

**Associate Laboratory Director's Design Review
of the sPHENIX Tracker
September 7-8, 2016
Charge to the Review Committee**

The sPHENIX detector, currently under development, is designed to facilitate large acceptance, ultra-high rate measurements of fully reconstructed jets and high resolution spectroscopy of upsilon states at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory (BNL). The experiment is being proposed with an eye toward enhancing the physics reach afforded by the RHIC complex prior to the possible construction of an Electron Ion Collider (EIC), which is currently under consideration by both the nuclear physics community and the Office of Nuclear Physics (ONP) in the Department of Energy. A review of the sPHENIX science program conducted by ONP in April 2015 resulted in a strong endorsement of the physics capabilities enabled by such a detector, and a Cost and Schedule Status Review, called by the BNL Associate Laboratory Director (ALD) for Nuclear and Particle Physics (NPP), was held in November 2015.

The sPHENIX team is currently considering a tracking detector consisting of two major components: a silicon-based vertex detector based on Monolithic Active Pixel Sensors (MAPS) for the inner tracking volume, and a Time Projection Chamber (TPC) that will serve as the principal outer tracking device. In addition, an intermediate silicon strip detector is being considered that would serve as a transitional detector to complement the tracking coverage. This review is being undertaken in order to provide an independent evaluation of the sPHENIX tracker, with the goal of obtaining expert advice as to the technical feasibility of each in the context of the sPHENIX cost, schedule, and staffing constraints, and the experiment's physics goals. The results of this review will inform Laboratory, sPHENIX team and, ultimately, ONP planning.

The Project is currently at the pre-Critical Decision 0 (CD-0) stage. The committee is being asked to assess the current status and plans for each of the sub-detectors presented, taking into consideration the conceptual stage of the planning and design. The final sPHENIX tracker must adhere to the constraints associated with the cost, schedule and available labor and other resources; be developed and constructed by subproject collaborations that can execute the envisioned plans on the required time scales; and target performance parameters that are consistent with the physics objectives of the experiment. The committee is being asked to conduct their deliberations within this context.

The review will include an examination of the following specific items:

1. Technical Design: Have the physics requirements driving the design specifications of the sPHENIX tracking detector been properly addressed in the detector design and planning? Are the tracking scope and specifications sufficiently well defined to support the preliminary cost and schedule estimates? Has a viable process and schedule for any anticipated significant technology down-selects been put forward? If so, does it realistically conform to the project's schedule constraints?
2. Cost and Funding: Are the cost estimates for each of the sub-detectors reasonable? Have the various funding sources and institutional resources been identified in each of the cases, and have any necessary assumptions been properly incorporated into the planning and presented? Do the estimates in the initial resource loaded

schedules contain all of the staffing and other resources needed in order to execute the subprojects?

3. Schedule: Are the schedules realistic and achievable? If not, how can this be remedied or addressed? Does the project schedule for each of the sub-detectors properly take into consideration all necessary activities associated with detector realization – i.e., design, R&D, prototyping, beam tests and analysis requirements, feedback to the design, and final design and construction?
4. Management: Is there a viable plan for the roles and responsibilities of the institutions involved in the different subprojects? Has the staffing at these institutions been identified? Do the proposed institutions/detector collaborations have the expertise and sufficient available research time to execute the projects on the envisioned time scales? Can viable subproject collaborations be assembled in the time available? Are ES&H aspects being properly addressed, and are future plans sufficient given the project's current stage of development?
5. Risk: Have the principal risks been identified and associated mitigation plans been developed? If not, where are the most notable deficiencies and vulnerabilities? Are there modifications to the design and/or R&D campaigns that might significantly reduce the principal risks?
6. Open Issues: Are there any unidentified open design or fabrication issues that require additional attention?

The review will take place on Wednesday and Thursday, September 7-8, 2016, at BNL. A closeout will be presented to the Laboratory and the sPHENIX team on Thursday afternoon. It is requested that the committee submit its final report to me by Friday, September 23.

I very much appreciate your willingness to lend your time and expertise to this highly significant step in the sPHENIX review process, and look forward to receiving your assessment.

Sincerely,



Berndt Mueller
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