Overview of Laboratories and Capabilities

Yuguo Tao

2023 LANNS Symposium-2

November 03, 2023

LANNS
LABORATORY FOR ADVANCED NUCLEAR NONPROLIFERATION AND SAFETY

Georgia Tech

Group Members

- **Group Leader: Anna Erickson**
  Associate Chair for Research and Woodruff Professor
  Director, Consortium for Enabling Technologies and Innovation
  G. W. Woodruff School of Mechanical Engineering
  Daniel Guggenheim School of Aerospace Engineering (Courtesy Appointment)
  Sam Nunn School of International Affairs (Courtesy Appointment)
- **Research Engineer:**
  Yuguo Tao, PhD
- **Graduate Researchers**
  Alexander England
  Caiser Bravo
  Erick Lassair
  Gracie Eccleston
  Ian Schreider
  Lucas McKown
  Mackenzie Duce
  Matthew Dunbrack
  Natalie Cannon
  Patience Yockey
  Shae Cole

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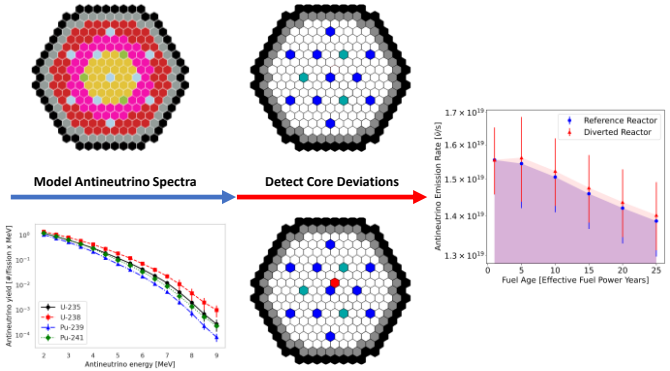
- **Undergraduate Researchers**
  Anna Shafer
  Corinne Hill
  David Straub
  Jana Shade
  Jenna Crawford
  Pierre O'Driscoll

Main Areas of Our Research

- Next-generation reactor verification & safeguards
- Innovative radiation detectors & detector systems
- Advanced computational analysis & algorithms
- Advanced nuclear cybersecurity



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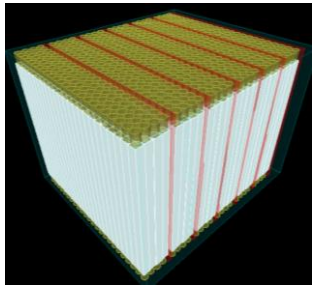
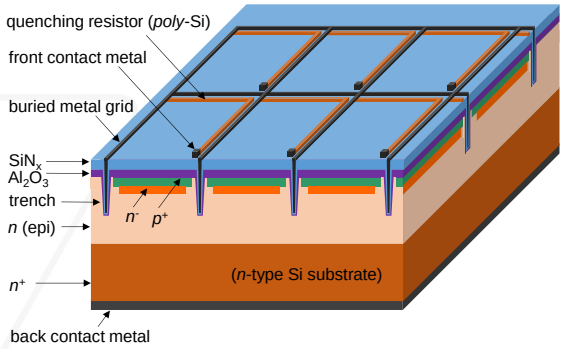
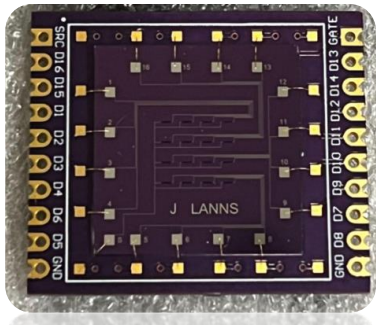
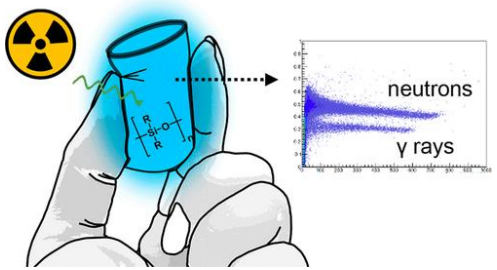
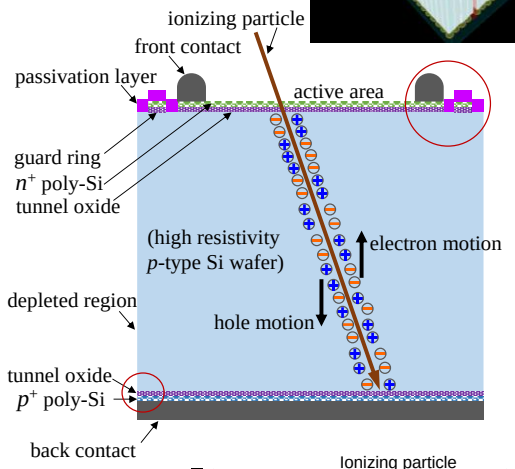
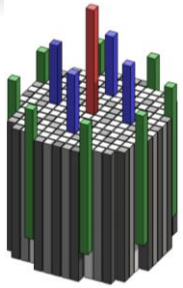




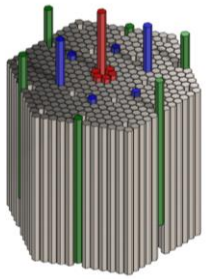


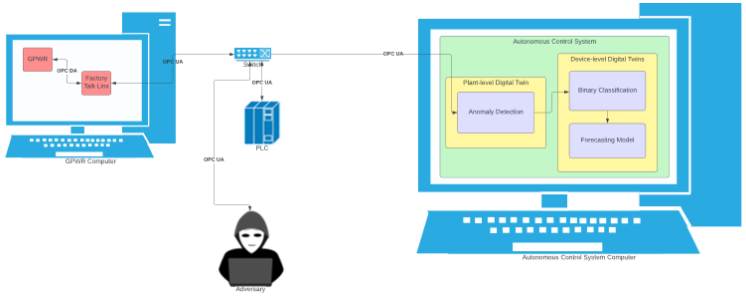


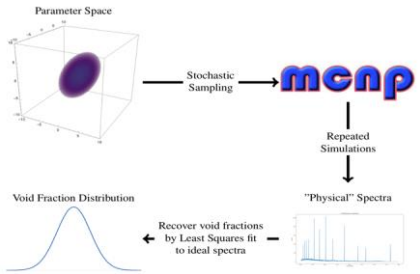


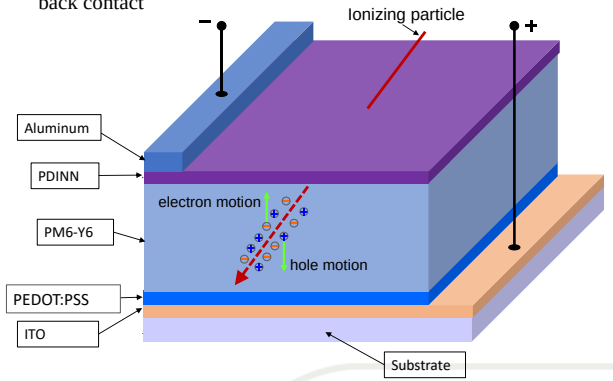


PWR		UCFR
I1	Inner	I1 I2 I3 I6
M1 M2 M4	Middle	M2 M3 M6
O1 O2 O4 O8	Outer	O4 O6









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LANNS Facilities: Boggs Building 3-19, 3-21

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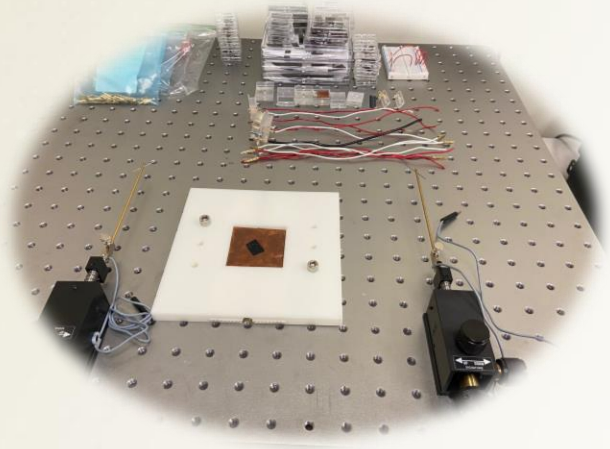
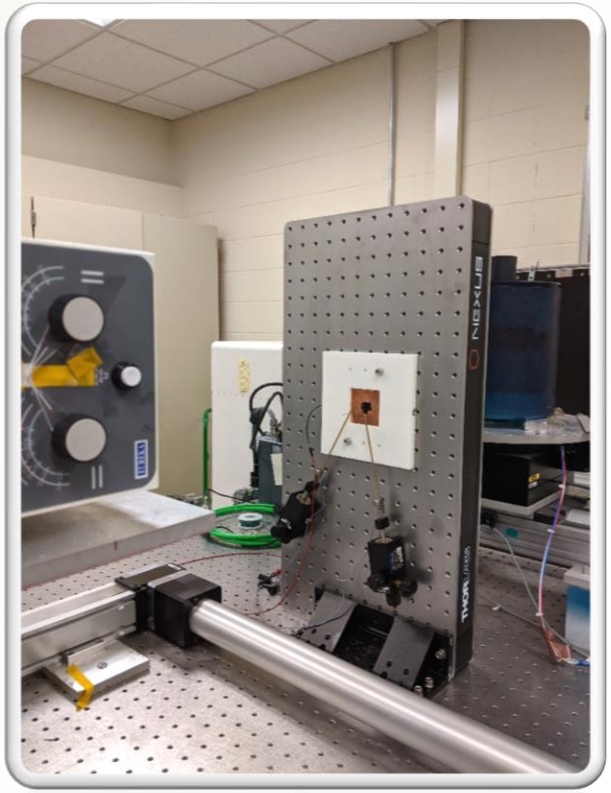
X-ray unit & probing station

To measure the current-voltage output of detectors (ie., carbon nanotube based detector) exposed to X-rays of various energies.





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LANNS Facilities: Boggs Building 3-68

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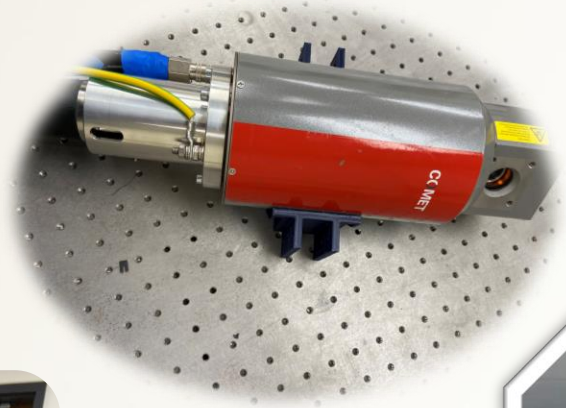
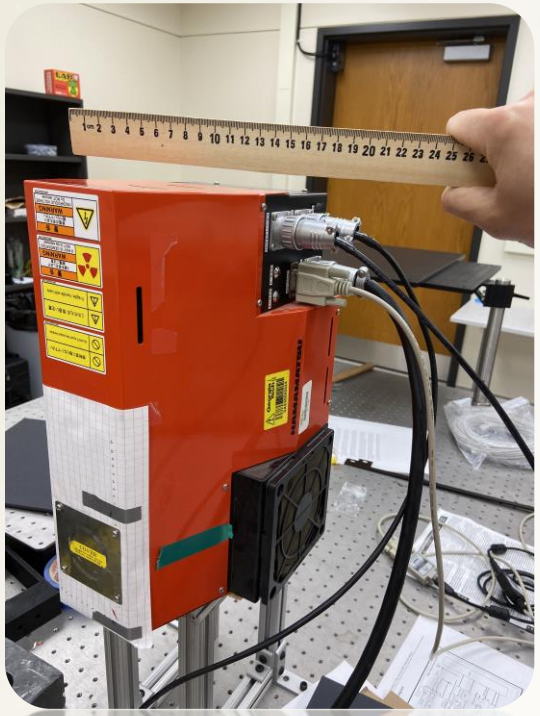
Building two new X-ray units





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LANNS Facilities: Boggs Building 3-36 (Shop)

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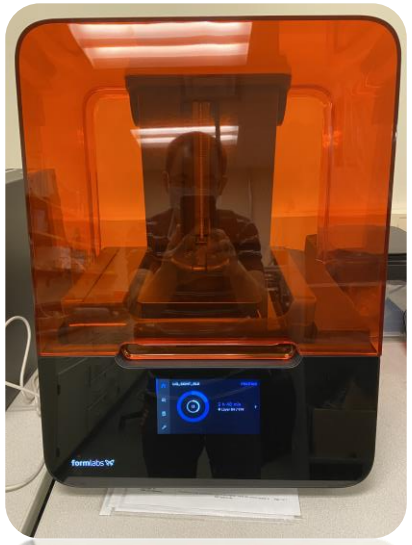
3D Printers

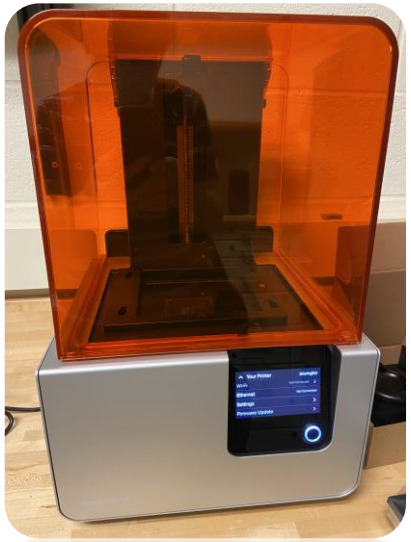
formlabs

“The new Form 3 uses advanced Low Force Stereolithography (LFS) technology to deliver incredible print quality and printer reliability, with post-processing accessories cross-compatible with the Form 2.”

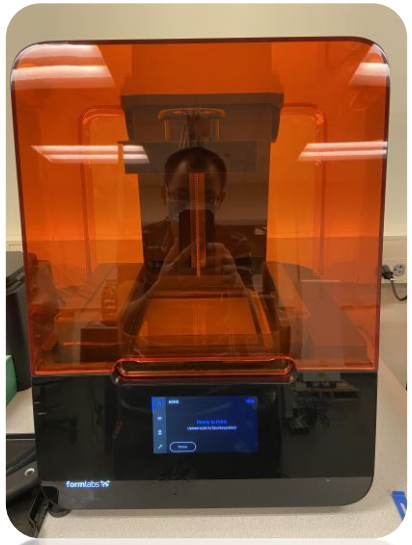
Form 3



Form 2



Form 3



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https://formlabs.com

LANNS Facilities: Boggs Building 3-12

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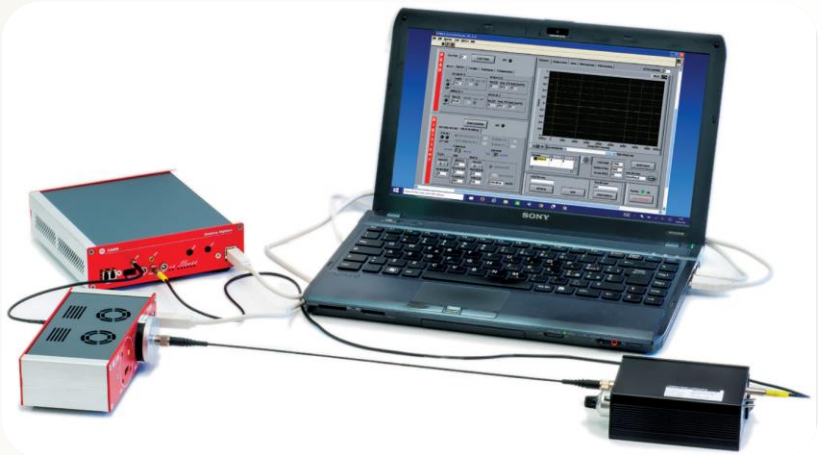
- **Fume hood**
- **Test station**

(ie., compare scintillator's performance via pulse shape discrimination)

- **Wet bench**
- **Various radiation sources**
- **CAEN equipment** (ie., digitizer)
- **Detector system accessories**



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LANNS Facilities: High performance computing

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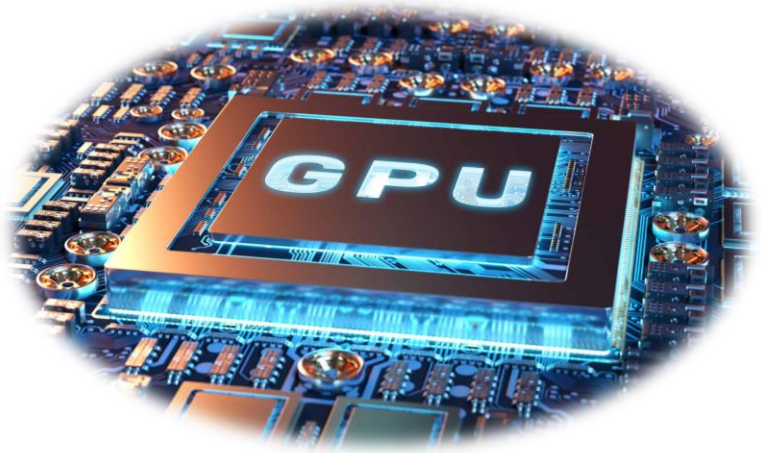
Partnership for an Advanced Computing Environment (PACE)

Provides faculty participants a sustainable leading-edge high performance computing (HPC) infrastructure with technical support services.



- **768 GB compute node with single precision GPU**
  -- machine learning/deep learning applications
- **2 x 384 GB compute node + 384 GB Compute node with local disk**
  -- general MCNP/serpent work
- **Software: SERPENT, MCNP5, MCNP6, MURE**

https://pace.gatech.edu

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LANNS Facilities (accessible): RSEL Lab

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Radiological Science and Engineering Laboratory (RSEL)

- Varian Clinical Linear Accelerator
- Radiation Physics Laboratory
- Neutron Generator Vault
- Calibration Lab
- Radioactive Sources

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https://www.rsel.gatech.edu

LANNS Facilities (accessible): IEN cleanroom

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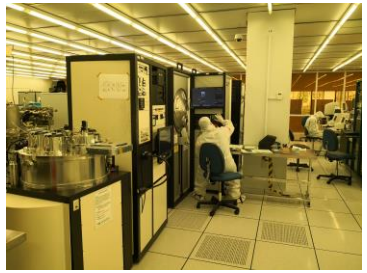
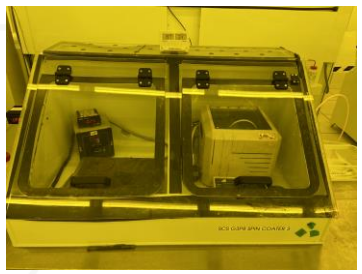
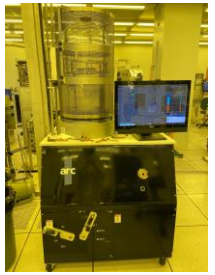
Institute for Electronics and Nanotechnology (IEN) Facilities

- **Lithography/Patterning:** UV Photolithography, Inkjet Printing
- **Etching:** Dry (reactive ion etcher), Wet (chemical solutions)
- **High Temperature Processes:** Oxidation, Annealing, Curing, Sintering
- **Thin Film Deposition:** Sputtering, Evaporation, ALD, PECVD, APCVD, LPCVD
- **Characterization:** SEM, TEM, Reflection, SIMS, IV Curve

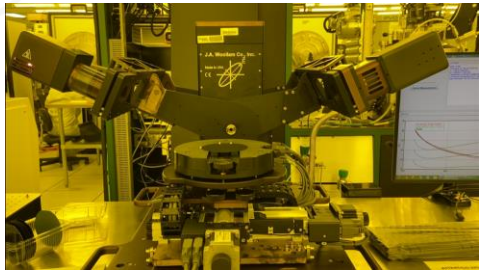


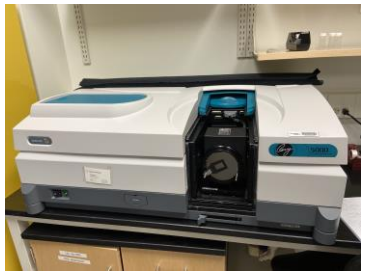




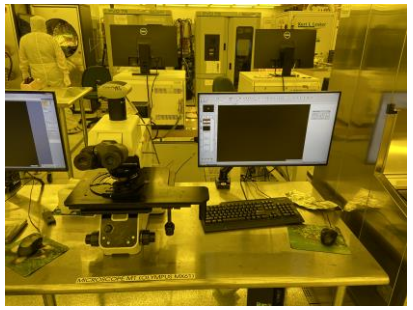










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Publications

Books and Book Chapters: **5**

Edited Volumes: **3**

Peer-reviewed Journal Publications: **46**

Conference Presentation with Proceedings : **26**

Conference and Invited Talks : **77**

Poster Presentations: **15**

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ETI

Consortium for Monitoring Technology and Verification

U.S. DEPARTMENT OF ENERGY

VTR VERSATILE TEST REACTOR

arpa·e
CHANGING WHAT'S POSSIBLE

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Thank you

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