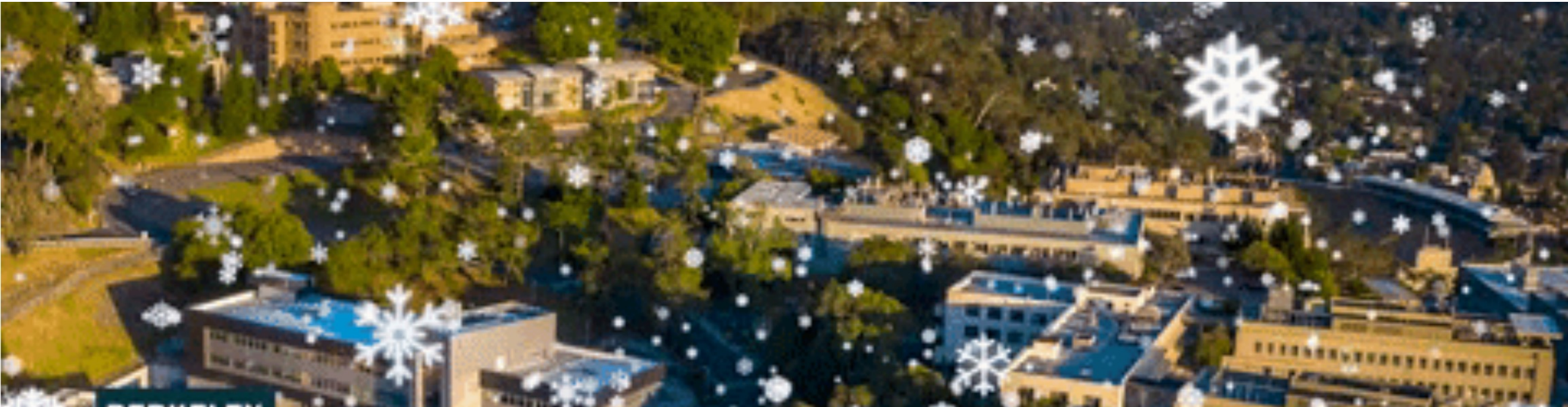
BERKELEY LAB
Bringing Science Solutions to the World

U.S. DEPARTMENT OF ENERGY
Office of Science

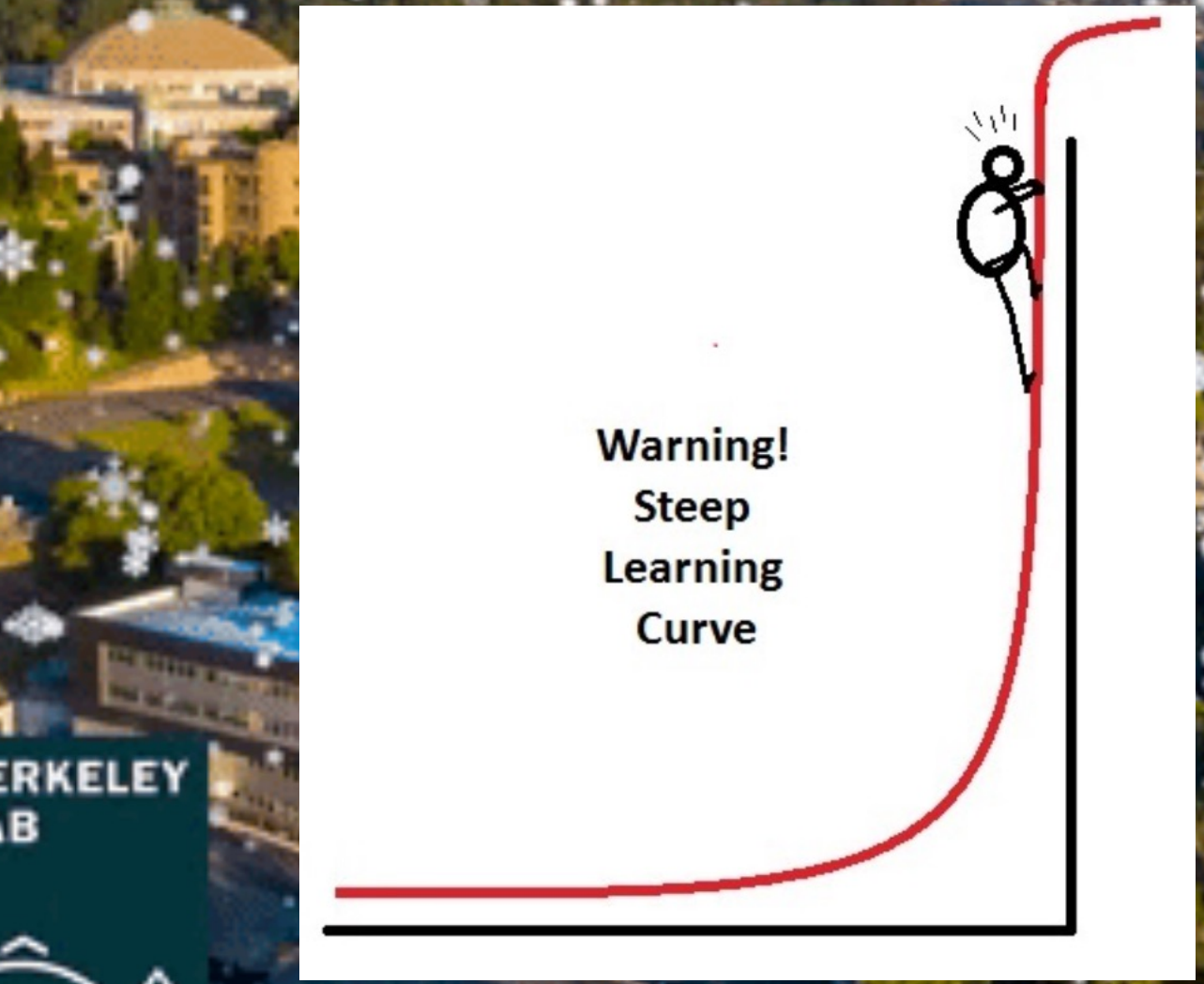
End of year reflections

Reiner Kruecken

December 20, 2022



Reflections on the last 6 months



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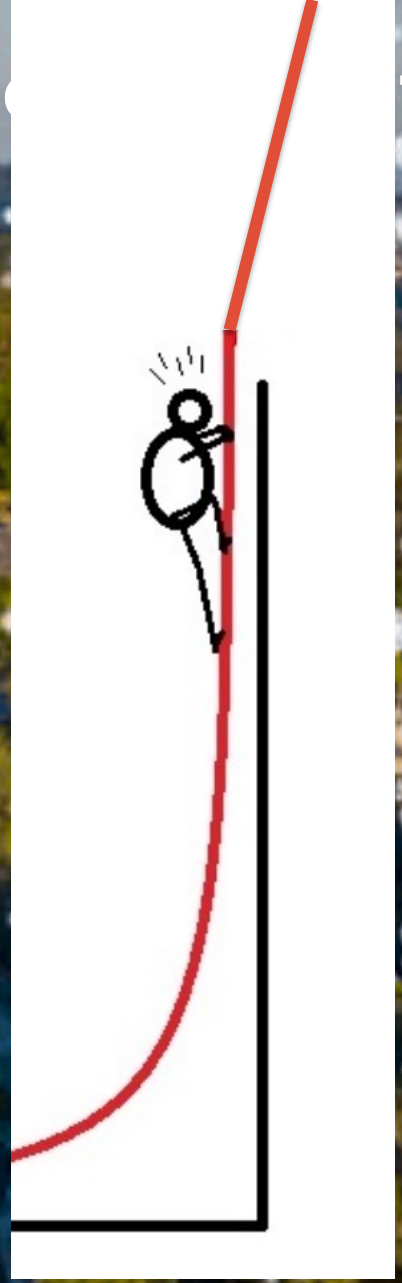
Reflections t 6 months



JOB ADVICE

#6 IF YOU DON'T KNOW WHAT YOU'RE DOING WALK FAST AND LOOK WORRIED.

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NSD Highlights

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NUCLEAR SCIENCE DIVISION

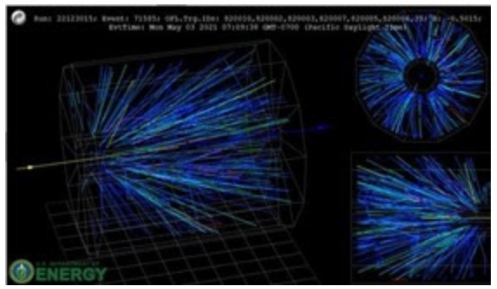
U.S. DEPARTMENT OF ENERGY
Office of Science

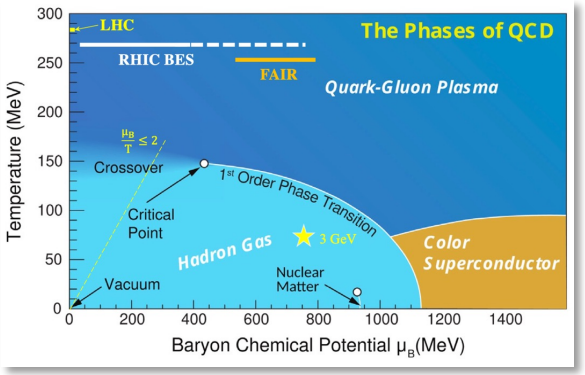
COMMUNIQUE

19 December 2022

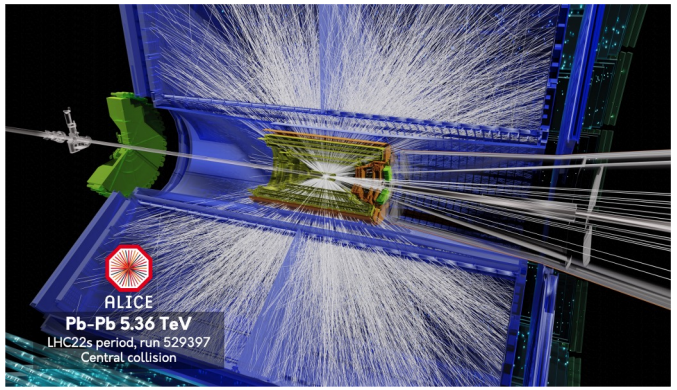
The Office of Science posted four new highlights between 12/6/22 and 12/19/22.

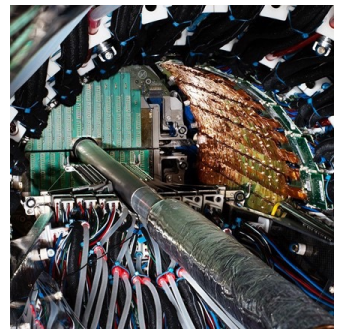
Narrowing down the critical point in quark-gluon plasma: Nuclear matter consists of quarks and gluons. Like ordinary matter, it can exist in different phases. In today's world, it exists mostly as protons and neutrons in atomic nuclei. By colliding heavy ions, scientists have revealed the quark gluon plasma (QGP), a phase of nuclear matter with freely moving quarks and gluons. The QGP is like the matter in the early universe and dense compact stars. Scientists are trying to establish if a critical point exists where the QGP would coexist with a gas of protons, neutrons, and other particles. Scientists found that colliding gold ions at the lowest energies accessible at the Relativistic Heavy Ion Collider do not form a QGP. In contrast, they observe a QGP at energies above 20 giga-electron volts. This indicates that the critical point, if it exists, should be between collision energies of 3 GeV and 20 GeV.





ALICE inner tracker taking data at LHC





MVTX Silicon tracker for sPHENIX delivered to BNL

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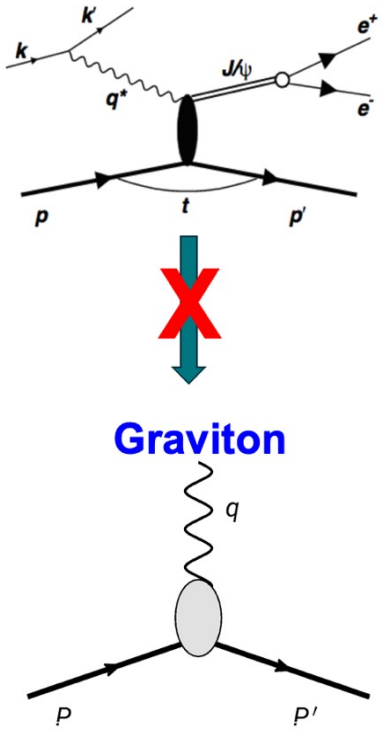


Can we measure the gravitational form factors and its mass distribution?

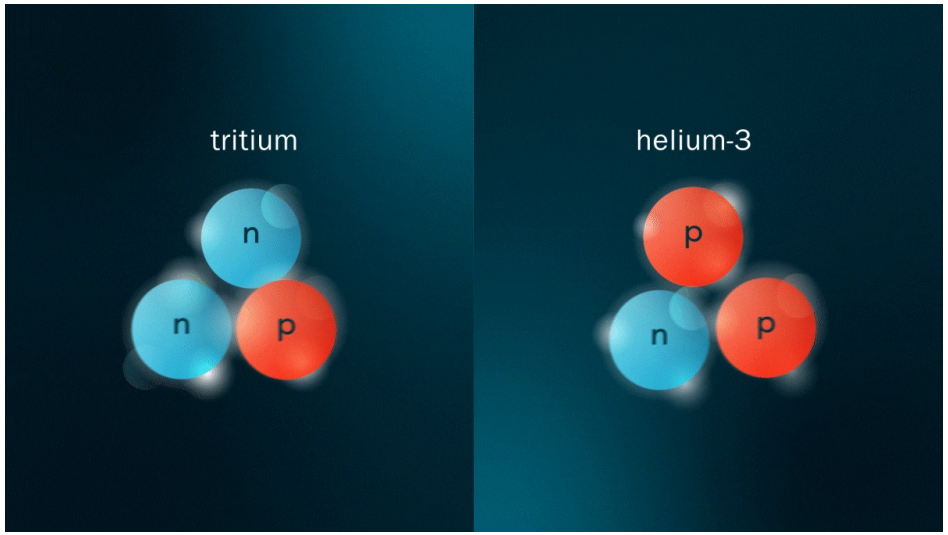
Perturbative QCD computations for heavy quarkonium production reveal no connection between cross section and form factors

Feng Yuan et al.,
PLB 2021, PRD 2022

nature

Article | Published: 31 August 2022

Revealing the short-range structure of the mirror nuclei ^{3}H and ^{3}He



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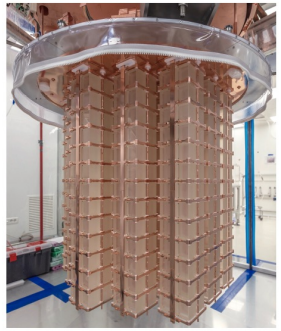
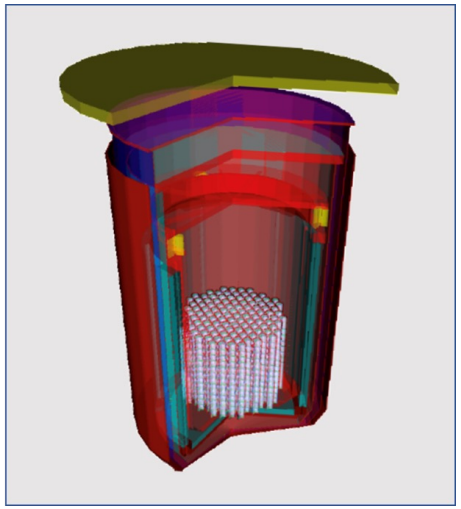
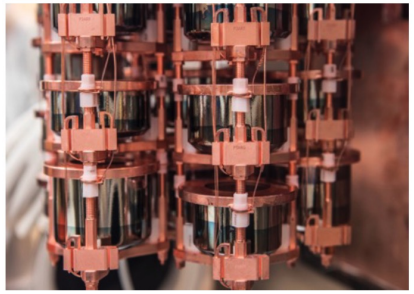
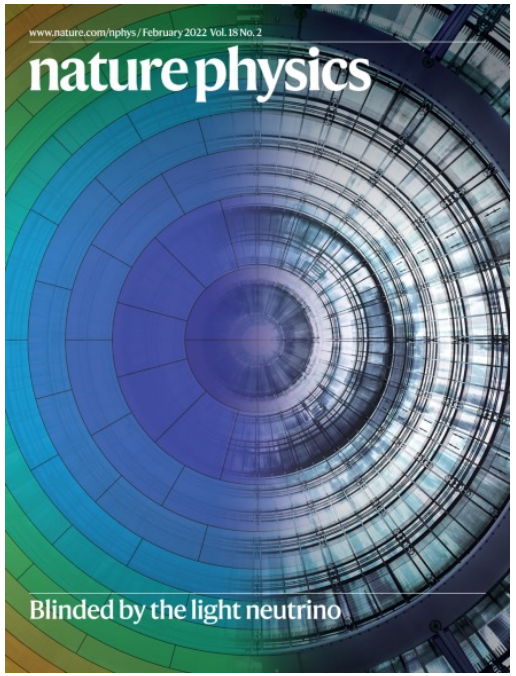
- CUPID and LEGEND receive IRA funding to move towards CD-1

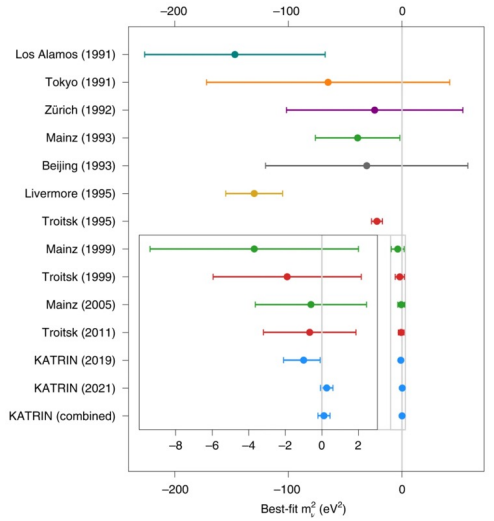






KATRIN in setting new limits on neutrino mass utilizing NERSC





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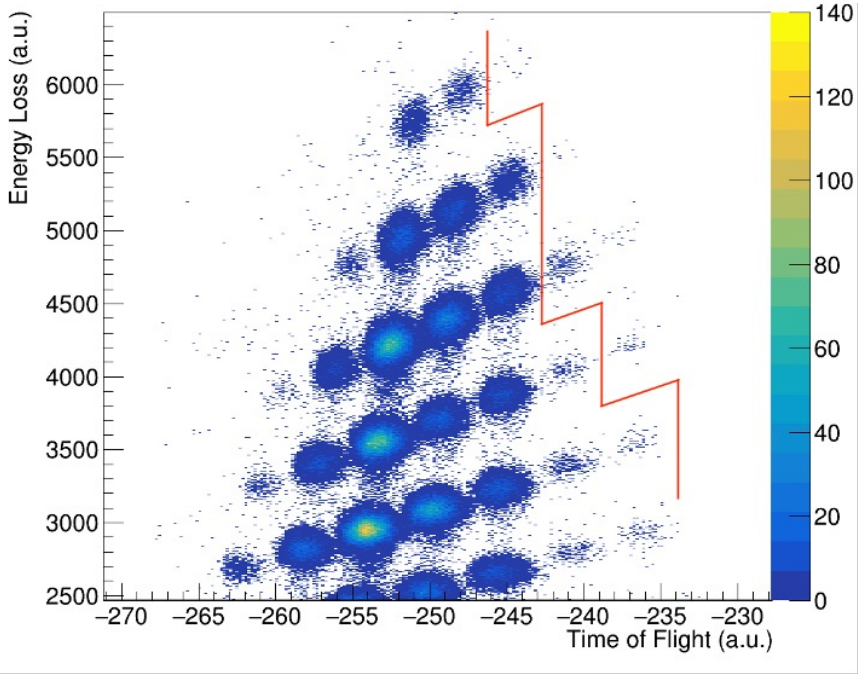
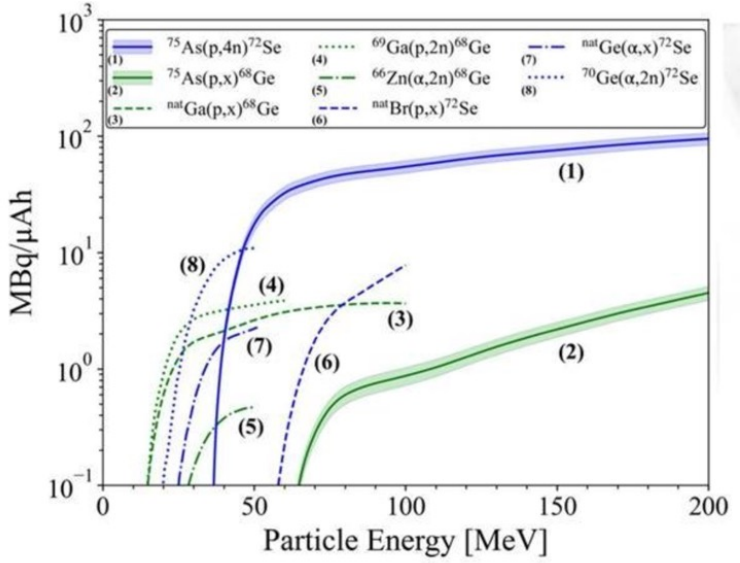
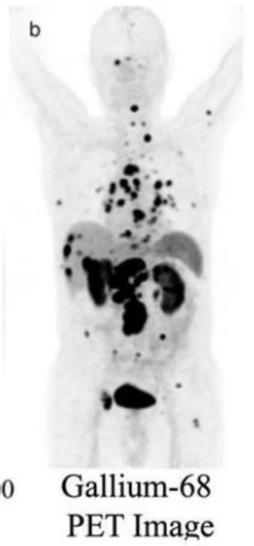
First FRIB Results, new isotopes and half-lives



H. Crawford et al, PRL 2022

Fighting Cancer on Earth and in Space using High-Energy Protons





Left: production rate as a function of proton energy of parent radioisotopes selenium-72 (Se-72) (1) & germanium-68 (Ge-68) (2). Right, a Positron Emission Tomography (PET) image of a patient with metastatic colon cancer, obtained using gallium-68 (Ga-68)

88-Inch, Nuclear Data Program, DOE Highlight

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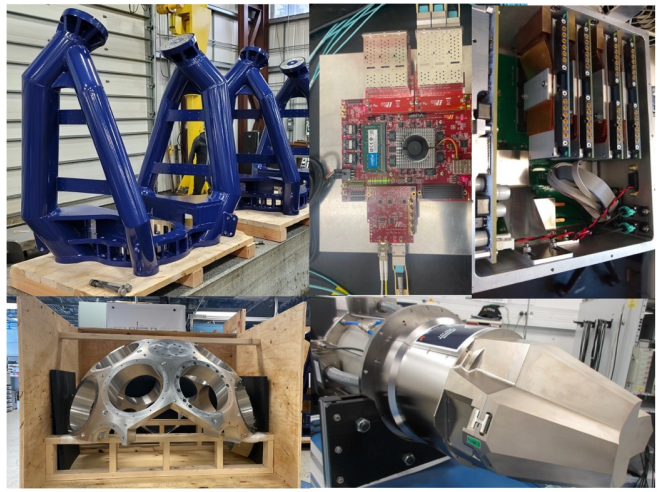
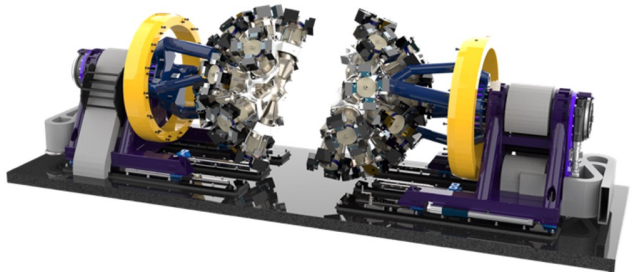
GRETA construction progressing





IRA funding allows project to move forward expeditiously

PANDA advanced sensor networks for radiological detection

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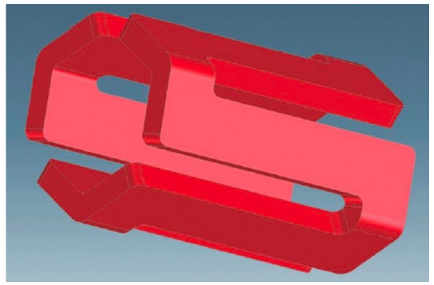
- MARS ECR source magnet funded



- TRMC funding for 88-Inch infrastructure upgrades
  - Additional Pumping (Cryo/turbo array)
  - Spare He Compressor
  - Beamline Power Supply
  - LN Distribution Line
  - 18 GHz RF System
  - AlO Coated Plasma Chamber
  - Commissioning

- DOE funding awards for topical theory collaborations in nuclear physics
  - 3D quark-gluon structure of hadrons: mass, spin, and tomography (QGT) (Feng Yuan)
  - SURGE – Saturated Glue Topical Collaboration (Xin-Nian Wang)
  - Nuclear Theory for New Physics (NTNP) (André Walker-Loud, Wick Haxton)
  - Coordinated Theoretical Approach for Exotic Hadron Spectroscopy (Raúl Briceño),
  - Heavy-Flavor Theory for QCD Matter (Ramona Vogt)

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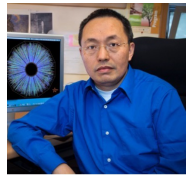
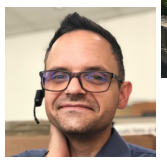
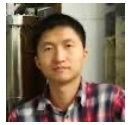
Awards & Promotions



- **Nu Xu:** Humboldt Research Award
- **Volodymyr Vovchenko:** IUPAP Nuclear Physics Young Investigator Prize

- **Agnieszka Sorensen:** 2023 APS Dissertation Award in Nuclear Physics





- **Nikki Apadula:** Research Scientist
- **Ren Cooper:** Senior Staff Scientist, NSD Deputy Director
- **Tom Gallant:** Business Manager
- **Yuan Mei:** Career Staff Scientist

Service Milestones

- 10 years: Bethany Goldblum
- 15 years: Lady Bonifacio, Xin Dong, Feng Yuan
- 20 years: Michael Johnson
- 25 years: Mario Cromaz
- 30 years: Paul Fallon, Brian Fujikawa
- 35 years: Peter Jacobs
- 40 years: Grazyna Odyniec

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Thank you everyone
for great teamwork and your tremendous
contributions to a successful year 2022!
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Wishing all of you a relaxing and enjoyable Holiday Break and a great start into the New Year 2023!

1	15	15	39
H	P	P	Y
Hydrogen 1.008	Phosphorus 30.974	Phosphorus 30.974	Yttrium 88.906

67	3	66	16
Ho	Li	Dy	S
Holmium 164.930	Lithium 6.941	Dysprosium 162.50	Sulfur 32.066