Origin of Quark Confinement
  - ***Spectroscopy (light mesons and baryons)***
- 1.A.2 The Fundamental Structure of the Nuclear Building Blocks
  - ***The 3D quark/gluon structure of the nucleon***
    - ***(GPD's, form factors, …..)***
  - ***The spin structure of the nucleon***
    - ***(transverse partion distributions via SIDIS, the extended GDH integral and sum rule, …)***
  - ***Quark structure and nucleon excitations***
    - ***(duality, ….)***
  - Valence Quark Structure Parton Distributions

- 1.A.3 The Physics of Nuclei
  - ***The Emergence of Nuclei from QCD***
    - The onset of scaling behavior in nuclear cross sections
    - Helicity conservation in nuclear reactions
    - Learning about the *N*-*N* force by the measurement of the threshold J/ψ-*N* cross section and by searching for J/ψ-nucleus bound states
    - Short-range correlations in nuclei: the nature of QCD at high density and the structure of cold, dense nuclear matter
  - ***Fundamental QCD Processes in the Nuclear Arena***
    - Color transparency
    - Pion photoproduction from the nucleon and in the nuclear medium
    - Quark propagation through cold QCD matter: nuclear hadronization and transverse momentum broadening

- 1.A.4 Symmetry Tests in Nuclear Physics
  - Standard Model Tests
  - Properties of Light Pseudoscalar Mesons via the Primakoff Effect
  - ***Test of Charge Symmetry at the Partonic Level***

1.B Upgrade Project Summary
- 1.B.1 The Accelerator
- 1.B.2 The Experimental Equipment
  - Hall A and the Medium Acceptance Device (MAD)
  - Hall B Upgrade and CLAS12
  - Hall C and the Super High Momentum Spectrometer (SHMS)
  - Hall D and the GlueX Experiment