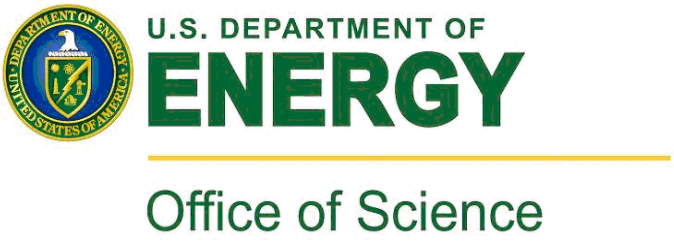

Department of Energy
Office of Nuclear Physics Report

on the

Annual Progress Review

of the

Super BigBite Spectrometer (SBS)

November 4-5, 2013

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Executive Summary

On November 4-5, 2013, the Department of Energy, Office of Science, Office of Nuclear Physics' Facilities and Project Management Division conducted an Annual Progress Review of the Super BigBite Spectrometer (SBS) program. The review was held at the Thomas Jefferson National Accelerator Facility (TJNAF, or JLAB) in Newport News, Virginia.

The review panel reaffirmed the conclusions of the 2011 SBS Science/Technical, Cost, Schedule, and Management Review regarding the high significance and merit of the experiment. The SBS science program consists of a set of nucleon form factor (FF) measurements (GEn, GEp, and GMn) extending to $Q^2 \approx$ 10-14 GeV^2 as well as semi-inclusive DIS (SIDIS) measurements with broad kinematic coverage.

Progress has been made in the engineering/specification and procurement processes for the SBS base (work breakdown structure 1 or WBS 1) project. The large dipole magnet from Brookhaven National Lab (BNL) has arrived. The bids for new coils were over budget and a final request has been issued to the subcontractor. Since most likely the saddle coils will drive the cost, a decision has to be made whether to re-use the BNL saddle coils, though with small compromise on acceptance. The requirement of Hall A readiness for beam in February 2014 poses an additional burden on JLab resources; it is important that the effort for completion of the SBS WBS1 tasks remain on track.

The project team has prototyped the Gas Electron Multiplier (GEM) detector to address technical risks. Based on the test results it appears that the prototype chambers work well and the foils from the European Organization for Nuclear Research (CERN) will be of good quality. The review team recommends the project team updates the work flow for the GEM construction with a resource loaded schedule with the appropriate personnel skill for each step. Furthermore, the team has to develop a written quality assurance/test plan, including acceptance criteria for foils and assembled chambers.

There exists concern whether the detectors and data acquisition can sustain the required event rate given the background. To address this, the project team was asked to conduct a background assessment for each experimental program that includes background rejection and signal efficiency as a function of trigger cuts. The data acquisition system uses three different FASTBUS systems and the project team should document the interface to these three systems. Some of the low voltage distribution has the potential for safety aspects. A safety review must be carried out to insure that the equipment satisfies JLAB safety requirements.

Outside organizations will contribute critical components that are not part of the SBS project. They are the helium-3 (He-3) target, Gas Cherenkov detector, Front Tracker GEMs, Calorimeters and a proposed Coordinate Detector (CDet). The suite of off project detectors brings critical capabilities to the experiments in a cost-effective manner, but also presents an integration and management challenge. Establishing a Hadron Calorimeter (HCAL) factory to produce approximately 300 modules (consisting of

24,000 scintillators) is a large task. The projected completion rate of one module per day may be a challenge to maintain. The HCAL project could benefit from a pre-production review to help ensure successful completion.

The overall complexity of the SBS program should not be underestimated. It requires a significant effort from the Hall A team and coordination and oversight of sizable off-project contributions. Thus, a significant management effort will be needed to ensure successful completion of the program. We recommend several strategies to help managing this scenario. Integration milestones for all off-project equipment, as well as key JLAB readiness and safety reviews, should be incorporated into the list of SBS project milestones. Technical specifications and integration plans for all experimental components (on- and off-project), which includes goals, activities and schedule must be generated. The Research Management Plan must be upgraded to capture current plans for scientific effort needed to implement the project and the Project Management Plan should be updated to reflect changes in scope to the work breakdown structure (WBS) components and evolving list of off-project equipment.

Recommendations

- Update the work flow for GEM module construction to include workforce (by type) required for each step. Submit to DOE by December 15, 2013.
- Develop a written Quality Assurance/test plan, including acceptance criteria for foils and assembled chambers that will be used for both UVa and INFN.
- Conduct a background assessment for each experimental program that includes background rejection and signal efficiency as a function of trigger cuts, and present at the next review.
- Develop a document describing the interface between the DAQ system and each of the 3 types of electronics (FADC, GEM, and FASTBUS) and present at the next review.
- Integration milestones for all equipment off-project, as well as key JLAB readiness and safety reviews, should be incorporated into the list of milestones. Provide updated list of milestones to DOE by January 1, 2014.
- Develop a Technical Specifications Document for all experimental components in the SBS program and present it at the next annual review.
- Develop an integration plan for all experimental components (on and off project) needed for the SBS program, which includes activities, schedules and goals.
- Update the Research Management Plan to capture current plans for scientific effort needed to implement the project. Submit to DOE by February 15, 2014.
- The Project Management Plan should be updated to reflect changes in scope to the WBS components and evolving list of off-project equipment. Submit an updated PMP to DOE by January 1, 2014.

Introduction

On November 4-5, 2013, the Department of Energy (DOE) Office of Science, Office of Nuclear Physics (NP) held an Annual Progress Review of the proposed Super BigBite Spectrometer (SBS) program. The review panel consisted of five external peer review experts: Professor Richard Majka (Yale University), Professor Gerald Miller (University of Washington), Professor William Jacobs (Indiana University), Dr. Hank Crawford (Lawrence Berkeley National Laboratory), and Professor Ricardo Alarcon (Arizona State University). The review was chaired by Dr. Jehanne Gillo, Director of the Facilities and Project Management Division for NP. Other attendees included Dr. Sergio Zimmermann of the Office of Nuclear Physics and Dr. Ted Barnes, Acting Program Manager for Medium Energy Physics for the Office of Nuclear Physics.

Each panel member was asked to evaluate and comment on any relevant aspect of the SBS project. In particular, the purpose of this review was to assess all aspects of the project's plans—scientific, technical, cost, schedule, management, and environment, safety, and health (ES&H). The following main topics were considered at the review:

1. The significance and merit of the project's scientific goals;
2. The feasibility and merit of the technical approach for delivering the science, and the technical status of the project, including completeness of scope and fabrication progress;
3. The feasibility and completeness of the budget and schedule, including workforce availability;
4. The effectiveness of the management structure and the approach to ES&H; and
5. Other issues relating to the SBS project.

Prior to the review, the Laboratory provided relevant background material to the panel members, including the project's Conceptual Design Report and Preliminary Project Management Plan.

The two-day review was based on formal presentations given by the project team, separate follow-up discussions with the reviewers, and executive sessions. The second day included a question and answer session in which the project team responded to questions posed by the panel on the first day as well as a breakout session. The second day also included an executive session during which time the panel deliberated and prepared draft reports on their assigned areas of focus and ended with a brief closeout with the SBS project team and collaborators and laboratory management. The panel members were asked to submit their individual evaluations and findings in a "letter report" covering all aspects of the charge. The executive summary and the accompanying recommendations are largely based on the information contained in these letter reports. A copy of the charge letter and the agenda are included in Appendices A and B, respectively.

Significance and Merit

Findings:

The Super BigBite Spectrometer (SBS) program involves measurement of 3 of the 4 elastic nucleon form factors (GE(n), GM(n), GE(p), with the 4th (GM(p)) being measured in another Hall A program.

- Measurements of the ratio of the neutron electric to magnetic form factors would be extended to Q^2=10 GeV^2.
- Measurement of the ratio of the proton electric to magnetic form factors would be extended to Q^2=12 GeV^2.
- The ratio of the neutron to proton magnetic form factors would be extended to Q^2=13.5 GeV^2.

These form factors provide information that constrain Generalized Parton Distributions. The measurements are aimed at achieving a very high accuracy.

The semi-inclusive deep inelastic scattering (SIDIS) experiment is aimed at measuring transverse momentum distributions (TMDs) of the neutron with broad kinematic coverage and would vastly extend the existing data base.

The measurements of A_1^n would be extended to large values of x.

Work is being done on the coils for the SBS magnet. Use of a combination of racetrack coils and existing saddle coils from Brookhaven National Laboratory (BNL) is being considered. The use of the BNL coil would reduce the acceptance of the proton measurement by 10%.

Comments:

This panel generally affirms conclusions of the 2011 SBS program review panel regarding the high significance and compelling merit of the experiment.

Separate measurements of neutron and proton form factors are needed to understand the structure of the nucleon. Interest in the nucleon electromagnetic form factors, in terms of QCD lattice calculations and models, remains high and can be expected to remain high.

Results of the experiments would test quark-diquark explanations of the measured form factors. The results of the experiments would enable measurements of transverse charge and magnetization densities at very small transverse sizes.

The SIDIS measurement would supply important information regarding neutron structure.

The 10% reduction of the acceptance would have negligible impact on the significance of the ultimate experimental data.

Recommendations:

- None

Technical Approach

Magnet, Beam line and Infrastructure

Findings:

Detailed 3D modeling of the various experimental SBS setups has been completed for use in design of the required magnet, target and detector supports, and ancillary components.

The BNL 48D48 magnet has been received, including extra yokes and a set of energizing coils.

The magnet power supply contract has been awarded, bids for new coils received and drawings completed and out for bids for the yoke modifications.

Engineering efforts are underway (with various completion stages) on the support structure/magnet platform (80%), field clamps (50%), detector supports (40%) and beam pipe/shielding (20%).

Comments:

Substantial progress has been made in the engineering/specification and procurement processes for the SBS base (work breakdown structure 1 or WBS 1) project. The bids for new coils are over budget and a "best and final" request has been issued with the likely result that the saddle coils drive the cost. Use of the BNL saddle coils is estimated to compromise the acceptance slightly. A decision regarding the saddle coils needs to be taken soon as the larger BNL coils also impact other design items now in progress.

Field modeling of the beam pipe shielding using a finite element analysis program called "TOSCA" is still in progress, although the worst case scenario has been used to specify the size (13") of the slot to be cut in the yoke for the beam pipe. Beam line shielding prototyping and testing for comparison with TOSCA calculations may be helpful in substantiating the choice of a minimal number of beamline configurations to be used.

The requirement of Hall A readiness for beam in February 2014 poses an additional burden on JLAB resources; it is important that the effort foreseen for timely completion of the SBS WBS 1 engineering tasks remain on track.

Recommendations:

- None

Gas Electron Multiplier (GEM) Detectors

Findings:

It is proposed to build (29 + 35) 50 cm x 50 cm GEM chambers over the course of projects WBS2 and WBS3 or (29 + 11) chambers in the case of a recently proposed scintillator-based Coordinate Detector. A contract for the first 29 GEM chambers is in place with University of Virginia (UVa.) that led to a subcontract for foils from the European Organization for Nuclear Research (CERN). Component acquisition, foil testing, chamber assembly and testing will be done at UVa. During the prototype phase UVa. has made design improvements. Four prototype chambers have been built and tested with sources and cosmic rays. Two chambers have been tested in a beam at Fermi National Accelerator Laboratory (Fermilab).

The Front Tracker (6 planes, 3 chambers each, ~60k channels) and its electronics are provided by the Istituto Nazionale di Fisica Nucleare (INFN).

Comments:

The project team has done an excellent job in addressing technical risk through prototyping. From the test results presented it appears that the prototype chambers work well and the foils from CERN are of good quality.

If the scintillator option is chosen for the Coordinate Detector, this effectively translates into one extra year of schedule float for the GEM chamber construction. The chamber construction workflow was presented, but did not identify the necessary workforce needed. However, through description of activities, it appears that adequate workforce is planned. It would be beneficial to add the needed workforce to the existing workflow.

The quality assurance (QA)/test plan has not been fully updated and documented yet. It would be beneficial if a similar plan were utilized by both UVa. and the INFN.

The 250Mhz/cm^2 gamma rate on the front tracker suggests that an attempt should be made to minimize the amount of material in the gas window in the cathode.

Recommendations:

- Update the work flow for GEM module construction to include workforce (by type) required for each step. Submit to DOE by December 15, 2013.
- Develop a written Quality Assurance/test plan, including acceptance criteria for foils and assembled chambers that will be used for both UVa and INFN.

Electronics, DAQ and Trigger

Findings:

The trigger for the elastic scattering experiments is based solely on the calorimeters, with no component from any tracking detector or other particle identification.

Upon request, a description of the Level 1 and Level 2 triggers was presented for each of the approved 4 experiments utilizing the SBS.

The electronics for the Hadron Calorimeter (HCal) is based on flash analog-to-digital (FADC) modules developed at JLAB and hence has a strong local expertise pool.

The electronics for the GEM trackers will be based on the APV 25 chip, with at least the "front trackers" using INFN modules, while the polarimeter GEMS will use either the INFN or the RD51 SRS electronics.

The electronics for the newly-proposed multi-anode photomultiplier (MAPMT) based CDet is to be Fastbus modules acquired from the BELLE experiment.

The inelastic background is significantly larger than the elastic signal although this was not quantified at the review. The ratio of elastic to inelastic triggers for $Q^2>3$ GeV^2 is expected from lower Q^2 data to be large enough to accomplish the measurements using offline cuts.

Comments:

These are beautifully simple experiments in concept, being based on 2-body kinematics. As such, knowledge of the beam energy defines the geometry of the scattering process and leads to well-defined coincidence requirements for triggering. However, the trigger issue is one of background and whether the detectors and data acquisition can sustain event rates that lead to a clean signal in offline analysis in which all the detectors can participate.

It is unclear to the panel as to how the interpretation of these measurements depends on the thresholds used in the experiment's trigger.

The JLAB FADC system was not presented, but should be more than adequate for forming coincidence triggers at rates the panel was told are sufficient.

The utilization of three Fastbus systems in parallel to achieve the data rates required is non-standard.

The electronics for the GEM detectors have sufficient ring memory depth to allow formation of a coincidence trigger at Level 2 in less than ~2μs. Trigger algorithms, concerning cluster locations formed in <2μs should be possible within the FADC system.

The standard RD51 SRS system has some potential safety issues regarding the low voltage distribution. As part of the design review or before committing to a purchase for electronic systems a safety review should be carried out to assure the equipment will satisfy JLAB requirements.

It would be useful to conduct a prototype electronics system test, which incorporates a slice of the different types of electronics, as soon as it can be accommodated.

Recommendations:

- Conduct a background assessment for each experimental program that includes background rejection and signal efficiency as a function of trigger cuts, and present at the next review.
- Develop a document describing the interface between the DAQ system and each of the 3 types of electronics (FADC, GEM, and FASTBUS) and present at the next review.

Calorimeters and Other Off-Project Components

Findings:

There are five components that are being contributed by outside organizations and not included in the project:

- The He3 target from the UVa, College of William and Mary (W&M), JLAB, Temple University, University of New Hampshire (UNH)
- A Gas Cherenkov detector from the W&M, JLAB, Glasgow, James Madison University (JMU), North Carolina Agricultural & Technical (A&T) State College
- The Front Tracker GEM detector from INFN
- The Hadron Calorimeter from Carnegie Mellon University (CMU), INFN, JLAB
- The eCal and BIGCal (with workforce from various institutions)
- In addition, a scintillator-MAPMT based Coordinate Detector (CDet) is proposed by Saint Mary's University in Canada to replace the proton tagger in the neutron form factor experiment (WBS 2) and the Vertical Coordinate Detector (VCD) in the proton form factor experiment (WBS 3).

The polarization of the target is expected to be sufficient for the measurements even in the presence of the anticipated luminosities.

The proposed CDet is based on existing MAPMTs (CDF) and FASTBUS electronics (BELLE) and gives improved position and time performance in both the neutron and proton program compared to a GEM solution.

The gas Cherenkov detector is envisioned for the GE(n) and GM(n) programs. Its performance requirements were not presented.

The HCal is based on 288 cells of 15cm x15cm Fe-Scint cells employing wavelength shifter readout through fast 2" photomultipliers (PMTs).

The requirements for the HCAL to be used with the SBS have driven continued research and development (R&D) efforts in understanding the behavior of the COMPASS HCAL1 (simulation compared to measurement) as well as desired improvements.

Most of the R&D activity has been aimed at improvements in timing, and a choice of PPO-only scintillator (matched to a WLS readout) coupled to fast PMTs was presented as meeting the goal of ~ 0.5 ns resolution.

Contrary to the previous plan to produce the HCAL at the Joint Institute for Nuclear Research (JINR), the construction is now envisioned to take place at CMU and be based on U.S. vendors. Indeed construction (prototype), production (scintillator) and procurement (light guide parts) are already underway within an enlarged HCAL collaboration.

A work area, including clean room, has recently become available at CMU for this effort due to completion of other projects.

Comments:

The suite of off project detectors brings critical capabilities to the experiments in a cost-effective manner, but also presents an integration and management challenge.

The panel is pleased to see the progress in the HCAL R&D efforts; the SBS experiments will benefit from an HCAL with improved performance. Construction of the prototype HCAL module (targeted for early 2014) is an essential step to understand how the single tile tests translate into a modular response. The prototype will also be invaluable in addressing various mechanical and optical issues of module construction vis-à-vis desired performance, as well as help in preparing a mass production protocol and QA procedure.

Establishing an HCAL factory to produce ~300 modules (consisting of ~ 24,000 scintillator "pieces" among other things) is no small task and the projected completion rate of ~ 1/day may be a challenge to maintain. While many aspects of the overall design are finalized it is likely that the HCAL project would benefit from a "pre-production review" to help ensure successful completion.

The BIGCAL will require some R&D and refurbishment. These plans have not yet been well integrated into the overall project plans, and need to be.

The MAPMT CDet, by eliminating the need for an Al absorber in the electron arm, appears to be an improvement over the baseline GEM solution, reducing the background by a factor of six.

Recommendations:

- None

Budget and Schedule

Findings:

The SBS program is supported with Jefferson Lab capital equipment base funding.

The program is divided into three components: WBS 1: SBS Basic, WBS 2 - Neutron FF, and WBS 3 - Proton FF. The WBS 1 and 2 were initiated on October 1, 2012, and WBS 3 was initiated on 10/1/13.

The cost of the SBS Basic is $1.694 million, with 28% contingency; Neutron FF is $1.573 million, with 30% contingency; and Proton FF is $1.582 million, with 30% contingency.

Level 3 milestones have been added to the project management plan (PMP).

The project manager described the risk mitigation activities over the past year.

- To mitigate risk in WBS 1, a detailed 3D model of the Hall is maintained with all designs entered into the model and the beamline design has been initiated.
- In WBS 2 and 3, successful GEM prototypes have been developed, a contract has been awarded for 29 GEM modules, and QA tests by INFN have found few compromised detectors.

The schedule float in each WBS is about one year.

The scientific effort is specified in a research management plan which is not current.

In FY 2014, the SBS Program requires 68 person-weeks of design: 25 person-weeks of engineering and 30 person-weeks of technicians.

Comments:

The project has completed one milestone a few months behind schedule. The schedule float has been appropriately increased since the last review. The schedule appears feasible.

The project team should conduct regular estimates-to-complete and risk-based contingency assessments to determine whether the project is on track, and adequate contingency remains.

The project team would likely benefit from some project controls support from the JLAB project Management Office.

Recommendations:

- Integration milestones for all equipment off-project, as well as key JLAB readiness and safety reviews, should be incorporated into the list of milestones. Provide updated list of milestones to DOE by January 1, 2014.

Management and ES&H

Findings:

A PMP was assembled, reviewed, and approved by DOE in the spring of 2012, and some minor revisions were added in January 2013. Risks were identified in the PMP.

To keep track of the project the PM works closely with Hall A management and the collaboration through weekly meetings.

The SBS Collaboration has formed a Coordinating Committee, which is a working group of the Hall A Collaboration and separate from the SBS construction project.

Project activities adhere to the protocols in the JLAB Environment, Health and Safety (EH&S) manual.

A PMT-based CDet was presented that would change the scope of WBS 2 and WBS 3, requiring the building of a total 40 GEM modules instead of the original 64 GEM modules.

			Previous Baseline-GEM	Proposed C-Det	current situation
n-ff	WBS-2	Tagger	24	0	29
p-ff	WBS-3	Polarimeter	40	40	11

There does not exist an overarching document which articulates technical specifications of all equipment components, both on and off-project.

An integration plan for installation of all essential components does not exist.

Comments:

The Project Manager and Collaboration are commended for fully responding to recommendations from the last review, as well as addressing comments in the DOE Report.

The SBS Collaboration has attracted a number of strong collaborators, including a substantial contribution from INFN, which is greatly appreciated.

A decision on the Coordinate Detector needs to be made and documented. The panel endorses the proposed change in technical scope. The WBS components and PMP should be updated to accurately reflect the changes in cost, schedule, and scope.

The Laboratory and the Collaboration have developed an organization and communication system which seems to be working well for them. The Laboratory is

commended for having obtained commitments from collaborating institutions in regards to maintenance and operations of off-project equipment.

The SBS Collaboration includes 16 different institutions, from three different countries. It is supported by a number of funding agencies, including direct university support. It includes a suite of challenging detectors that are constructed off-project and not under the direct authority of the PM of the laboratory. The management and integration challenges of the SBS are considerable and should not be underestimated.

Recommendations:

- Develop a Technical Specifications Document for all experimental components in the SBS program and present it at the next annual review.
- Develop an integration plan for all experimental components (on and off project) needed for the SBS program, which includes activities, schedules and goals.
- Update the Research Management Plan to capture current plans for scientific effort needed to implement the project. Submit to DOE by February 15, 2014.
- The Project Management Plan should be updated to reflect changes in scope to the WBS components and evolving list of off-project equipment. Submit an updated PMP to DOE by January 1, 2014.

Appendix A: Charge Letter

Thank you for agreeing to participate as a panel member for the Annual Progress Review of the Super BigBite Spectrometer (SBS) for Hall A at the Thomas Jefferson National Accelerator Facility (TJNAF). This review is being organized by the Department of Energy (DOE) Office of Nuclear Physics Facilities and Project Management Division and is scheduled to take place at TJNAF on November 4-5, 2013. A list of the review panel members and anticipated DOE participants is enclosed.

Each panel member is being asked to evaluate and comment on any relevant aspect of the SBS project. In particular, the purpose of this review is to assess all aspects of the project's plans—scientific, technical, cost, schedule, management, and environment, safety and health (ES&H). The following main topics will be considered at the review:

a. The significance and merit of the project's scientific goals;
b. The feasibility and merit of the technical approach for delivering the science, and the technical status of the project, including completeness of scope and fabrication progress;
c. The feasibility and completeness of the budget and schedule, including workforce availability;
d. The effectiveness of the management structure and the approach to ES&H; and
e. Other issues relating to the SBS project.

Each panel member is asked to review these aspects of the SBS project and write an individual "letter report" on his/her findings. These letter reports will be due at DOE two weeks after completion of the review. As Chairperson for the review, I will accumulate the "letter reports" and compose a final summary report based on the information in the letters. We take care to keep the identity of the reviewers confidential in the summary report. It would be convenient if you would prepare your response in a form suitable for transmittal to the proponents devoid of potentially identifying information. The cover letter may include other remarks you wish to add.

The project team has been asked to provide relevant background materials prior to the review. This documentation, along with a current agenda, will be distributed in the near future. If you have any questions about the review, please contact myself at 301-903-1455, or E-mail: Jehanne.Gillo@science.doe.gov. If you have any questions regarding local travel or lodging, please contact Pat Stroop at TJNAF at (757) 269-7553, or E-mail: stroop@jlab.org.

I greatly appreciate your willingness to assist us in this review. It is an important process that helps our office to understand the status of the project. I look forward to a very informative and stimulating review.

Sincerely,

Jehanne Gillo
Director
Facilities and Project Management Division
Office of Nuclear Physics

Enclosure

Appendix B: Agenda

DOE SBS Review
November 4-5, 2013

Monday 04 November 2013

Executive Session - F113 (08:00-08:50)

Welcome - (08:50-09:00)
- Presenters: MCKEOWN, Robert

SBS Science Update and Overview - (09:00-09:45)
- Presenters: CATES, Gordon

SBS Program: Cost, Schedule and Management - (09:45-10:45)
- Presenters: LEROSE, John

BREAK - (10:45-11:00)

Coordinating Committee Overview - (11:00-11:30)
- Presenters: QUINN, Brian

WBS 1 - SBS Basic: Magnet and Infrastructure - (11:30-12:15)
- Presenters: WINES, Robin

Lunch (Executive Session) - B207 (12:15-13:30)

WBS 2 - Neutron Form Factor: GEM Detectors - (13:30-14:15)
- Presenters: LIYANAGE, Nilanga

Ancillary Equipment: Front Tracker - (14:15-14:45)
- Presenters: CISBANI, Evaristo

Ancillary Equipment: Calorimetry - (14:45-15:15)
- Presenters: FRANKLIN, Gregg

Technical Proposal: PMT-Based Coordinate Detector - (15:15-15:45)
- Presenters: SARTY, Adam

BREAK - (15:45-16:15)

Executive Session - F113 (16:15-19:30)

Dinner - Atrium (19:30-21:00)

Tuesday 05 November 2013

Q&A - F113 (08:00-09:00)
Breakout: GEM Detectors and Electronics - L102 (09:00-10:30)
Breakout: Magnet/Infrastructure/Integration - B207 (09:00-10:30)
Breakout: Project Management - F113 (09:00-10:30)

Executive Session - F113 (10:30-12:30)

Lunch (Executive Session) - F113 (12:30-13:30)

Executive Session - F113 (13:30-15:00)

Closeout - F113 (15:00-16:00)