Nuclear and Particle Physics Program Advisory Committee Meeting
Brookhaven National Laboratory

May 27, 2010

Executive Summary

The Program Advisory Committee (PAC) convened in an online meeting on May 27. The PAC thanks the STAR, PHENIX and sPHENIX Collaborations for their presentations.

Isobar Run Analysis - The PAC commends STAR for its excellent progress on their blind analysis of data from the 2018 isobar run (alternating between Ru+Ru and Zr+Zr collisions "on the blind"). The update that the PAC received was presented clearly and effectively. Doing a blind analysis was a suggestion made by the PAC several years ago. Designing the blind analysis protocols needed in this context to make such a suggestion feasible and real is a very substantial undertaking, and the PAC was impressed and pleased with what STAR has done, and with how far they have come. This measurement is important to the RHIC program. Regardless of what the result turns out to be, as the PAC has described in previous years it will answer important questions and be highly visible. The observables being measured (at least three different analyses are planned) are (ratios of) correlation observables that are small in magnitude, and what is of interest is how these observables differ between Ru+Ru and Zr+Zr collisions. This means that what STAR will need to deliver is precision and credibility. The update on the blind analysis procedures now underway that the PAC received made an entirely positive impression. We, and many, look forward to seeing the unblinded results later this year. The PAC sees STAR as on track to delivering what will be seen as an experimental tour de force in the RHIC program, setting a high standard for both precision and credibility.

The PAC commends STAR for having already published a paper describing the specifics of the blind analysis techniques that they employ. The PAC was also pleased to hear confirmation that after unblinding (in addition to the paper presenting results from all of their flagship analyses) STAR plans to publish a long paper that will contain not only all the details of the procedures followed but also results for all the individual correlation observables that are measured.

BES II Progress and Plans - The PAC congratulates and commends the STAR collaboration and CAD for a very successful run 20(a). The PAC is pleased that STAR has successfully addressed and solved the problems with the endcap Time Of Flight system (eTOF) which improves its capabilities especially for the fixed target runs. Also, the apparent ability to measure hyper-nuclei down to 3 GeV collision energy is very impressive and has the potential to open up a new area of study. It was furthermore encouraging to see that the analysis of the FXT data is underway. Concerning the request to retake the FXT data at the lowest beam energies with iTPC and eTOF in place, the PAC suggests that STAR update the PAC regarding the status of this at the September PAC meeting and encourages STAR to present this as a part of a full BUR if needed.

The PAC further commends BNL management for its decision to attempt completion of the interrupted run at 9.2 GeV during this year, which will ensure that the BES II program will

essentially remain on track.

PHENIX Data Analysis Progress - PHENIX is to be commended for maintaining a high level of output despite having completed data-taking in 2016. The scaling of direct photons with multiplicity is a beautiful result, as is the suppression of A_N in p+Au. The Collaboration still has an active group of PhD students performing a variety of analyses. The PAC is also pleased to see that PHENIX has begun the process of archiving their data, and looks forward to seeing the infrastructure once it is further along.

The one area of concern is the time it has taken to calibrate the 2016 Au+Au data, which had several technical issues due to an accident. It is our understanding that a critical person working on the problem left PHENIX, and that this responsibility has been reassigned. The PAC believes the completion of this work is essential, and urges that calibration and production of the 2016 Au+Au data set be assigned high priority for PHENIX.

Cold QCD - The PAC received a detailed report from STAR on the progress of analyzing the Run 15 and Run 17 data, and on the status of the forward upgrade. As STAR is considering a dedicated polarized pp run at 500 GeV in Run 22 following the completion of the forward upgrade, this status report is timely and highly relevant. The PAC congratulates the STAR collaboration for the impressive progress towards achieving the physics goals of Run 15 and Run 17. The new result on the dijet Sivers effect and the preliminary result on the transverse Single Spin Asymmetry for W and Z boson production are of particular interest, as they clearly reflect the unique RHIC capability in addressing some outstanding issues in spin physics. One of the stated goals for Run 17 is the asymmetry for Drell-Yan data. The PAC looks forward to a report on this important analysis at the next PAC meeting.

The STAR Forward Upgrade continues to make good progress. Understandably the COVID-19 situation has adversely impacted the very tight schedule for completing this challenging upgrade. The delay in the prototype testing and the procurement of silicon sensors for the Silicon Tracker, and the delay in the mass production of sTGC are particular concerns. The PAC recommends that BNL management provide the necessary assistance to mitigate the risk of a serious delay in this upgrade. To fully assess the prospect for the STAR Forward Upgrade to be completed in time for a productive 500 GeV pp run in FY22, it would be very helpful if BNL management review the status of the STAR Forward Upgrade prior to the next PAC meeting. The PAC also anticipates an updated, realistic schedule be presented to the PAC at that time.

sPHENIX - The PAC commends the sPHENIX collaboration on progress made on both the project and scientific fronts. The collaboration continues to grow with the addition of major research groups. Impressive progress has been made in reconstruction software, physics simulations and detector calibrations. Construction of all detector subsystems has proceeded well. The collaboration and project management are committed to the plan of sPHENIX data-taking in early 2023 in spite of the interruption due to COVID-19 pandemic.

The PAC recognizes the challenges for sPHENIX to maintain the construction schedule and supports the sPHENIX efforts to use available resources to reduce the pressure on schedule

contingency. The sPHENIX installation requires extended access during RHIC shutdown period. The PAC concurs that timely start-up of sPHENIX experiment is a high priority for the future RHIC scientific program. The PAC recommends that RHIC management works closely with sPHENIX to meet its scheduling needs and that future planning of RHIC operations take these into account as well.

Small Systems Analyses from PHENIX and STAR - The PAC was asked to review the status of the analysis of the p, d, He^3 + Au flow (v_n) results from PHENIX and STAR. There remains a factor of 3-4 difference between preliminary v_3 results in p/d+Au collisions reported by STAR at Quark Matter 2019 and those published by PHENIX. These differences must be resolved, as our understanding of the contributions from the initial and final states depend on their outcome. We understand that the ALD has requested a written report from each of the collaborations. Once these have been submitted, unless there is resolution of these differences, the PAC advises the ALD to form a task force, perhaps chaired by a person outside of RHIC, to resolve the issues. The success of the task force will require the commitment of dedicated resources from both STAR and PHENIX collaborations to timely address questions that may arise. Progress and further plans of the task force should be reported at the PAC Meeting in September.

The PAC was requested by PHENIX to advise on "simultaneous PHENIX/STAR membership" and "how should BNL optimize this simultaneous collaboration membership moving forward". In the first 15 years of RHIC, membership in two active RHIC experiments was excluded explicitly with appropriate transition times between formal ending of membership when a member departs. Since forming the sPHENIX collaboration, and the end of data-taking in PHENIX in 2016 this policy has changed. While in most cases, simultaneous membership in STAR and PHENIX has been beneficial to both collaborations, recent events highlight the need for a discussion about integrity and membership guidelines. Moving forward, this must also include sPHENIX, which will start taking data in 2023. The PAC was also asked to advise on a more formal code of conduct for the RHIC experiments. We recognize the importance of maintaining healthy competition between the RHIC experiments and sustaining BNL's excellence in science. The PAC suggests that a discussion between the ALD and spokespersons can lead to an understanding of how to proceed on both these fronts and that this be presented to the PAC in September for comment.