

NP Virtual Site Visit
Relativistic Heavy Ion Collider (RHIC)

August 22, 2023

Comments:

- NP appreciates the well-prepared presentations and responsiveness to questions.
- The RHIC program continues to deliver outstanding science. The strong science output from PHENIX and STAR in FY23 is impressive with a new high-water mark of publications.
- The Laboratory leadership's strong commitment to successfully complete the RHIC science program is noted.
- The safety performance trends for NPP in FY 2022 and FY 2023 are concerning, and additional attention to work planning improvements is needed. Environment, safety, and health must have the highest priority. This will become even more important as the Lab moves into EIC construction.
- The Lab's efforts on DEIA and workforce development are excellent. It was good to hear the progress made on establishing the NPP Code of Conduct, as it is an important part of establishing expectations for staff, users, and visitors.
- The laboratory's tracking of demographics through each step of the hiring process is a best practice.
- The lab presented statistics on recent hiring trends showing that Hispanic, Black, and females remain underrepresented in new hires. Out of 78 total new hires, statistics showed 0 or 2 Black or African Americans hired (depending on the data source). Acknowledging the problem of underrepresentation is an important step in developing possible solutions. Note added in proof: This discrepancy was resolved following the visit. Two GEM Fellows were included in the June 30, 2023 data set, but not in the August 10, 2023 data set as they returned to their universities.
- While there has been progress on some fronts in responding to concerns about the user experience at BNL, continued attention is needed. NP staff has received recent, unsolicited anecdotes from summer interns and visiting scientists regarding poor working and living conditions, ambiguous processes for welcoming users to the campus, and extremely limited food and drink options. At minimum BNL should redouble efforts to provide options for food and beverages for those on shift.
- The environmental challenges of running RHIC during the summer months should be appropriately accounted for when planning Run 24 and Run 25.
- While the electricity rates were lower than planned in FY 2023, it is prudent for RHIC to continue planning outyear costs using conservative rates.
- Careful attention to resource planning across all technical groups during the current shutdown period will be critical to ensure the timely start of RHIC Run 24.

- The Lab is commended for the APEX activities during the shortened RHIC Run 23 on critical questions for EIC design. Demonstration of flat hadron beam, snake aperture optimization and advanced beam cooling efforts are all directly related to the most important EIC beam parameters, the luminosity and polarization. The EIC project will benefit greatly from APEX activities in future RHIC runs.
- The need for more funding for the cryogenic infrastructure was presented, but the solution to funding this critical infrastructure needed for the EIC is not clear. The possibility of SLI funding was pursued and seems not promising. Other sources of possible funding have not yet been identified. This is a significant problem that needs to be solved if the EIC project is to be successful.
- Procurement of the Building 912 cryo-infrastructure should proceed expediently, since prior year minor construction funds may be at risk. Work in Building 912 needed for the EIC that cannot be completed with available funds should be appropriately captured in the institutional MOU.
- The Extended EBIS system funded by RHIC and NASA is a critical addition for RHIC beam capabilities and the EIC. It is expected that the recent operational challenges during Run 23 will be resolved for Run 24.
- The early discussions with BNL HR on managing the transition of technical staff from RHIC to EIC is a good development.
- Research funding from NP to BNL continues to be lower than the LMBB request, which may result in delays of staff needed for EIC research and have a negative impact on timely completion of the RHIC science. Guidance is for flat (or slightly less than flat from FY22 to FY23) funding and to fit in that envelope, staffing priorities need to be clearly stated to NP.
- The AI/ML current and planned activities indicate increased efforts in this emerging field. It is expected that a strategic view and a coherent plan emerges from these activities during the last few years of RHIC running and for the EIC project. This effort should take advantage of future funding opportunities.
- The PHENIX Collaboration analysis plans have resulted in many new publications over the past year and show several more papers will be submitted in the next year. The leadership of PHENIX has done a good job of shepherding these analyses through to publication. However, the future of the PHENIX collaboration beyond two more years is not clear.
- Discussion regarding data preservation showed progress in this initiative. The inclusion of students in this process, and particularly undergraduates, is noteworthy. The current plans on data preservation appear to match well with administration and DOE plans being updated for data sharing.
- Computing facilities for STAR and sPHENIX continue to be challenged, with CPU resources below the requested level for both detector groups. NP acknowledges this may result in delays of physics publications from the new data.
- Completion of the sPHENIX MIE and the 1008 I&F project (sPHENIX installation), and nearly completing the Run 23 beam commissioning plan for sPHENIX is commendable.

The C-AD RHIC group demonstrated great flexibility in providing various running conditions for the sPHENIX commissioning plan.

- Eight DOE Office of Science Highlights from STAR since the last S&T review is notable especially for a single collaboration. In addition, placement of recent members of the collaboration in faculty positions has been impressive.
- The STAR group continues to be very productive with many interesting new results about the physics of the QGP and the QCD phase diagram, among other topics.
- The STAR analysis map indicates that many results have already been published from past years' running, with many analyses still in progress or near to being submitted for publication.
- The success of the RBRC and the renewal of the MOU provides an excellent model for an international research center.

Recommendations:

- Update the weekly RHIC facility operations costs estimates for FY 2024 and FY 2025 and share with DOE NP by September 30, 2023.
- Provide an update on cost, schedule, and funding plans for SDCC power and cooling capacity upgrade to handle the needs of future RHIC physics analysis by December 15, 2023.