Report from Director's Cost, Schedule, and Risk Review of the STAR iTPC

Feb. 4, 2016

A Director's Review was held on Jan. 25, 2016 at BNL on the Cost, Schedule, and Risk of the proposed STAR iTPC project. Members of the committee were James Dunlop (BNL, chair), Chilo Garabatos (GSI), Thomas Hemmick (SBU), Richard Majka (Yale), and Bo Yu (BNL). The project as presented had a cost to DOE of $3.6M, lasting from FY2016-FY2018, with a completion date of March 1, 2016. The agenda and presentations to the committee can be found at https://indico.bnl.gov/conferenceDisplay.py?confId=1711. The committee was charged by Berndt Mueller, Brookhaven Associate Laboratory Director for Nuclear and Particle Physics, to answer 3 charge questions. Following are the Findings, Comments, and Recommendations of the committee for these 3 charge questions.

1) Are the costs of the project sufficiently well understood, and are all the resources required to complete the project fully identified?

Answer: Yes.

Findings:

The costs presented are well justified based on quotes, engineering designs, prototypes and previous experience. The resources are identified and risks of losing key personnel noted. The contingency is modest but seems matched to level of design and prototyping for each component.

Contingency of MWPC production budget (Chinese contribution, not in DOE scope) was not presented.

Comments:

Capturing the insertion tool as an off-project resource is justified.

2) Is the schedule of the project sufficiently well understood and matched to the plan for full operation in the FY19 RHIC Run?

Answer: Yes.

Findings:

The proponents have identified MWPC production and FEE production (tied to the schedule for the SAMPA chips) as critical path items. The schedule float is not clearly indicated. The schedule presented for the FEE does not allow full operation by the currently scheduled start of the FY19 RHIC run. The proponents have identified a backup plan that would allow instrumentation of every other pad row in FY19 using the existing electronics.

The MWPC assembly cleanroom cannot accommodate two parallel production lines (6 granite tables). There is no obvious float in the MWPC production schedule.

A new pad plane layout is proposed, which is expected to operate at a lower gas gain with the same signal to noise ratio as the current inner detector. It is not obvious that the current pad to FEE connector grouping is compatible with the backup plan with the old electronics (half the readout channels per group) while reading out every other pad row.

Comments:

We encourage the project to develop the optimal mapping scheme of pad to electronics channel in order to mount the previous generation of electronics on the new iTPC sectors prior to sending the padplane for production.

Committee feels that the time between now and the delivery of first units to Shandong could best be used to repeatedly practice all procedures on the existing prototypes in order to maximize efficiency of eventual production.

The project should work out the complete test and QA plan, including procedures and criteria, for qualifying a sector at all points in the production and installation.

Optimize balance between number of shipments and number of items per shipment in the phasing of delivery schedule of key components such as strongback and padplane to accelerate production schedule, including the possible paying of a premium for the first few items to accelerate their delivery

The project should develop a trackable set of milestones for the off-project dependencies. This should be a separate table from the US/BNL project milestones and with clear indication that it is for tracking purposes.

Presentation of schedule did not clearly delineate the level of float of individual parts of the project.

Recommendations:

The committee requests a document describing the physics impact of running in RHIC FY19 with a shorter run or previous generation of electronics mounted on new iTPC sectors by Feb. 15, 2016

3) Are the risks introduced by the project into the successful operation of the STAR detector in the Beam Energy Scan Phase 2 run fully understood and are sufficient plans to mitigate these risks in place?

Answer: Yes.

Findings:

The proponents have identified risks to successful project completion and provided mitigating strategies. The proponents also provided two methods to reduce or eliminate the ion back flow from the grid leak between the inner and outer sectors. It is not clear how serious distortions from this leak will be at BES II luminosities.

The proposed upgrade maintains the same wire grid configuration. Changes planned for the strongbacks include minor shift in the FEE connector slot positions, and a small notch for

installing the grid leak suppression feature. Garfield simulations using 3 low gain (~40) wires with larger diameter at the edge were performed as part of the grid leak study. But using dead wires (gain=1) instead of low gain wires has not been considered.

Comments:

In the installation of new sectors and deinstallation of old sectors, careful attention should be paid to initial cleaning, including both the old and new backplanes, and proper clean-room techniques, including handling of surfaces, tools, and materials, so as to minimize risk.

Evaluate the risk to benefit of the grid leak mitigation walls for the Beam Energy Scan Phase 2 program, and if determined to be of sufficient benefit, that the final design be fully tested for electrostatic or discharge problems on spare sectors.

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Charge to Cost, Schedule, and Risk Review for the STAR iTPC Project

The purpose of this review is to assess the technical feasibility of the STAR iTPC project within cost and schedule constraints, and to assess the risk the iTPC project introduces to the overall Beam Energy Scan Phase 2 program.

In carrying out its review, the review committee is requested to consider the following questions:

I) Are the costs of the project sufficiently well understood, and are all resources required to successfully complete the project fully identified?

II) Is the schedule of the project sufficiently well understood and matched to the plan for full operation in the FY19 RHIC Run?

III) Are the risks introduced by the project into the successful operation of the STAR detector in the Beam Energy Scan Phase 2 run fully understood, and are sufficient plans to mitigate these risks in place?

Sincerely,

Berndt Mueller
Associate Laboratory Director for Nuclear and Particle Physics

Concurred by: _____

James Dunlop
Associate Chair of the Physics Department for Nuclear Physics