

U.S. Department of Energy's
Office of Science

CLOSEOUT REPORT
on the
Review Committee
for the

12 GeV CEBAF Upgrade

at

Thomas Jefferson National Accelerator Facility (TJNAF)

Daniel R. Lehman, Chair
DOE/SC Review Committee

July 22-24, 2008

<http://www.science.doe.gov/opa/>



Review Committee Participants

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Daniel R. Lehman, Chairperson, DOE/SC
 SC1 SC2 SC3

SC4

SRRF Cryomodules and Cryogenics (WBS 1.3.1/1.3.3)

* Michael Kelly, ANL
 Harry Carter, FNAL
 Bruce Strauss, DOE/SC

WBS 1.3.2/1.3.4/1.3.5/1.8.1) and Accelerator Physics

* Rod Gerig, ANL
 Ray Fujia, ORNL
 Nancy Grossman, FNAL
 Ali Nassiri, ANL
 Joe Tuozzolo, BNL

Control Systems and Instrumentation (WBS 1.3.6)

* Larry Hoff, BNL
 Ned Arnold, ANL

Detector (WBS 1.4/1.5/1.8.2)

* Andy Lankford, UCI
 Bill Louis, LANL
 Nicolai Martovetsky, ORNL
 Ed O'Brien, BNL

SC5

SC6

SC7

SC8

Conventional

Facilities (WBS 1.6)

* Dixon Bogert, FNAL
 Joe Harkins, LBNL

ES&H

* Frank Konegav, ORNL

Cost and Schedule

* Diane Hatton, BNL
 David Arakawa, DOE/OR
 Kurt Fisher, DOE/SC

Project Management (WBS 1.7)

* Carl Strawbridge, ORNL
 Jeff Geouque, ORNL
 Hanley Lee, DOE/SSO
 Steve Tkaczyk, DOE/SC

Observers

Jehanne Simon-Gillo, DOE/SC
 Manouchehr Farkhondeh, DOE/SC
 Jim Hawkins, DOE/SC
 Helmut Marsiske, DOE/SC
 Brad Tippins, DOE/SC

Gordon Fox, DOE/SC
 Brian Huiuzenga, DOE/OECM
 James Turi, DOE/TJSO
 Joe May, DOE/TJSO
 Beverly Kipe, DOE/CFO

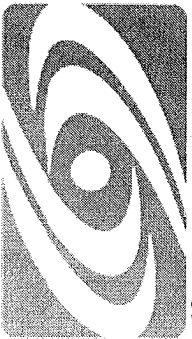
LEGEND

SC Subcommittee

* Chairperson

[] Part Time

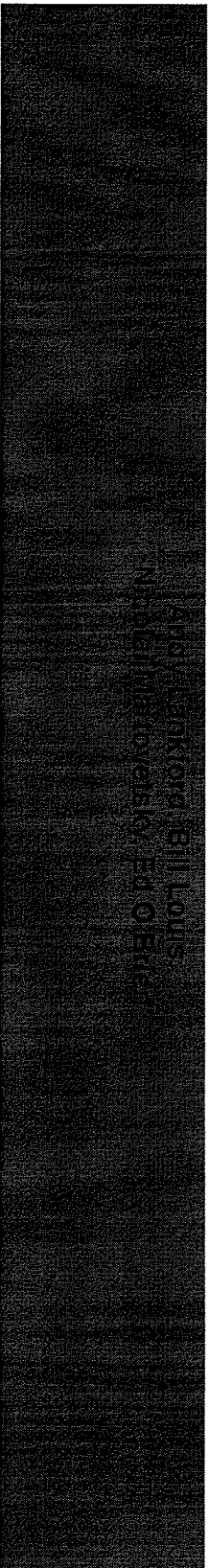
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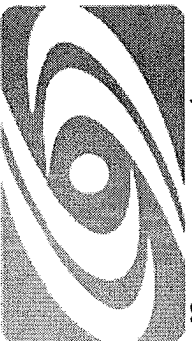
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Section 2.4 Detector WBS 1.4, 1.5, 1.8.2



**Independent Project Review of 12 GeV Upgrade
Jefferson Lab
July 22-24, 2008**

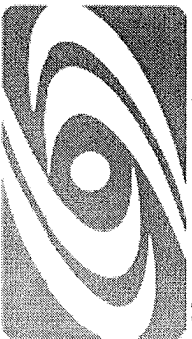


Detector Systems - General

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■ Findings:

- R&D and PED progress has been impressive across all areas of the detector projects.
- Prototyping of many detector designs is well advanced.
- Design/safety reviews have been used to good advantage. Responses to review recommendations are tracked.
- Management and project teams for upgrade projects in Halls B, C, and D have been strengthened.
- The former Associate Project Manager for Physics left JLab and has not yet been replaced.



Detector Systems - General

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■ Comments:

- Designs are sufficiently mature for approval of FY09 procurements.
- Designs are on track to be ready for FY10 and later procurements and fabrications.

■ Recommendations:

- Fill the Associate Project Manager position with a well-qualified individual at the earliest opportunity.



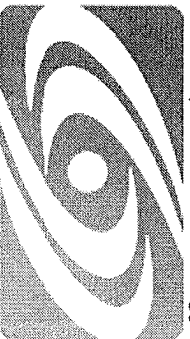
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Superconducting Magnets

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■ Findings:

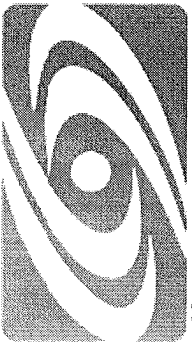
- JLab used inside and outside expertise for magnets design.
- The Hall B solenoid and toroid were designed by Efremov Institute, St. Petersburg, and a review in April 08 found the design excellent. CEA Saclay also presented their input for the solenoid design.
- The Hall C magnets were designed in house (Q1, Q2, Q3, Dipole) and by collaborators from Michigan State (HB). Fabrication trials on Q1 and HB are under way. An R&D contract with Michigan State may produce the final windings for the HB magnet as a deliverable.
- Refurbishing of the existing coil modules for the Hall D solenoid is underway, and all leaks found and repaired. One short will be repaired in 2009 with high confidence.
- The SC magnets were reviewed by external experts three times since 2006. All recommendations have been addressed. Designs are well substantiated, and magnets can be built with high confidence. Specs are written, and RFPs are under review.



Superconducting Magnets

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- **Comments:**
 - The status of magnets development is sufficiently mature to initiate procurements planned for FY09. The SC magnets are ready for CD-3.
 - Acceptance testing of the large magnets will take place at JLab. Although vendors are responsible for performance, proper oversight of the vendor's inspection and testing is needed to reduce risk.
- **Recommendations:**
 - none



Hall B (WBS 1.4.2)

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■ Findings:

- The CLAS12 detector will reside in Hall B.
- The new CLAS12 detector design will allow more accessible maintenance capability than the CLAS detector.
- Hall B procurements to be initiated in FY09 are the superconducting solenoid and toroid magnets and drift chamber fabrication.
- Magnets and Silicon Vertex Tracker are identified as High risk.



Hall B (WBS 1.4.2)

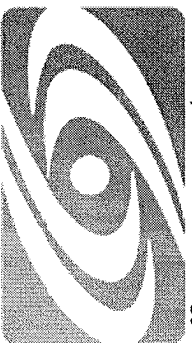
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■ **Comments:**

- The committee supports the project's plans to assemble and fully test 1 drift chamber prior to fabrication of the remainder.
- The SVT is the most technically challenging development for Hall B. The committee supports the project's plans for: timely choice of SVT readout IC, radiation testing of SVT sensors, testing of sensors from two vendors.
- The committee continues to be concerned about the need for development of strong JLab in-house expertise with silicon strip technology.

■ **Recommendations:**

- none



Halls A & C (WBS 1.4.1, 1.4.3)

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■ Findings:

- Halls A & C will house high resolution spectrometers.
- The Hall A upgrade is relatively small and low-risk. Beam-line instrumentation will be upgraded to measure polarization and energy up to 11 GeV.
- The Hall A plan for arc energy measurement has been simplified, with an associated cost reduction.
- The Hall C upgrade includes a new Super High Momentum Spectrometer requiring 5 SC magnets and a support structure.
- Hall C procurements to be initiated in FY09 include the Q1 quadrupole and the HB horizontal bend magnets. Procurement of the remaining magnets will be in FY10, although the procurement process will be initiated in FY09.
- Initiation of fabrication of drift chambers with NSF funds is also planned. The design of these chambers is scaled from existing chambers constructed by the same collaborating institution.



Halls A & C (WBS 1.4.1, 1.4.3)

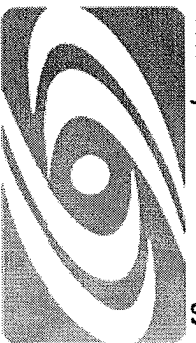
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■ Comments:

- none

■ Recommendations:

- none

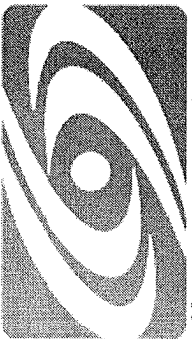


Hall D (WBS 1.5)

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■ Findings:

- The Hall D project consists of a tagged photon beam and a new detector constructed by the GlueX collaboration.
- Hall D procurements in FY09 include scintillating fibers for the barrel calorimeter (BCal) and Cockroft-Walton photomultiplier bases for the forward calorimeter. The scintillating fiber procurement is a major, phased procurement. Construction of the BCal lies on the 12 GeV Upgrade critical path. The procurement process has been initiated.
- Hall D will also initiate fabrication of the BCal and of central and forward drift chambers in FY09.
- Readout of the BCal, which is in a magnetic field, is challenging. The nominal design uses silicon photomultipliers (SiPM) as photodetectors. An alternate, more costly design using fine mesh photomultipliers is in development.



Hall D (WBS 1.5)

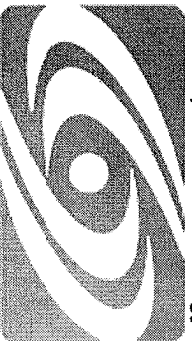
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■ Comments:

- There is little to no experience using SiPM's to instrument calorimeters. Aggressive testing plans for the SiPM readout of the Bcal should continue. It is important that the development of the alternate readout scheme using fine mesh PMT's be completed.
- Both the SiPM testing and alternate readout development need to be in a sufficiently advanced state to inform a final technology choice for BCal readout by the summer of FY09.

■ Recommendations:

- none



Detectors

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■ Charge:

1. Is the design of the 12 GeV CEBAF Upgrade project sufficiently mature to support start of construction and planned procurements in FY09? — Yes,
2. Is the project positioned to be completed within the established cost and schedule Performance Baseline (e.g., adequate progress to meet baseline objectives)? Is there adequate cost and schedule contingency to address the risks inherent in the remaining work and is it being properly managed? — Yes,
3. Is the project being properly managed (e.g., properly organized, adequately staffed) as needed to proceed with construction? Is there adequate support from TJNAF in all necessary areas (e.g., procurement, human resources)? — Yes
4. Are ES&H aspects being properly addressed given the project's current stage of development? — Yes
5. Has the project responded appropriately to recommendations from prior DOE/SC reviews? — Yes. Two items (SVT, APM) are on track to being closed within the next few months.

■ Ready for CD-3