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Department of Energy
Office of Nuclear Physics Report

on the

Joint Science and Technical, Cost, Schedule and Management Review

of the

Super BigBite Spectrometer (SBS)

October 13-14, 2011

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Executive Summary

On October 13-14, 2011, the Facilities and Project Management Division and the Physics Research Division of the Department of Energy (DOE) Office of Science, Office of Nuclear Physics (NP) conducted a joint Science and Technical, Cost, Schedule, and Management Review of the proposed Super BigBite Spectrometer (SBS) program. The review was held at the Thomas Jefferson National Accelerator Facility (TJNAF) in Newport News, Virginia.

The review finds the proposed SBS science program, consisting of a set of nucleon form factor (FF) measurements (GEn, GEp, and GMn) extending to $Q^2 \approx 10\text{-}14\ GeV^2$ as well as semi-inclusive DIS (SIDIS) measurements with broad kinematic coverage, to be compelling and technically feasible. As the detector design matures, the projected measurement sensitivities should be updated to reflect the final detector configuration and the results of the associated detailed MC simulations. The collaboration has prepared a preliminary Research Management Plan that should be expanded to include the resources needed to produce physics results in a timely fashion.

A large dipole magnet on loan from Brookhaven National Laboratory (BNL) will be modified extensively to serve as the spectrometer magnet for all phases of the SBS program. Initial magnetic field calculations using a finite element analysis program called “TOSCA” indicate that the required field configurations can be achieved, but the complete set of proposed beam line and SBS components should be added to the calculations. It was not clear whether the in-situ measurements of the magnetic field with elastic scattering events will yield the desired accuracy, or whether field mapping is required. The collaboration should clarify the need for either technique.

The proposed triple- Gas Electron Multiplier (GEM) technology is appropriate to deliver the SBS tracking requirements. While it is a well-established technique that has been applied by other experiments, the SBS implementation is challenging and requires careful evaluation of the technical and delivery schedule performance of the two potential suppliers as well as extensive prototyping of detector foils, readout boards and front end electronics. The difficulties in successfully fabricating a sizable number of large-area GEM detectors at an institution without prior production experience should not be underestimated.

Electronics, data acquisition (DAQ) and trigger for the four main detector subsystems (GEMs, HCAL, BigCal, and ECal, do not present unusual challenges and seem to be well in hand.

While the recovery of radiation damage in lead glass by ultra-violet (UV) exposure is well known, this is being pushed to an extreme in terms of recovery timescale for BigCal. The proposed scheme should be tested with prototype setups under realistic conditions before it can be viewed as a feasible strategy.

Success of the SBS program relies on several pieces of auxiliary equipment which are not part of the project, including a polarized target, a Cherenkov detector, Italian GEM detectors, and a hadronic calorimeter. It is crucial that management ensures their timely availability.

The SBS program is divided into three phases (SBS Basic, Neutron FF, and Proton FF). Each phase is to be funded out of the TJNAF capital equipment base budget, starting in first quarter fiscal year 2013 (1QFY13) and finishing in 4QFY17. The workforce for implementing the SBS program is to be provided by the laboratory and an international collaboration. The panel was unable to fully evaluate cost, schedule, and workforce, based on the material presented at the review.

A preliminary Program Management Plan has been prepared for the SBS program. However, it did not present an acceptable set of key performance parameters, nor credible cost and schedule information. The overall complexity of the SBS program should not be underestimated. It requires a significant effort from the Hall A team, coordination and oversight of sizable subcontracts with national universities for critical items, and the timely and efficient use of promised international resources. Thus, a significant management effort will be needed to ensure successful completion of the program. Laboratory management needs to continue to work with the project manager to put in place a strong management team with access to effective management tools.

Recommendations

- Develop credible cost estimates, including a risk-based contingency analysis, and resource-loaded schedules for all three program phases. Submit to DOE by January 3, 2012.
- Complete a revised PMP appropriately tailored to the size of the program. Submit to DOE by January 3, 2012.

Introduction

On October 13-14, 2011, the Department of Energy (DOE) Office of Science, Office of Nuclear Physics (NP) held Joint Science and Technical, Cost, Schedule and Management Review of the proposed Super BigBite Spectrometer (SBS) program. The review panel consisted of five external peer review experts: Dr. John Arrington (Argonne National Laboratory), Professor Bernd Surrow (Massachusetts Institute of Technology), 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. Helmut Marsiske, Program Manager for Nuclear Physics Instrumentation and Dr. Ted Barnes, Acting Program Manager for Medium Energy Nuclear Physics. Other participants included Dr. Jehanne Gillo, Director of the Facilities and Project Management Division for NP and Dr. Timothy Hallman, Associate Director of the Office of Science for Nuclear Physics and Acting Director of the Physics Research Division.

Each panel member was asked to assess the scientific merit and significance of the proposed SBS program as well as all relevant aspects of the spectrometer's conceptual design and associated fabrication plans. The following main topics were considered at the review:

1. The merit and significance of the proposed scientific program for the SBS; specifically, what important progress in scientific knowledge could occur as a result of the new capabilities becoming operational:
    a. The significance of specific scientific questions identified by the community and laboratory which they believe can be addressed by data acquired during the first three years of operations;
    b. The impact of the planned scientific program on the advancement of nuclear physics in the context of current and planned world-wide capabilities; and
    c. The experimental and theoretical research efforts needed to accomplish the proposed scientific program.

2. All aspects of the SBS project's conceptual design and associated plans—technical, cost, schedule, management, and environment, safety and health (ES&H); specifically:
    a. The feasibility and merit of the proposed technical approach; the status of the technical design, including completeness of technical design and scope; and the feasibility and effectiveness of the technical performance for delivering the science;
    b. The feasibility and completeness of the proposed budget and schedule, including workforce availability;
    c. The effectiveness of the proposed management structure and the approach to ES&H; and
    d. Other issues relating to the SBS project.

In addition to the above, the panel was asked to evaluate:

1. A Research Management Plan that identifies, as specifically as possible, research groups and leaders who will support and exploit the new capabilities to accomplish the proposed scientific program; and
2. Drafts of project documentation, including the project proposal, Conceptual Design Report, and a Project Management Plan.

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 and Impact of Scientific Program

Findings:

The Super BigBite Spectrometer (SBS) program allows for a complete set of nucleon electromagnetic form factors (FF) measurements extending to $Q^2 \approx 10$ GeV^2 compared to the present 3.4 GeV^2 range. While some of the form factors can be measured in other Halls, the SBS program allows for a complete set of measurements with kinematic coverage and precision exceeding all other proposed measurements.

The physics program follows up on the form factor program at 6 GeV, which showed unexpected behavior in the proton electric form factor at high Q^2, supporting the importance of quark orbital angular momentum, and has shown differences in the up- and down-quark contributions to the form factors. These measurements will provide the highest Q^2 constraints from exclusive reactions for the broader program of Generalized Parton Distribution (GPD) measurements, and relate to the small transverse scales in 3D tomography of the proton. The form factors can be used to directly determine the light-front "charge density" of the nucleon, with the high Q^2 data contributing to the structure at small distance scales. Detailed comparisons of the proton and neutron form factors can provide essentially model-independent information on the up- and down-quark contributions to the nucleon form factors, which have already been demonstrated to have different Q^2 dependences.

The SBS spectrometer also is planned to be used for the Physics Advisory Committee (PAC) approved Semi-inclusive Deep Inelastic Scattering (SIDIS) experiment. This will provide high-precision data on the neutron, with broad kinematic coverage in x, z, and Q^2. The measurement focuses on transversity and the Collins and Sivers asymmetries and requires the addition of a Ring Imaging Cherenkov (RICH) detector for particle identification.

The GEp measurement will extend to $Q^2 \approx 12$ GeV^2 with uncertainties a factor of 2-3 smaller than the existing high-Q^2 data. This will allow for a determination of the high-Q^2 behavior sufficient to differentiate between the approximately linear falloff currently observed, which predicts that GEp becomes negative, and a slowing falloff with GEp leveling off before becoming negative.

Comments:

The panel found the scientific program compelling and feasible. The panel felt the collaboration has significant experience in form factor (FF) measurements using polarization degrees of freedom and open, large-acceptance spectrometer devices. A complete set of FF measurements provides the best way to test models of the nucleon structure. At present, complete measurements exist only up to 3.4 GeV^2, where pion cloud contributions are expected to be significant. Because these are excluded (or treated on an unequal footing) in most calculations, the present data are limited in their ability to challenge such models. A complete set of FF measurements above 3-4 GeV^2 will allow, for the first time, detailed evaluations of models in a region where the data are expected to be sensitive mainly to the three-quark core.

While the Q^2 range of these experiments may not be high enough to see the perturbative quantum chromo dynamics (pQCD) scaling behavior, extending measurements of the pattern of deviation from pQCD for the proton and neutron (and up- and down-quark contributions) is of great interest.

Advancements of models of nucleon structure in recent years make it likely that a theoretical interpretation of the measurements will be possible, and that interpretations of the present data (e.g., in terms of orbital angular momentum or di-quark correlations) can be tested.

The SIDIS measurements will provide high-precision data with broad kinematic coverage which can be combined with similar measurements on the proton to more thoroughly study the up- and down-quark contributions to proton structure.

While very high Q^2 measurements with SBS may be limited to fully exclusive reactions, there is room for significant improvement in a range of measurements at somewhat more modest Q^2 values, including, but not limited to, the extension of the A1n measurement and the high precision measurement of GMn to be proposed at the next PAC. The projected measurement sensitivities should be updated to reflect the final detector configuration and the results of the associated detailed MC studies. If need be, the highest planned Q^2 value should be adjusted so as to maintain the necessary precision.

Recommendations:

- None

Technical Approach/Completeness of Technical Design and Scope

Magnet, Beam line and Infrastructure

Findings:

A large dipole magnet (48D48) at Brookhaven National Laboratory (BNL) has been identified for loan to Thomas Jefferson National Accelerator Facility (TJNAF/JLAB) to be modified extensively and used as the magnet for the SBS program. Modeling of its magnetic field, beam line constraints, and associated support infrastructure has begun. Layouts for the various configurations have begun to be visualized and requirements for the infrastructure are being determined and documented.

The SBS magnetic and detector components will be configured differently for the envisioned suite of experiments; indeed, significant movement and re-configuration is involved in preparing for different angle settings for a given experiment.

The demand for increased luminosity is met by higher electron beam currents from the 12 GeV upgrade as well as by target upgrades.

Comments:

The panel is pleased to see the good progress in analyzing the SBS magnetic fields using full TOSCA calculations. Initial indications are that suitably configured clamps with the addition of bucking coils and beam line magnetic shielding (the latter given by simple Mermaid calculations) can reduce transverse field components along the beam as required.

Regarding the field clamping, bucking magnets and beamline magnetic shielding, it is important to add all of the proposed elements to the full TOSCA calculations. In addition, more of the full SBS configuration should be added (e.g., the effect of the BigBite magnet when present) in order to get a full picture of the fields in the various configurations.

Needed target improvements are generally thought to be within the scope of a moderate extension of present capabilities. For the He^3 target, ongoing development of a faster pumping technique for a longer cell needs to continue in order to achieve the desired figure of merit (FOM).

Detailed knowledge of the field components of the SBS magnet is most crucial for the spin tracking needed in the GEp experiment. It was not clear to the panel whether the in-situ measurements with elastic scattering events would yield the desired accuracy, or whether field mapping was required. The collaboration should clarify the need for either technique.

Recommendations:

- None

Gas Electron Multiplier (GEM) Detectors

Findings:

The SBS physics program requires tracking with high rate capability and spatial resolution well below 100 μm. A comparison of MWDC, GEM, and Silicon technology favors GEM technology as providing a cost effective solution for covering a large tracking area while enabling a hit resolution of about 70μm. Triple GEM technology is a well-established technique that has been applied by several experiments.

The proposed layout of GEM tracking stations is based on modular triple-GEM detectors of about 40 x 50 cm^2. The basic GEM foil and 2D readout board size is 40 x 50 cm^2. The SBS front tracker consists of six 40 x 150 cm^2 GEM tracking stations. Each tracking station in turn is made up of three 40 x 50 cm^2 individual triple GEM detectors. Those 18 individual detectors are being built by Italian collaborators and are fully funded by the Istituto Nazionale di Fisica Nucleare (INFN).

The SBS polarimeter tracker and coordinate detector will be built at the University of Virginia (UVA). The polarimeter tracker stations consist of eight GEM tracking stations of 50 x 200 cm^2. Each tracking station in turn consists of five individual 50 x 40 cm^2 triple-GEM detectors. The coordinate detector consists of two GEM tracking stations of 80 x 300 cm^2 segmented further into smaller size triple GEM detector modules made of 12 40 x 50 cm2 individual detectors.

The readout of each triple GEM detector is realized by the APV25-S1 chip. The required number of APV chips (~1000) has already been secured. This readout chip has been used by numerous triple GEM detector projects and has been identified by the RD51 collaboration as the most suitable readout choice among currently available readout chips.

Comments:

The required size of GEM foils of about 40 x 50 cm^2 is such that double-mask and single-mask production procedures at the Conseil European pour la Recherché Nucleaire (CERN) could be used. It is strongly suggested to compare the procurement of CERN-produced foils to foils manufactured in industry by Tech-Etch Inc. using glass masks rather than mylar foil masks. The optical uniformity of large foils as produced by Tech-Etch Inc. is superior compared to those produced at CERN. Another critical performance characteristic is the leakage current behavior, in particular the long-term performance regarding charge build-up. It is strongly suggested to purchase prototype foils at CERN and Tech-Etch Inc. and characterize those foils in terms of uniformity and leakage current. The delivery schedule for CERN-produced foils is a concern.

The length of the readout strips of ~50 cm is such that care should be taken regarding the input capacitance for each APV25 chip. A careful evaluation of signal to noise performance is important.

Each Front-End electronics (FEE) module is mounted onto a carrier board at the edges of each triple GEM detector. The overall orientation of the FEE modules is appropriate. Appropriate care should be taken in inserting and extracting FEE modules. It is understood that some FEE modules are mounted at 90º requiring bending of the 2D readout board foil. Care must be taken to avoid breakage of readout strips.

The high voltage (HV) distribution from a HV board should be designed in such a way that one can disable one sector individually in case it develops a large leakage current.

Once a vendor is selected a clear list of specifications in terms of uniformity and leakage current performance should be formulated and agreed upon, followed by a small-scale procurement for the purpose of confirming each agreed upon specification. Those specifications should include explicitly the need for clean handling in particular in the case of Tech-Etch Inc. produced foils. It is strongly suggested to assemble several full-scale prototype modules and test their performance to practice all assembly steps in the local UVA clean room environment.

The production of spacer grid frames could turn into a rather labor intensive effort. The collaboration should consider water jet cutting which provides a rather cost effective solution.

Recommendations:

- None

Electronics, DAQ and Trigger

Findings:

There are four main detector subsystems present: GEMs for tracking, a hadronic calorimeter (HCAL) for nucleons, BigCal for electron ID in proton measurements, and BigBite ECal for neutron measurements.

Electronics for the GEMs are based on 128-channel APV25 analog chips (already purchased) which have triggerable internal analog pipelines which then feed commercially available digitizing electronics. Electronics for HCAL is based on a TJNAF-designed FADC operating at 250 MHz to produce cluster sums for triggers and discriminator outputs based on thresholds applied to these sums. Electronics for BigBite exists and are based on Fastbus which requires an external trigger and a fast clear—easily accommodated in the trigger scheme. Electronics for BigCal are based on existing summing amplifiers to produce floating boundaries for cluster sums, producing discriminator outputs for triggers, with individual PMT analog copies and sums going to Fastbus ADCs and TDCs.

Discriminator signals constitute a Level1 trigger produced within 100ns of an event. Discriminator signals from HCAL and BigBite ECal cluster sums are passed to commercial FPGA units (CAEN 1495) for level-2 geometry based triggers. If no level-2 trigger is issued, a fast clear is produced.

Event rates are expected to be a few kHz with a total data acquisition rate of ~60 MB/s.

Comments:

The neutron measurements are based on quasi-elastic scattering constraints using an existing electromagnetic system and Cherenkov detector with a new HCAL, GEM tracking, and trigger/data acquisition (DAQ). The key to this measurement appears to be background rejection based on electron/pion PID. The HCAL design appears to have adequate segmentation to provide sufficient angular constraints for the neutron program.

The proton program uses local polarimetry based on scattering in unpolarized CH_2 (methylene) between the magnet and the HCAL, which appears adequate for the program. Tracking to determine precession in the magnetic field and the transverse and longitudinal components of the scattered proton appears adequate. The coordinate detector using GEMs with BigCal appears to be a straightforward implementation.

The FADC is a key element in all aspects of the program and appears to be a sophisticated module of general utility in pattern triggers.

The GEM technology is a good choice given its availability with both front-end and digitizing electronics that appears to fit into the overall trigger scheme, namely, it has sufficient pipeline capability for the few μs latency of the level-2 trigger decision. Selecting regions of interest based on the geometry of the coincidence trigger leads to manageable data volumes.

There seem to be no particular challenges with the trigger/DAQ approach. The idea of using clusters for ECal and HCAL signals is based on standard shower analysis. The implementation of geometric constraints to reduce cluster coincidences to a manageable level is good and uncontroversial given the availability of fast FPGAs with sufficient input channel bit count. The team should consider developing multiple simultaneous trigger capability using prescaled single-cluster triggers for both ECal and HCAL to keep track of “singles” rates.

Recommendations:

- None

Calorimeters and Other Off-Project Components

Findings:

The components of the BigCal lead glass calorimeter have been used before and hence are well characterized. For the GEp experiment, high levels of radiation damage (leading to darkening) are anticipated.

While not formally part of the SBS program, the HCAL calorimeter and its good performance are essential for the envisioned suite of experiments. The planned HCAL is very similar to that used by COMPASS, but with some modifications. The actual construction of the HCAL modules is scheduled to begin in calendar 2012 at the Joint Institute for Nuclear Research (JINR) shops. A necessary HCAL improvement over COMPASS is timing resolution; results from simulation and extrapolation from prototypes at CMU suggest that faster WLS and PMTs may indeed get the desired timing resolution.

Comments:

The rearrangement of the components of the BigCal lead glass calorimeter for use in the SBS setups is not an issue. While the recovery of radiation damage in lead glass by UV exposure is well known, in the present application this may be pushed to an extreme in terms of recovery timescale. Different damage and/or cure rate time components could complicate the proposed scheme. The lead glass radiation damage and cure rates should be tested with prototype setups under realistic conditions (e.g., high dose in 7 hours, full cure in 1 hour) before this can be viewed as a feasible strategy. Similarly, in-situ UV effects on the PMT photocathode should be studied.

The SBS collaboration should consider relevant HCAL specifications including components, and fabrication and QA procedures, as well as provide production oversight at JINR to ensure the desired HCAL performance.

Recommendations:

- None

Budget and Schedule

Findings:

The SBS program will be funded out of the Jefferson Lab capital equipment base budget.

The program is divided into three phases: SBS Basic, Neutron FF, and Proton FF. The estimated cost of the SBS Basic is $1.652 million; Neutron FF is $1.076 million; and Proton FF is $1.597 million. The average overall contingency was stated to be 21%.

As presented, the first two phases (SBS Basic and Neutron FF) start in 1QFY13 and complete in 4QFY15; the last phase (Proton FF) starts in 1QFY14 and completes in 2QFY17. In each phase, a schedule was presented with 72, 15, and 11 days of schedule float, respectively.

The workforce for implementing the SBS program is provided by TJNAF and an international collaboration. The scientific effort is specified in a research management plan.

Comments:

A basis of cost was presented, and appears reasonable for the items that are included. There is concern that the cost for some activities has not been captured. The contingency estimate does not fully take into account technical and schedule risk. Schedule float as presented is insufficient.

The panel was unable to fully evaluate cost, schedule, and workforce, based on the material provided.

Recommendations:

- Develop credible cost estimates, including a risk-based contingency analysis, and resource-loaded schedules for all three program phases. Submit to DOE by January 3, 2012.

Management and ES&H

Findings:

A preliminary Program Management Plan (PMP) has been prepared for the SBS program. Five subsystems have been identified and management responsibilities have been assigned to different institutions.

The level of effort for project management was not quantified and consists primarily of the available time of the Project Manager, who also serves as the 12GeV Upgrade Hall A Project Manager. He is being assisted by TJNAF project controls personnel.

The overall program is undertaken as an international collaboration with significant contributions from national and overseas institutions. The collaboration has developed a detailed research management plan, mostly covering the time period during the fabrication phase of the instrument.

The project management indicated a commitment to producing an integrated safety plan.

Comments:

The overall complexity of the SBS program should not be underestimated. It requires a significant effort from the Hall A team, coordination and oversight of sizable subcontracts with national universities for critical items, and the timely and efficient use of international resources promised to the program. Thus, a significant management effort will be needed to ensure successful completion of the program.

Laboratory management needs to work with the project manager to define a strong management team with effective management tools.

The collaboration should work with DOE to expand the research management plan to include the resources required to produce physics results from various measurements in a timely fashion.

The project team should work with DOE to develop an acceptable set of key performance parameters.

Recommendations:

- Complete a revised PMP appropriately tailored to the size of the program. Submit to DOE by January 3, 2012.

Appendix A: Charge Letter

Thank you for agreeing to participate as a review panel member for the Joint Science/Technical, Cost, Schedule, and Management Review of the proposed Super BigBite Spectrometer (SBS) for Hall A at the Thomas Jefferson National Accelerator Facility (TJNAF). The review is scheduled for October 13-14, 2011, at TJNAF. A list of the members of the review panel and anticipated Department of Energy (DOE) participants is enclosed.

A set of components collectively called SBS has been proposed to accomplish an experimental program of measurements of the ground-state elastic electromagnetic nucleon form factors at high momentum transfer, using an 11 GeV electron beam and a variety of targets in Hall A. The SBS concept is based on a large-solid-angle, high-rate, high-resolution spectrometer. It utilizes, in a number of different configurations, an existing (but modified) dipole magnet together with new Gas-Electron-Multiplier (GEM) trackers, calorimeters, and other components from the existing BigBite spectrometer.

Each panel member is asked to assess the scientific merit and significance of the proposed SBS program as well as all relevant aspects of the spectrometer's conceptual design and associated fabrication plans. The following main topics will be considered at the review:

1. The merit and significance of the proposed scientific program for the SBS; specifically, what important progress in scientific knowledge could occur as a result of the new capabilities becoming operational:
   a. The significance of specific scientific questions identified by the community and laboratory which they believe can be addressed by data acquired during the first three years of operations;
   b. The impact of the planned scientific program on the advancement of nuclear physics in the context of current and planned world-wide capabilities; and
   c. The experimental and theoretical research efforts needed to accomplish the proposed scientific program.

2. All aspects of the SBS project's conceptual design and associated plans—technical, cost, schedule, management, and environment, safety and health (ES&H); specifically:
   a. The feasibility and merit of the proposed technical approach; the status of the technical design, including completeness of technical design and scope; and the feasibility and effectiveness of the technical performance for delivering the science;
   b. The feasibility and completeness of the proposed budget and schedule, including workforce availability;
   c. The effectiveness of the proposed management structure and the approach to ES&H; and
   d. Other issues relating to the SBS project.

In addition to the above, the panel will be asked to evaluate:

1. A Research Management Plan that identifies, as specifically as possible, research groups and leaders who will support and exploit the new capabilities to accomplish the proposed scientific program; and
2. Drafts of project documentation, including the project proposal, Conceptual Design Report, and a Project Management Plan.

Each panel member is asked to review these aspects of the proposed 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. The review will be chaired by Dr. Helmut Marsiske, Program Manager for Nuclear Physics Instrumentation and Dr. Ted Barnes, Acting Program Manager for Medium Energy Physics for the Office of Nuclear Physics. As Co-Chairs, they will collate the comments and recommendations from these "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. The first day of the review will consist of presentations by the project team and executive sessions. The second day will include break-out sessions and executive sessions and preliminary report writing. A brief close-out will occur around 5:00 p.m.; preliminary findings, comments, and recommendations will be presented at the close-out.

If you have any questions about the review, please contact Dr. Helmut Marsiske at 301-903-0028, or E-mail: Helmut.Marsiske@science.doe.gov or Dr. Ted Barnes can be contacted at (301) 903-3212, or E-mail: Ted.Barnes@science.doe.gov. If you have any questions regarding local travel, lodging, or other local logistics, please contact Pat Stroop at TJNAF at (757) 269-7553, or E-mail: stroop@jlab.org.

We greatly appreciate your willingness to assist us in this review. It is an important process that allows our office to assess the scientific need for the proposed new capability, and to understand the associated fabrication project and its readiness to proceed. We look forward to a very informative and stimulating review.

Sincerely,

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

Timothy J. Hallman
Acting Director
Physics Research Division
Office of Nuclear Physics

Appendix B: Agenda

SBS Review Agenda

13 October 2011

All (non-executive) sessions plenary:

8:00 – 8:50		Executive Session
8:50 – 9:00		Welcome (McKeown)
9:00 – 9:15	(10+5)	Introduction and Overview (Ent)
9:15 – 10:15	(40 +20)	Physics Motivation Overview (Cates)
10:15 – 10:45	(20+10)	Neutron Form Factor Measurements (Riordan)
10:45 – 11:00		Break
11:00 – 11:30	(20 +10)	Proton Charge FF Measurements (Wojtsekhowski)
11:30 – 12:00	(20+10)	SIDIS and Other Physics (de Jager)
12:00 – 1:00		Lunch (Executive session)
1:00 – 1:45	(30+15)	SBS Project Overview (Wojtsekhowski)
1:45 – 2:15	(20+10)	Magnet and Infrastructure (Wines)
2:15 – 2:45	(20+10)	GEM Detectors (Liyanage)
2:45 – 3:15	(20+10)	Calorimetry ()
3:15 – 3:30		Break
3:30 – 4:00	(20+10)	DAQ/Trigger Electronics (Camsonne)
4:00 – 4:30	(20+10)	Project Management, cost and schedule (LeRose)
4:30 – 4:45	(10+5)	Collaboration Management (de Jager)
4:45 - 5:00		Break
5:00-7:00		Executive session
7:30		Dinner (CEBAF center)

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8:00 – 9:00	Q&A
Breakout sessions	
9:00-11:30	Magnet/Infrastructure/Integration (de Jager, Michaels, Wines, Gavalya)
9:00-11:30	GEM Detectors and Electronics (Cisbani, Camsonne, Liyanage)
9:00-11:30	Project Management (Cates, LeRose, Khandaker, Wells)
9:00-11:30	Physics ()
11:45 – 1:00	Lunch (Executive session)
1:00 – 5:00	Executive session
5:00	Closeout