Report from C-AD, 12 Oct 2025

This report provides a summary and outlook for the final year of RHIC operations including present status and projections for ongoing Au+Au collisions, time estimates for accommodating possible additional modes of operation (unpolarized p+p, polarized p+p, and polarized p+Au), and a present status of EIC-related Accelerator Physics Experiments (APEX).

Responses to ALD questions:

Latest Au-Au delivered luminosity and an estimate by December 22 [28-weeks mark] and January 6th [30-weeks mark]. The integrated luminosity delivered through fill 36164 (Oct 12, 2025) during RHIC Run-25 with Au+Au at 200 GeV center of mass energy is shown below. The shaded regions show projections for minimum and maximum integrated luminosity. For reference, sPHENIX recorded, within the +/10 cm vertex, 3.5 nb^{-1} (exactly half of the target of 7 nb^{-1}) on 23 Sep 2025 after 11 weeks of operation corresponding to ~ 11 nb^{-1} delivered luminosity. The projections did not and do not take into account any luminosity gain from operation with the superconducting 56 MHz cavity, which unfortunately is not anticipated to enter operation, owing to an emergent operational issue (electron avalanche phenomenon – 'multipacting'). The two periods without data correspond to pauses in operations due to a failed utility line (Aug 26, 2025) and a vacuum breach in the Yellow Ring (Sep 25, 2025). Au-Au delivered luminosities are estimated as STAR=59.4 nb^{-1} and sPHENIX=16.9 nb^{-1} by Dec 22, 2025 (28 weeks) and STAR=62.84 nb^{-1} and sPHENIX=17.73 nb^{-1} by January 6, 2026.

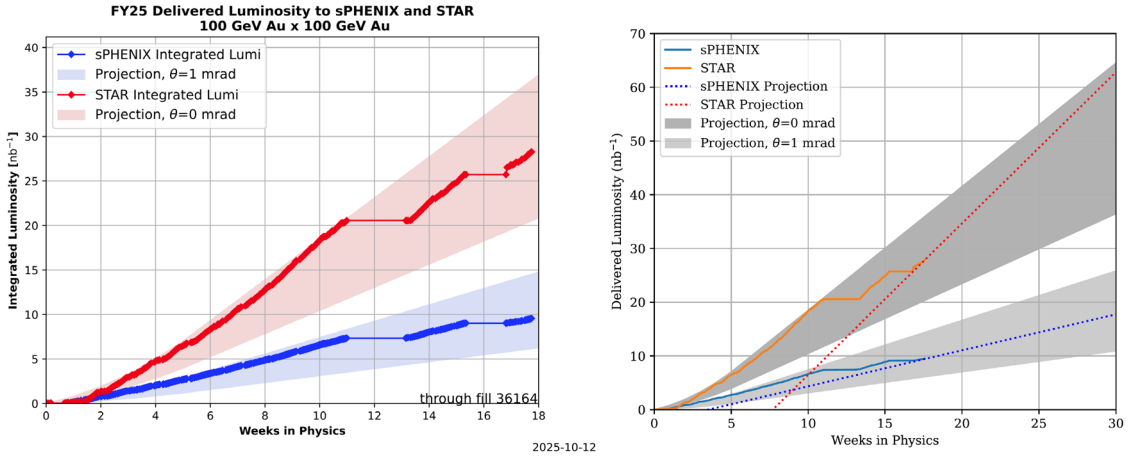

Figure 1. Delivered Luminosity to sPHENIX and STAR during RHIC Run-25 (Au+Au at 200 GeV center-of-mass energy) to date (left) and with future projections (right). Time zero corresponds to 10 June 2025.

Time estimates for changing operational modes from Au-Au.

- **unpolarized p-p: 8 hours** (normal maintenance day, no special requirements)
- **polarized p-p: 16 hour** maintenance day for preparation of Siberian snakes power supplies (with 2 teams preparing 2 snakes), in parallel 12 hours for yellow ring polarimeter fiber installation (to be followed by 3-4 days of vacuum conditioning during RHIC setup)
- **polarized p – Au: 3 days** for repositioning DX magnets for asymmetric energy beam operations, in parallel 16 hours for preparation of Siberian snakes power supplies (with 1 team preparing 1snake) and also in parallel 12 hours for yellow ring polarimeter fiber installation (to be followed by 3-4 days of vacuum conditioning during RHIC setup)

Estimated time to start physics with those modes defined as ~50% of your maximum expected lumi or figure-of-merit (where we could define "start of physics"). Please use P^2L for polarized p-p and PL for p-Au. Assumption: no dedicated AGS setup time required (1 day for unpolarized protons, 2 days for polarized protons) with setup taking place behind ongoing physics program (LINAC beams, both polarized and unpolarized, expected to be available mid-November).

- **unpolarized p-p**: **4 days**
- **polarized p-p: 7 days** (including ½ day for p-C polarimeter target conditioning)
- **polarized p – Au**: **10 days** (including ½ day for p-C polarimeter target conditioning). Note: p-Au last run in 2015 so for short run expect ~2/3 of run-15 luminosity performance.

How much of the EIC related critical/essential APEX experimental program were you able to cover so far? Based on this, how much time would you need to get the critical APEX R&D for EIC done assuming alternate week Wednesday APEX? Responsive to APEX Acceptance Committee priority ratings of proposed experiments, six APEX sessions (16 hours, every-other week) were successfully executed with experiments informing EIC design parameters and demonstrating EIC beam requirements. Considerations for the remaining experiments are given below.

- Assuming a 28-week run ending on 22 December 2025 - 6 APEX sessions remain and the highest-priority EIC experiments (grade 0A and 1A) will be performed, however low-energy cooling experiments nor other lower-priority proposed experiments would not be possible. Experiments for demonstrating Coherent electron Cooling (CeC), with proposed 168 hours, would also not be accommodated.
- Assuming a 30-week run ending on 6 January 2026 - 7 APEX sessions would allow for all highest-priority EIC experiments and approximately half of the requested time for low-energy cooling experiments. Other lower-priority proposed experiments and experiments to demonstrate CeC would not be accommodated.
- Should credit be given for recent time without beam, with the run ending on 20 January 2026 - 8 APEX sessions would allow for all highest-priority EIC experiments and all low-energy cooling experiments, however the other proposed experiments and experiments to demonstrate CeC would not be accommodated.