



BNL happenings

RHIC operations 25th year and transition to EIC

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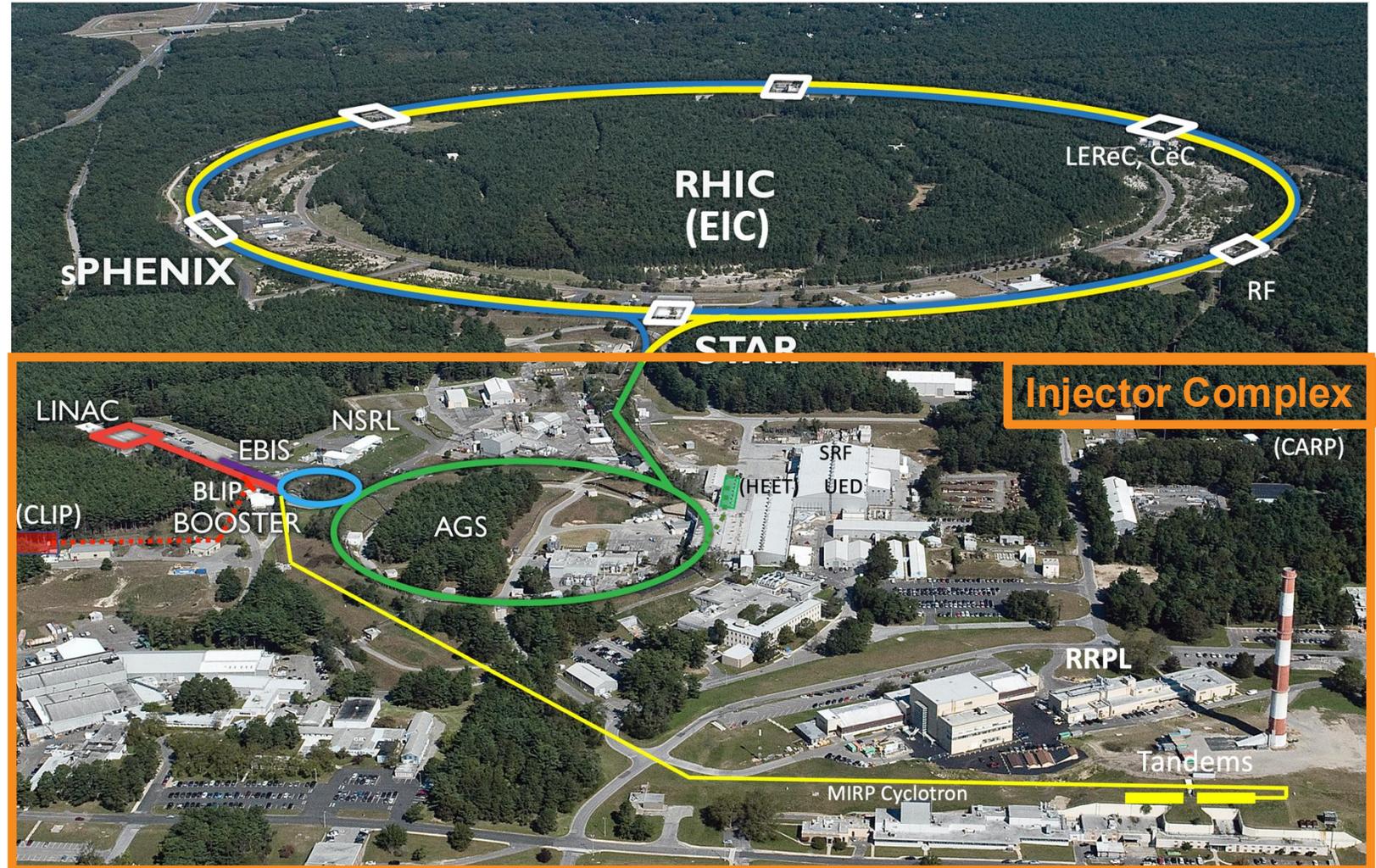
Relativistic Heavy Ion Collider (RHIC)

Basic scientific research woven with direct benefits to society

Uniquely flexible and only hadron collider in US for exploration of Quark Gluon Plasma and proton (spin) structure

Injectors also used for application programs:

- **LINAC:** Brookhaven Linear Isotope Producer: (medical and other Isotope production)
- **Booster** NASA Space Radiation Lab for space radiation studies
- **Tandem** for industrial/academic users
- **R&D for future facilities and application sources, beam cooling, polarized beams, ...**

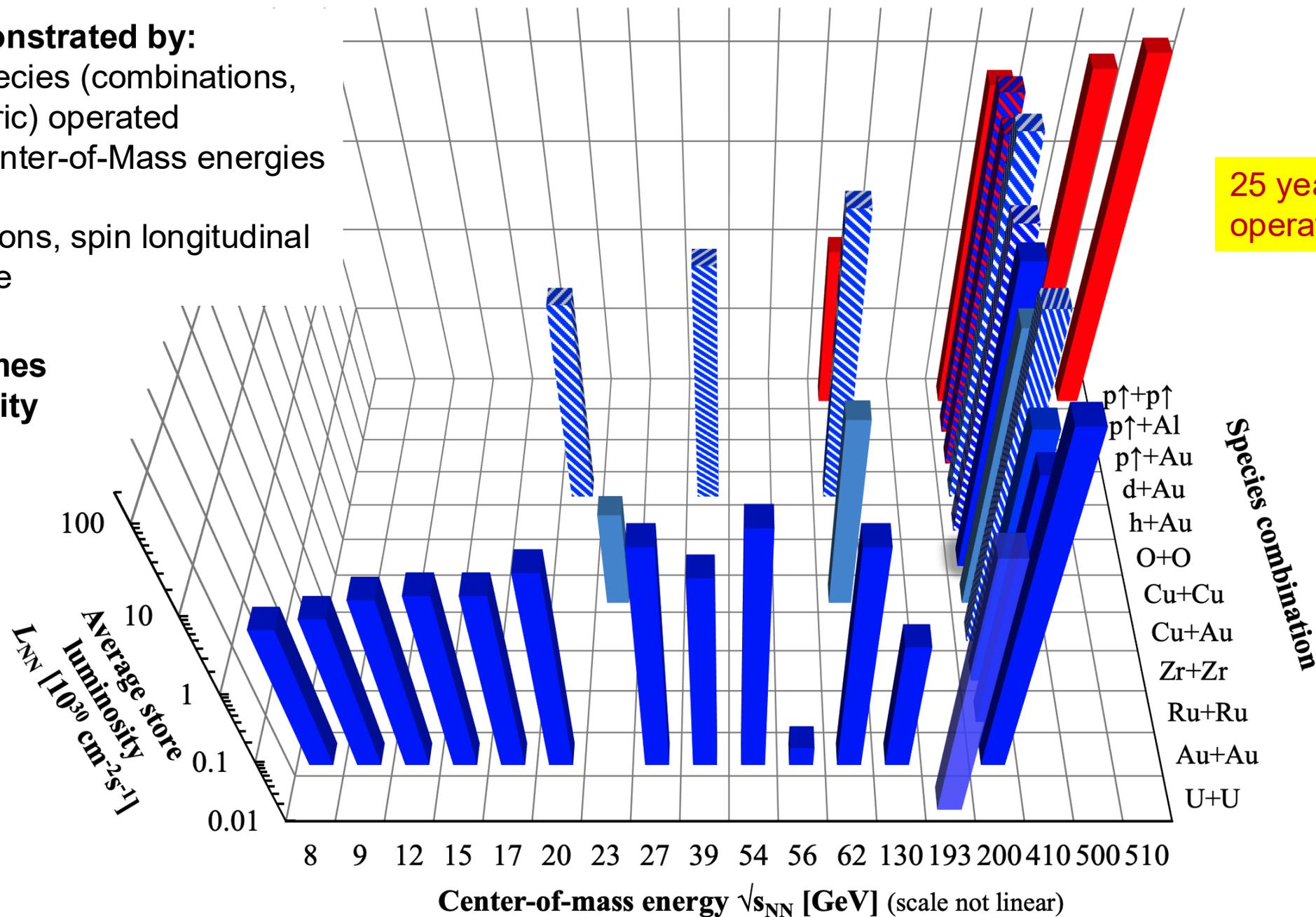


RHIC energies, species combinations and luminosities (Run-1 to 24)

Versatility demonstrated by:

- Number of species (combinations, and asymmetric) operated
- Number of Center-of-Mass energies operated
- Polarized protons, spin longitudinal and transverse

Delivered 50 times design luminosity



PHENIX publications

- **225 physics papers published**

- Phys. Rev. Lett. 77
- Phys. Rev. C 95
- Phys. Rev. D 47
- Nature Physics 1
- Phys. Letter B 4
- Nucl. Phys. A 1

- **Total citation: ~37000**

- Topcite 1000+ 3
- 500-1000 7
- 250-500 24
- 100-250 67
- 50-100 45

PHENIX White Paper: 3797 cites

Jet quenching discovery: 1261 cites

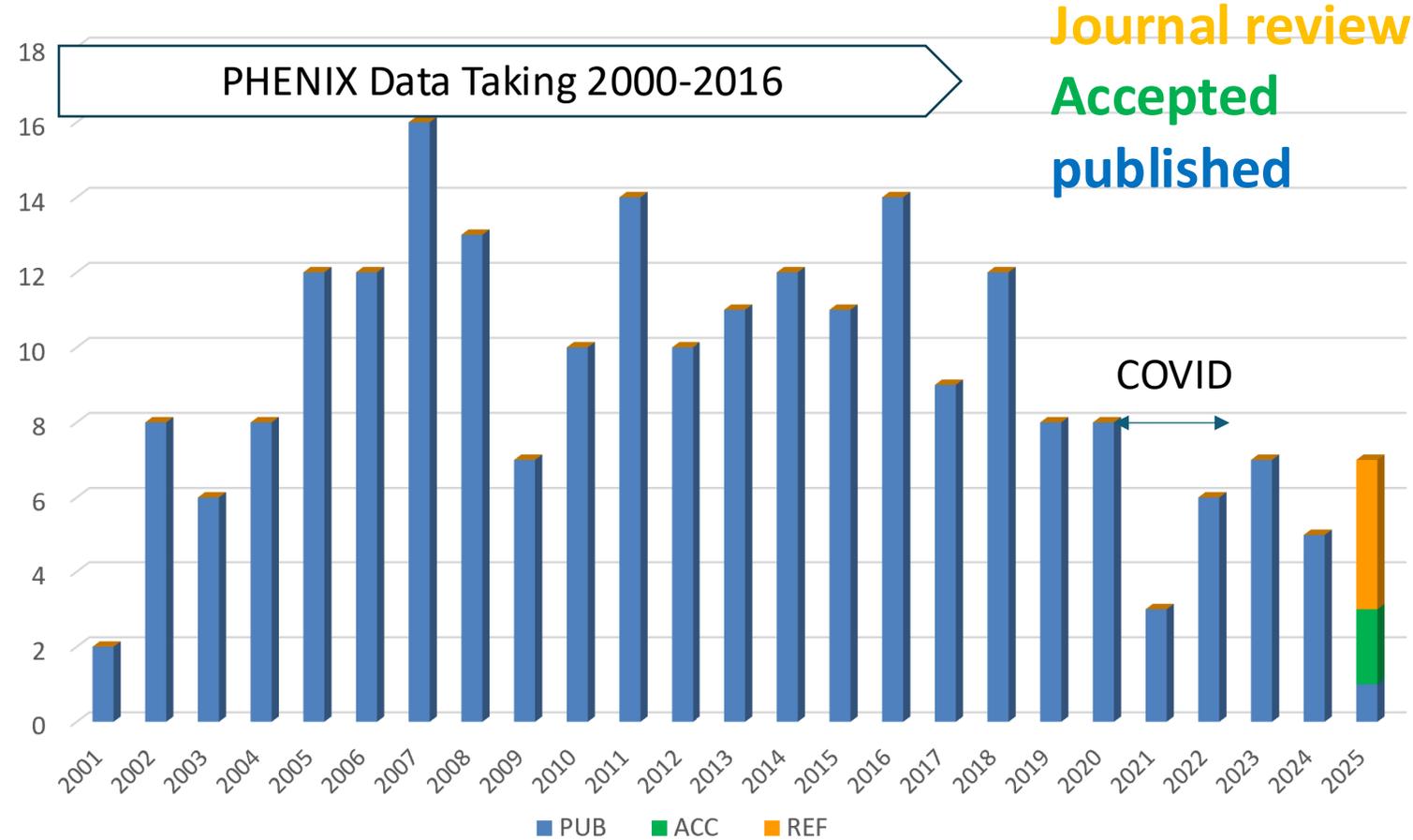
PID hadron in AuAu: 1037 cites

Nature P paper: 345 citations

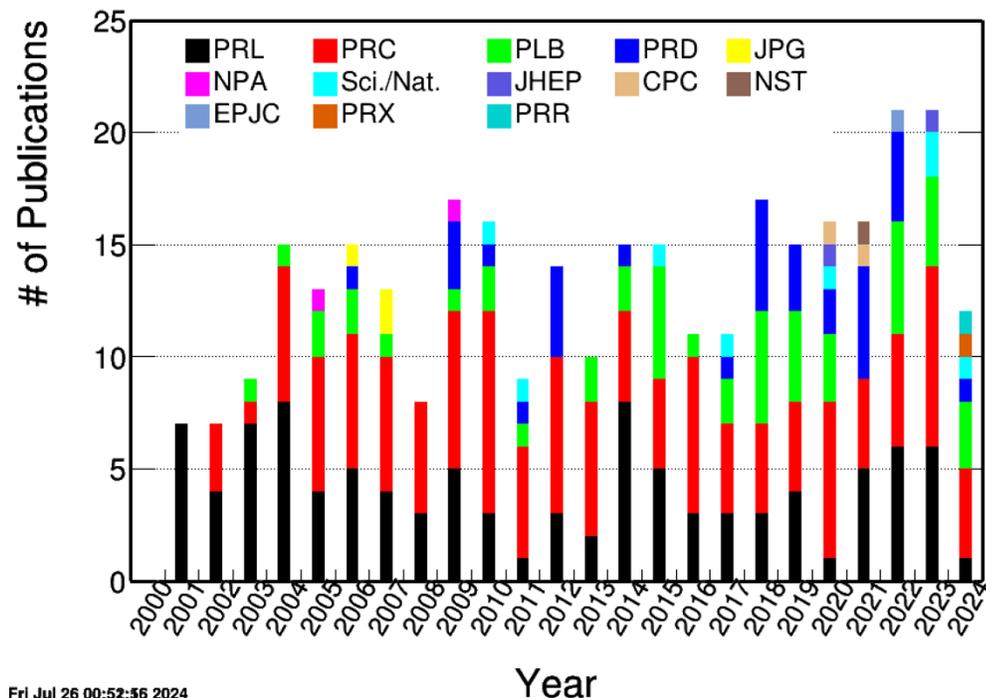
146 physics papers in topcite 50+

(167 if proceedings and detector papers are included)

Published PHENIX papers in each year



STAR Publication Summary



Fri Jul 26 00:52:56 2024

Continued strong publication and presentation record across all Physics Working Groups

Observation of Antihyperhydrogen-4 at RHIC, accepted for publication in Nature

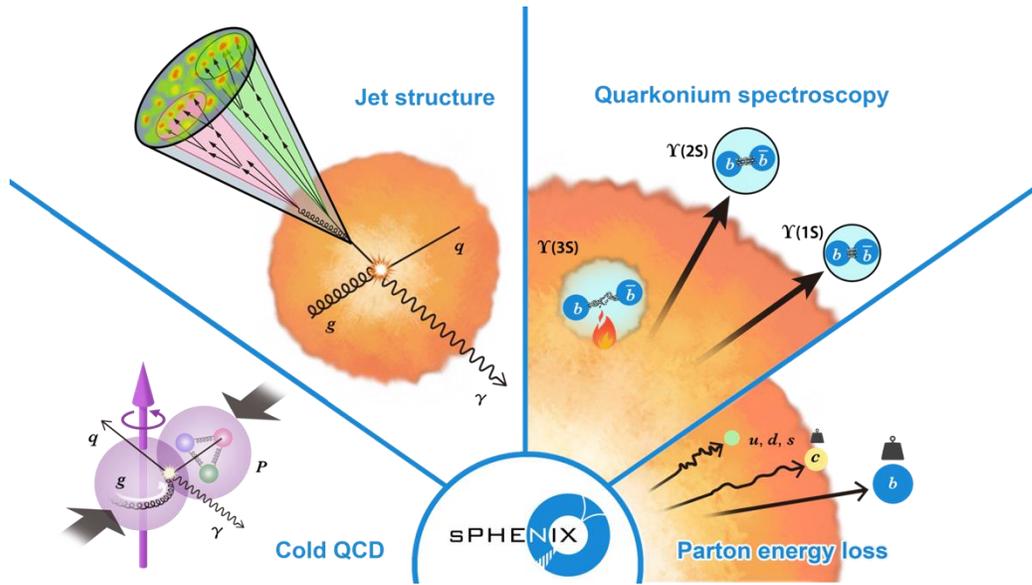
Observation of the electromagnetic field effect via charge-dependent directed flow in heavy-ion collisions at the Relativistic Heavy Ion Collider, the first PRX paper in heavy ion physics.

- **2023:** 21 published 6 PRL, 8 PRC, 4 PLB, 2 Sci/Nat, 1 JHEP
- **2024:** 12 published + accepted: 1 PRL, 4 PRC, 3 PLB, 1 PRD, 1 Nat, 1 PRX, 1 PRR

Journal review: 13; Collaboration review: 3; Active GPCs: 30

99% of STAR papers uploaded to HEPData, remaining 2 papers are newer and on track to be uploaded soon

Continued steady growth in citations

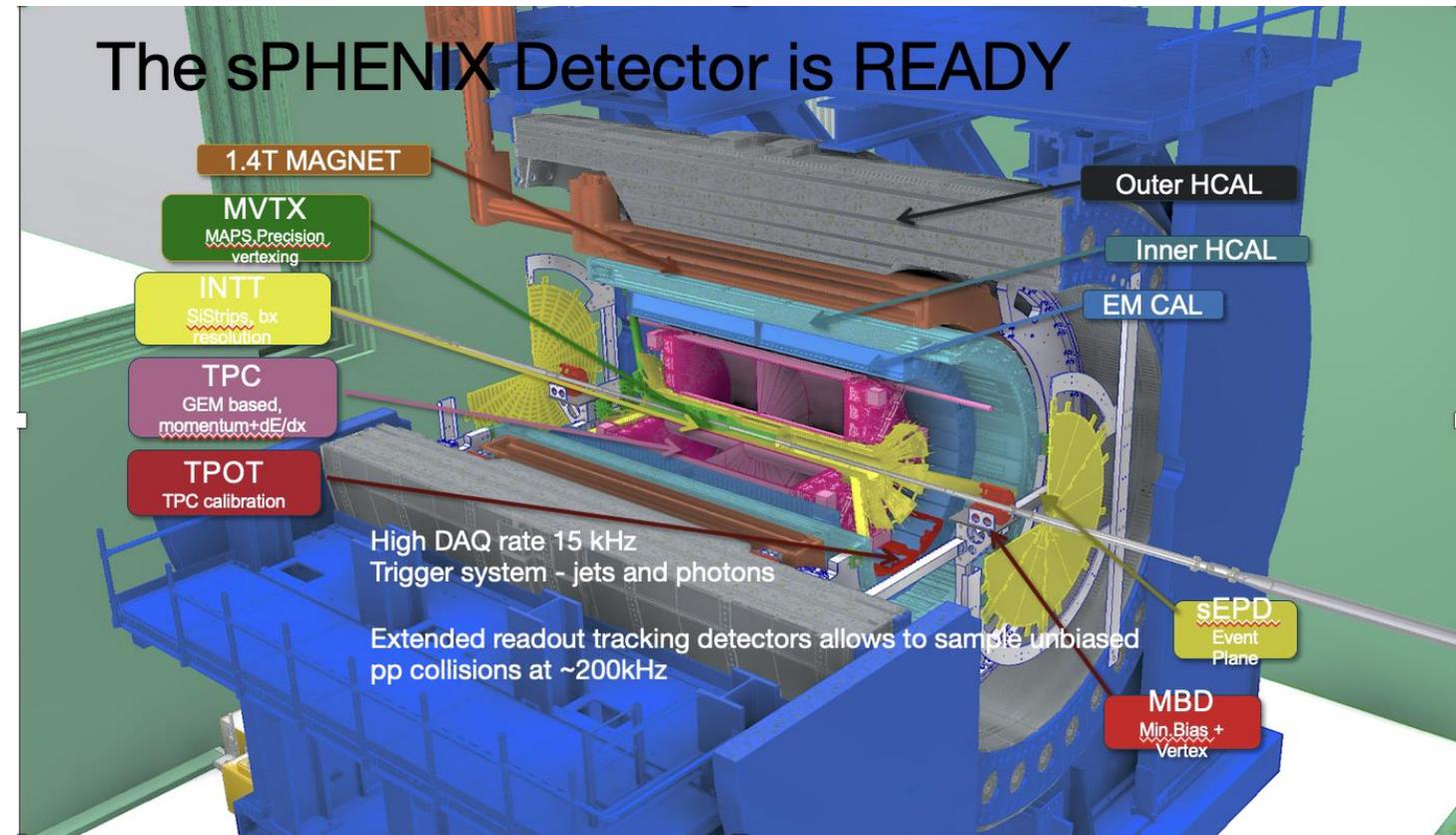


There are two central goals of measurements planned at RHIC, as it completes its scientific mission, and at the LHC: **(1) Probe the inner workings of QGP by resolving its properties at shorter and shorter length scales. The complementarity of the two facilities is essential to this goal, as is a state-of-the-art jet detector at RHIC, called sPHENIX.** **(2) Map the phase diagram of QCD with experiments planned at RHIC.**

Four pillars of science for sPHENIX

The new kid on the block

sPHENIX is ready

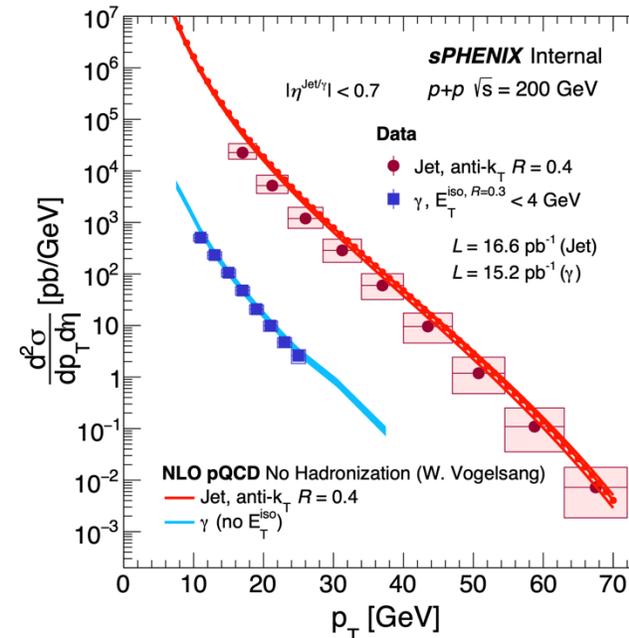


Summary of results

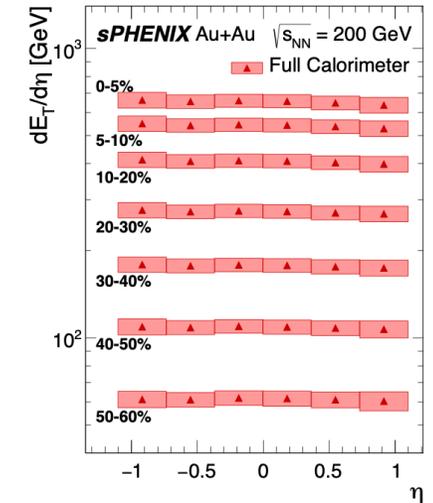
- sPHENIX is fully commissioned and producing physics
 - Recorded substantial pp reference dataset in 2024
 - Demonstrated
 - jet, photon and track reconstruction
 - physics analysis capability of large scale datasets
 - Remeasure standard physics candles
 - First publications submitted
 - Well equipped to complete the RHIC science mission
 - Looking forward to a successful AuAu run in 2025!

[sPHENIX Public Results](#)

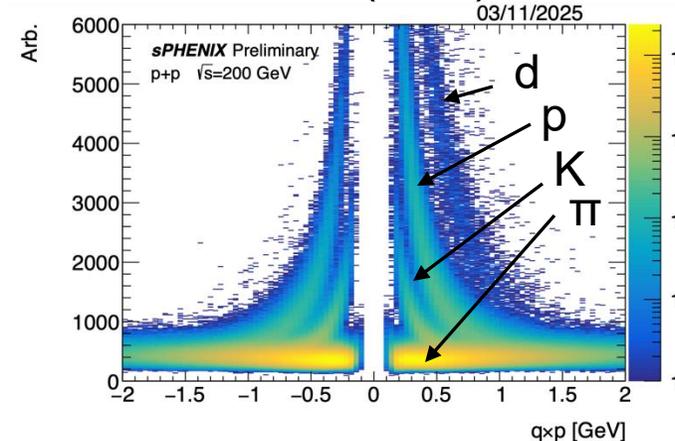
Photons, Jets in pp



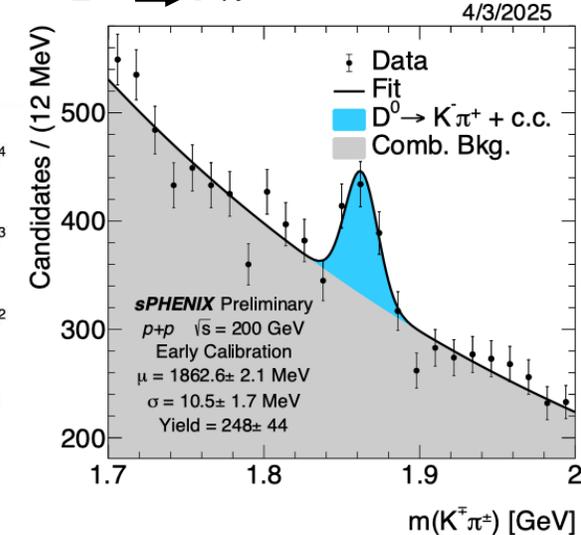
Au+Au



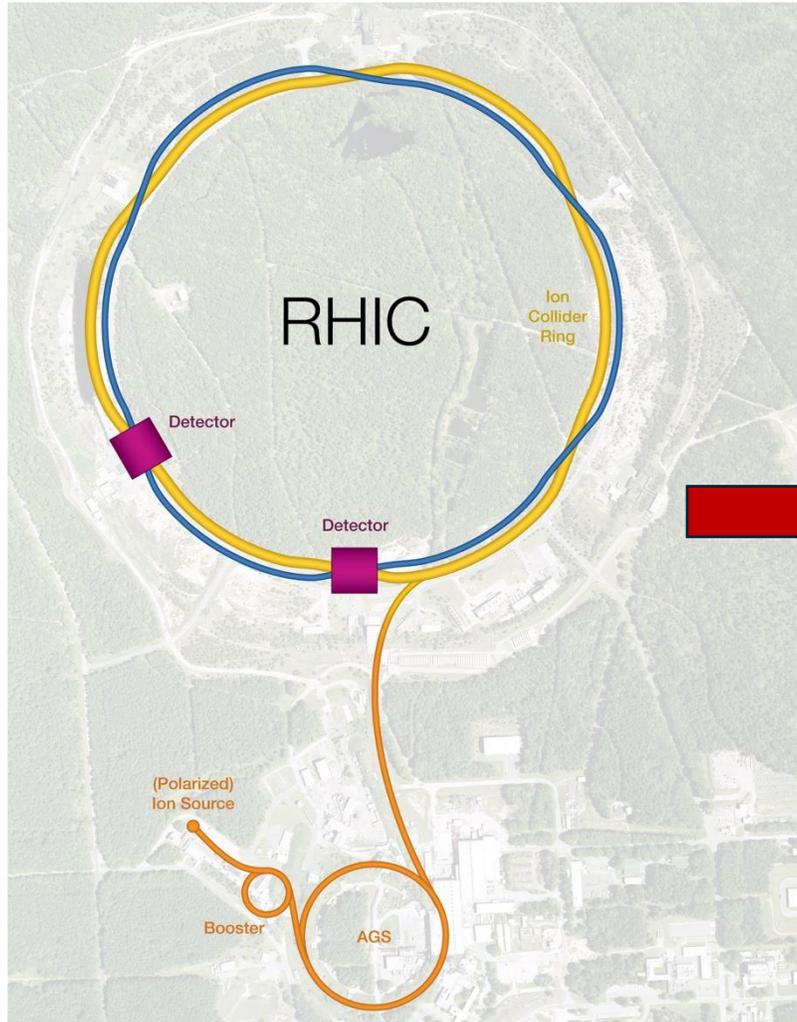
dE/dx (TPC)



$D^0 \rightarrow K^- \pi^+$



Transition from RHIC to Electron Ion Collider Around the end of 2025

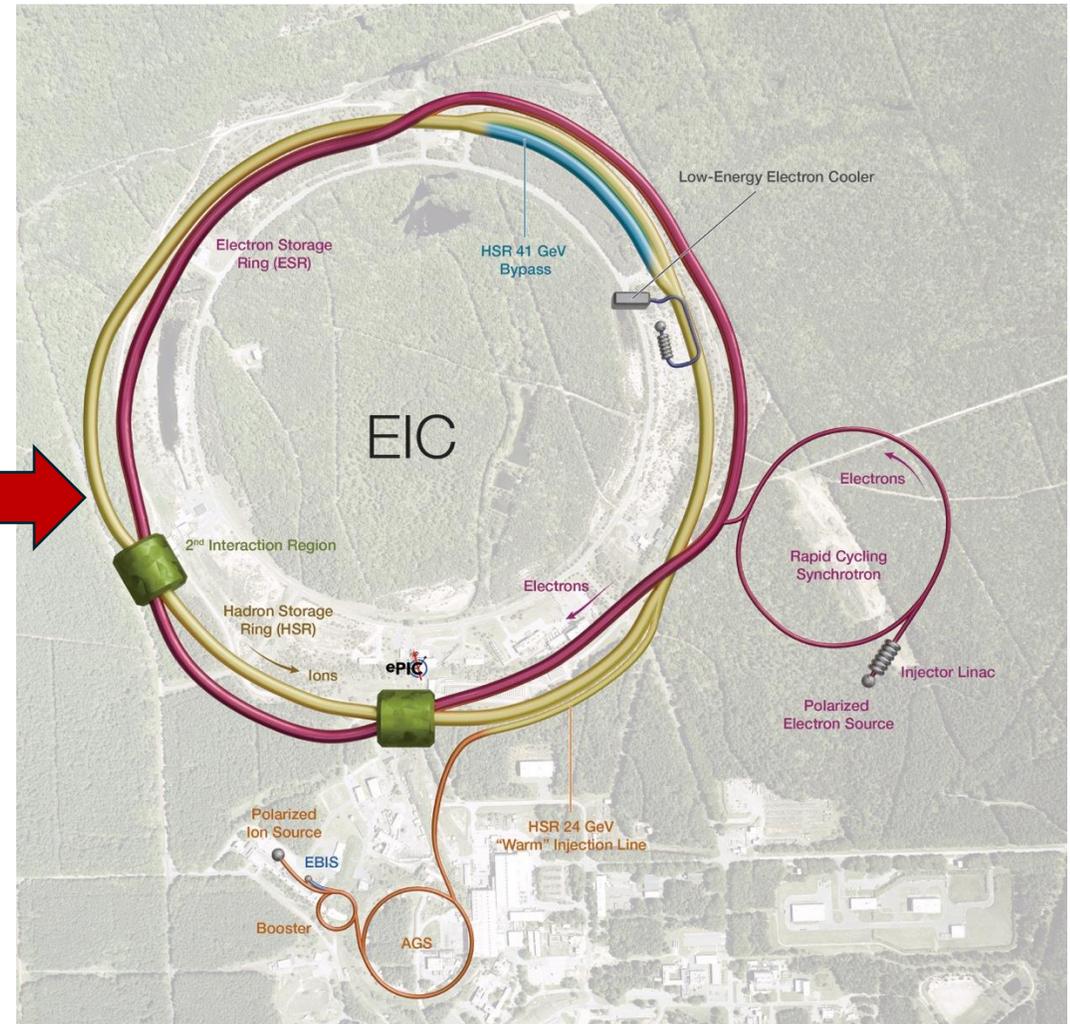


Re-Use the existing tunnel

Minimal modification to the hadron beam complex (yellow)

New electron beam facility

Build on the ~\$2B investment



RHIC to EIC transition

RHIC operations will stop around December 2025 and transition to EIC begins

During the transition years (lasting about 8-10 years)

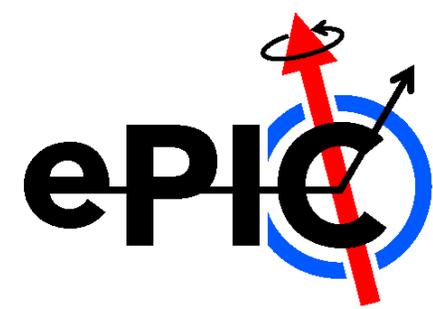
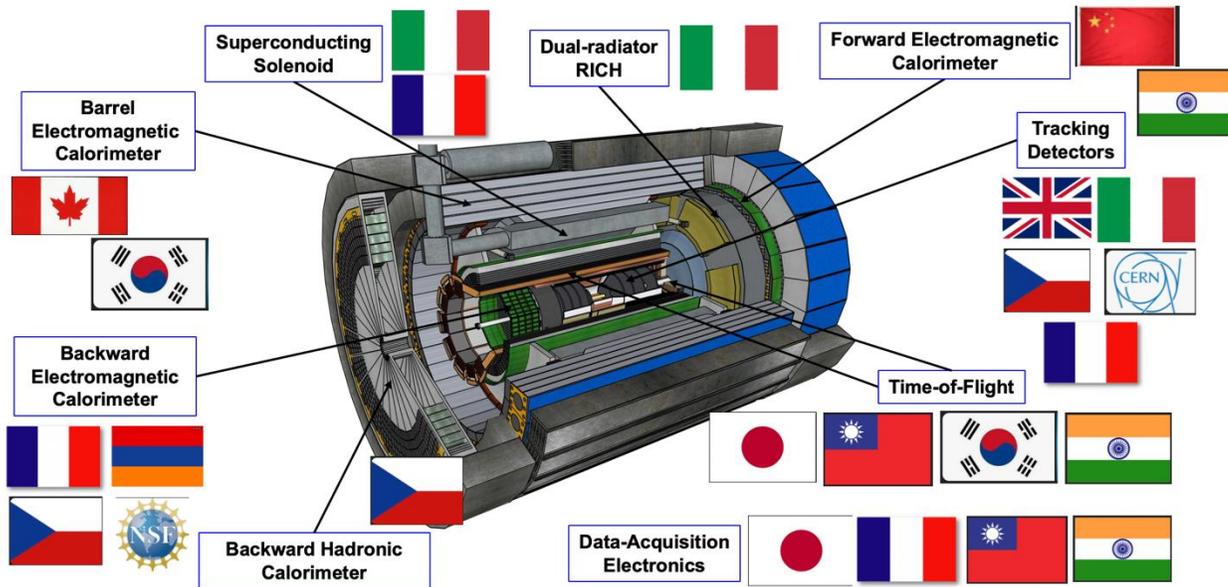
For RHIC:

- RHIC experiments will finish data analyses
- Archive (PHENIX, STAR and sPHENIX) data for potential revisits in the EIC era
- NASA Space Radiation Lab & Isotope Program (LINAC and Booster) will continue

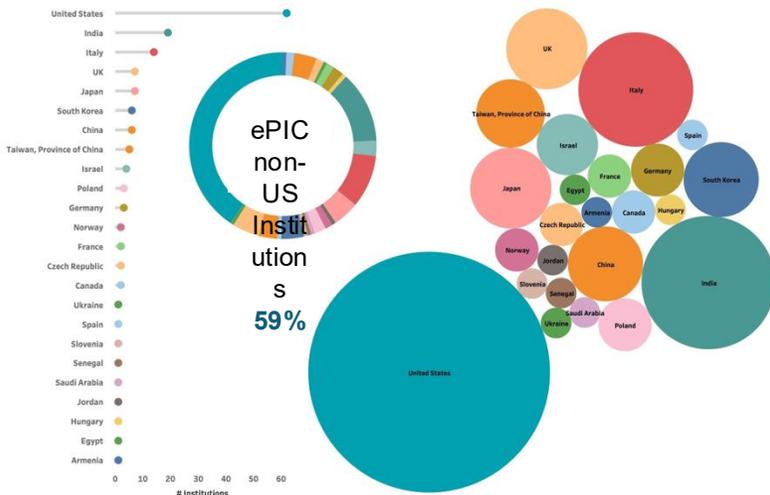
Towards EIC:

- RHIC/EIC Injector complex (source, LINAC, booster, AGS and some hardware in RHIC tunnels) to be maintained and operated regularly to be ready for EIC
- Staff transition from C-AD/Physics (NPP) to EIC and back for EIC operations

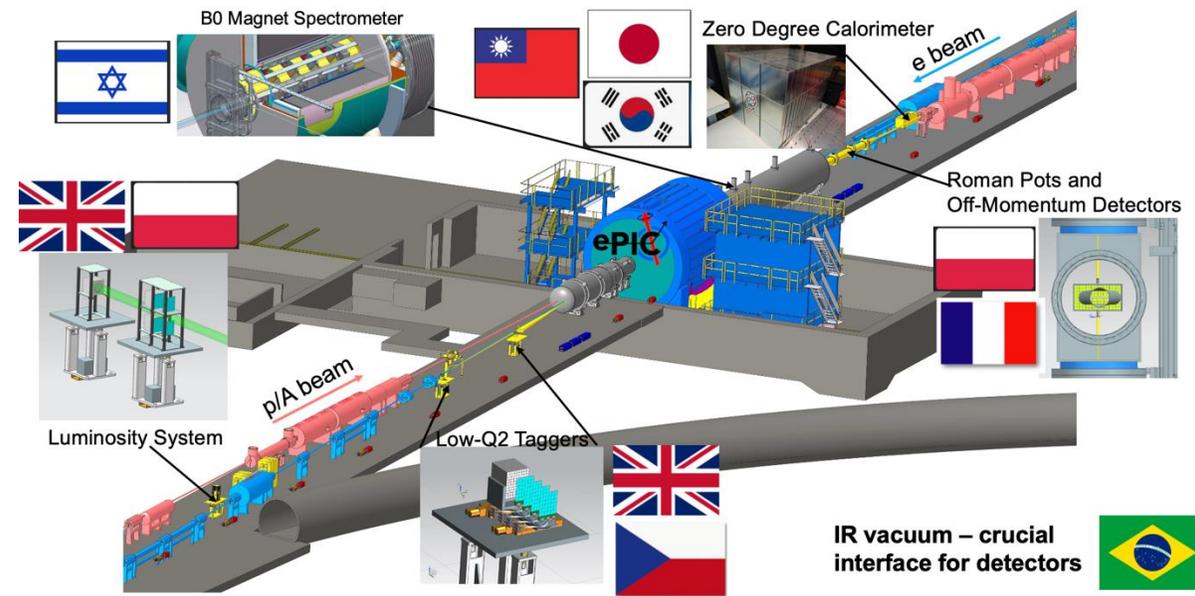
Central Detector Non-DOE Interest & In-Kind



ePIC formed 2022.
 ePIC is now 190+ institutions
 Representing 40+ countries
 900+ participants -- 60% non-US
 30% in-kind contribution to ePIC detector



Far-Forward/Far-Backward Detectors Non-DOE Interest & In-kind



Strong Support from Partners & Collaborators

- **New York State** committed **\$100M** toward construction of EIC buildings and infrastructure.
- **EIC Accelerator Collaboration** kicked off at the International Particle Accelerator Conference with over 150 participants expressing interest in contributing to the global EIC effort.
- **UK** announced £58 million (**\$75M**) for the EIC.



- **EIC Resource Review Board** Meetings in Rome in May 2024 and at BNL in Oct. 2024. Strong participation from **Canada, Czech Republic, France, India, Israel, Italy, Japan, Poland, South Korea, United Kingdom, and Taiwan**. Next meeting to be held in Prague in June 2025.

In-kind contributions are planned for the Detector (~30%) and the Accelerator (5%).

Quality of Life @ BNL

The BNL Cafeteria is now open again for breakfast and lunch!

The new Science and User Support Center (SUSC) ready

- Badging, housing, café
- Conference facilities 25-300 people, useful for collaboration and other meetings

In near future, train station near the south gate connecting to the JFK (via AirTrain) & NY City

