

# Relativistic Heavy Ion Collider

RHIC Users' Executive Committee • Brookhaven National Laboratory • PO Box 5000 • Upton, NY 11973

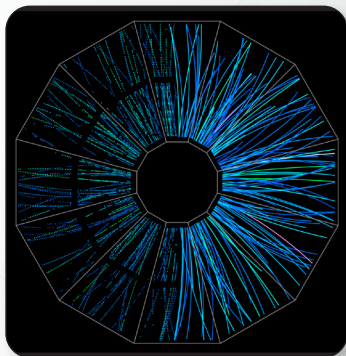
## Nuclear Physics at RHIC

[www.bnl.gov/rhic](http://www.bnl.gov/rhic)

### RHIC: Relativistic Heavy Ion Collider Exploring Matter at the Dawn of Time

Scientists' quest to understand matter and its interactions in the early universe inspired the construction and continuous improvement of the Relativistic Heavy Ion Collider (RHIC), the world's most versatile particle collider. It has produced a new kind of nuclear matter, a "nearly perfect" liquid made of the subatomic building blocks that give shape to everything we see in the universe today.

*The research conducted at RHIC attracts the world's best and brightest minds, inspires a new generation of scientists, and drives technological advances in many fields. ➤*



### RHIC Basics

- RHIC accelerates a large variety of nuclei across unprecedented baryon densities with crisscrossing rings of 1,740 superconducting magnets in a 2.4-mile tunnel
- RHIC's large nuclear collisions result in 1000s of outgoing particles that tell us about the nuclear force
- RHIC is the only U.S. particle collider, one of only two in this energy regime in the world
- Sponsored by the Nuclear Physics Program of Department of Energy's (DOE) Office of Science
- Replacement cost of over \$2 billion
- Two large particle detector complexes, STAR and sPHENIX

➤ *Thousands of outgoing particles detected by STAR*

### RHIC Productivity & Economics

- Major discoveries include the perfect-liquid Quark Gluon Plasma and the gluon spin contribution to the proton spin
- 1000+ scientists use RHIC (from around the world)
- \$180 million+ annual economic impact
- 500+ scientific papers, including 60 of the field's 100 most-cited
- 450+ PhDs, hundreds more to come
- 200+ tenured or tenure-track faculty and research positions in states across the U.S.
- More than a 1000 people working on the three experiments PHENIX, sPHENIX, and STAR
- Supports around 1,500 full-time equivalent jobs
- Newly upgraded detectors with precision capabilities



Installation of The MAPS-based VerTeX (MVTX) detector at sPHENIX.

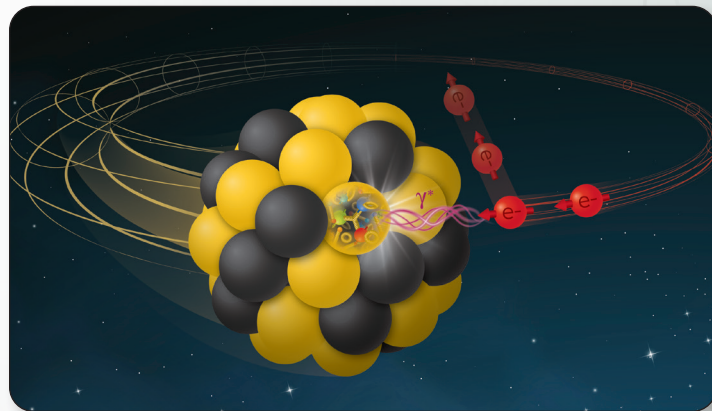
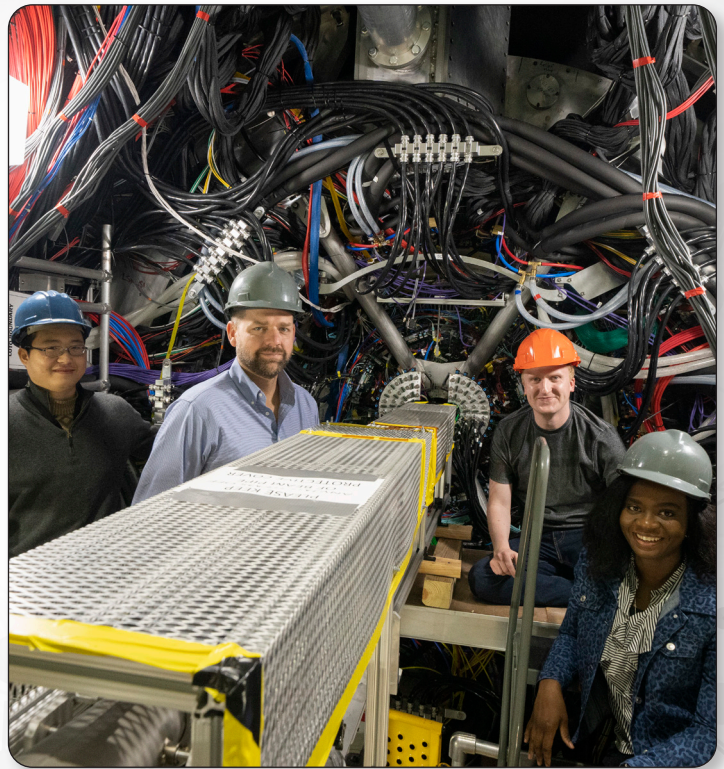
**Nuclear Physics DC Day**  
Washington, D.C. • April 30, 2025





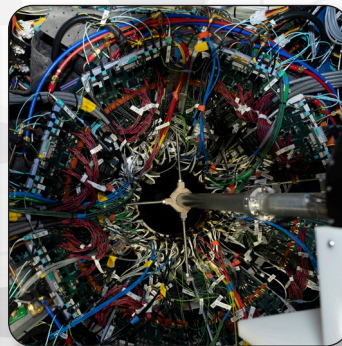
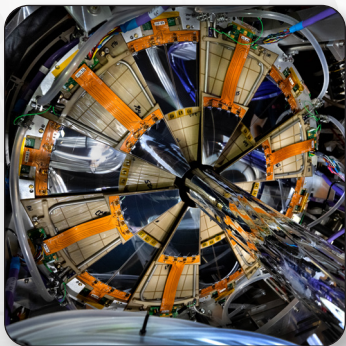
## RHIC Impact

- Maintains position of the U.S. as a leader in nuclear science
- Inspires and trains hundreds of students for careers in science, technology, engineering, and mathematics (STEM)
- Develops the high-tech workforce needed to address technical challenges in communications, energy technologies, national security, medicine, and more
- Essential for the detailed study of hot nuclear matter together with Europe's Large Hadron Collider (LHC)
- The 2023 National Nuclear Science Long Range Plan's #1 recommendation includes completing the RHIC science program
- Triggers spin-off benefits including:
  - medical isotopes for heart scans and cancer treatment
  - studies of space radiation impacting astronauts and electronics
  - accelerator advances that could improve cancer treatment and nuclear reactor safety
  - R&D to advance energy storage
  - computational advances for "big data" in many fields



## RHIC Future

- 2025 will be RHIC's final run
- The strong RHIC community is key to building America's next collider, the Electron-Ion Collider (EIC)
- RHIC infrastructure provides an affordable path to an EIC and U.S. leadership in nuclear physics for decades to come
- Sufficient funding is essential for a smooth RHIC-to-EIC transition that preserves:
  - scientific talent
  - skilled technical workforce
  - international collaborations
  - foreign contributions



This document was produced by the  
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