



**LaserNetUS**

# LaserNetUS: Opportunities for the AAC community

Félicie Albert, on behalf of the LaserNetUS Facilities Points of Contact  
*Lawrence Livermore National Laboratory*

Advanced Accelerators Concepts workshop  
July 25<sup>th</sup> 2024, Naperville, IL

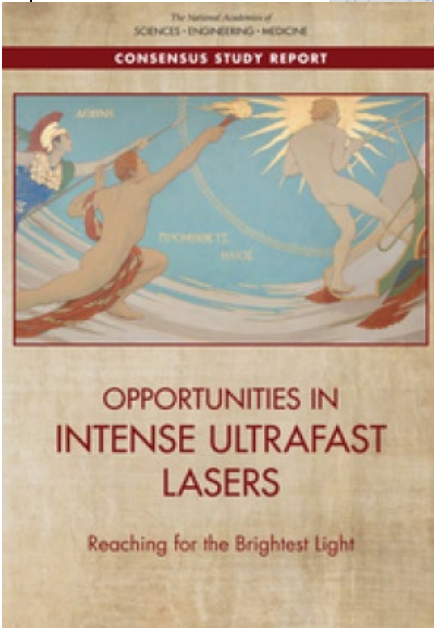
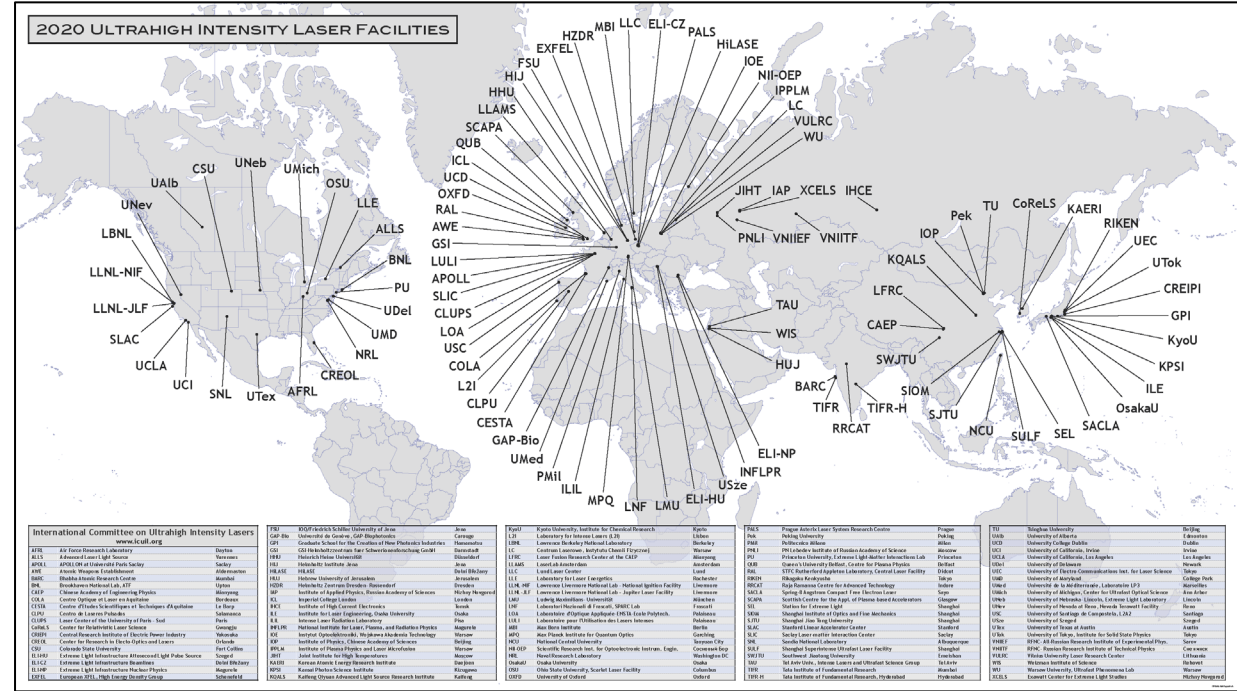
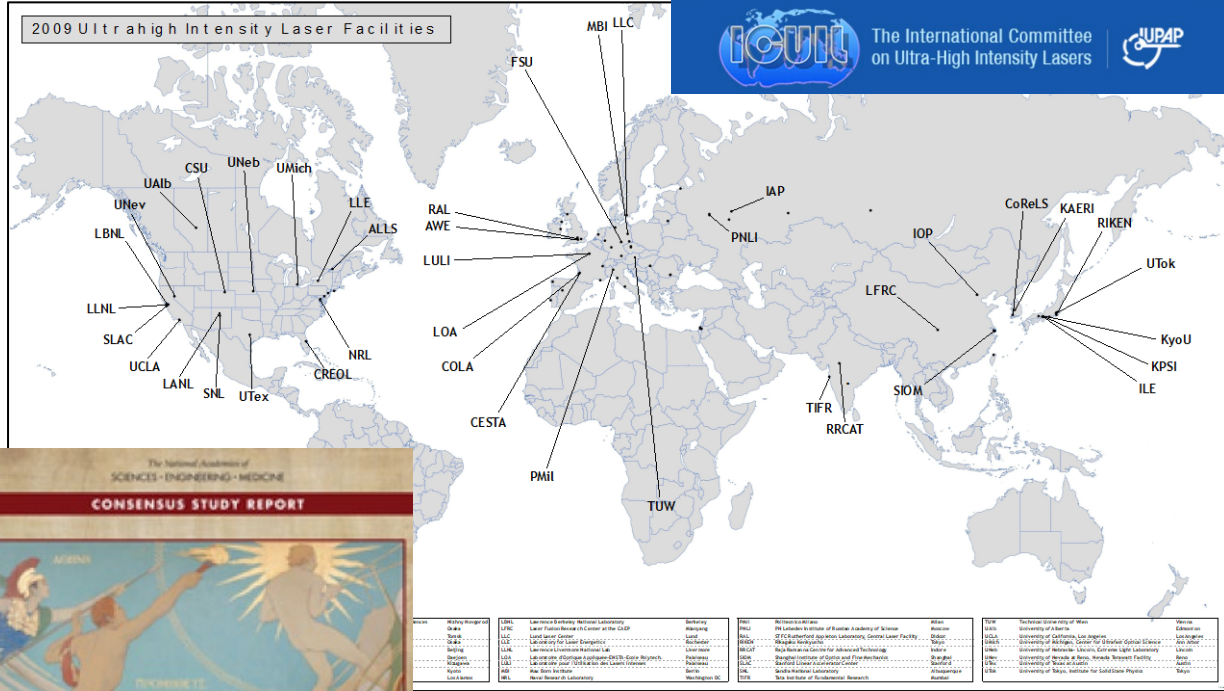


U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science



# The worldwide emergence of high intensity lasers stimulated the creation of LaserNetUS

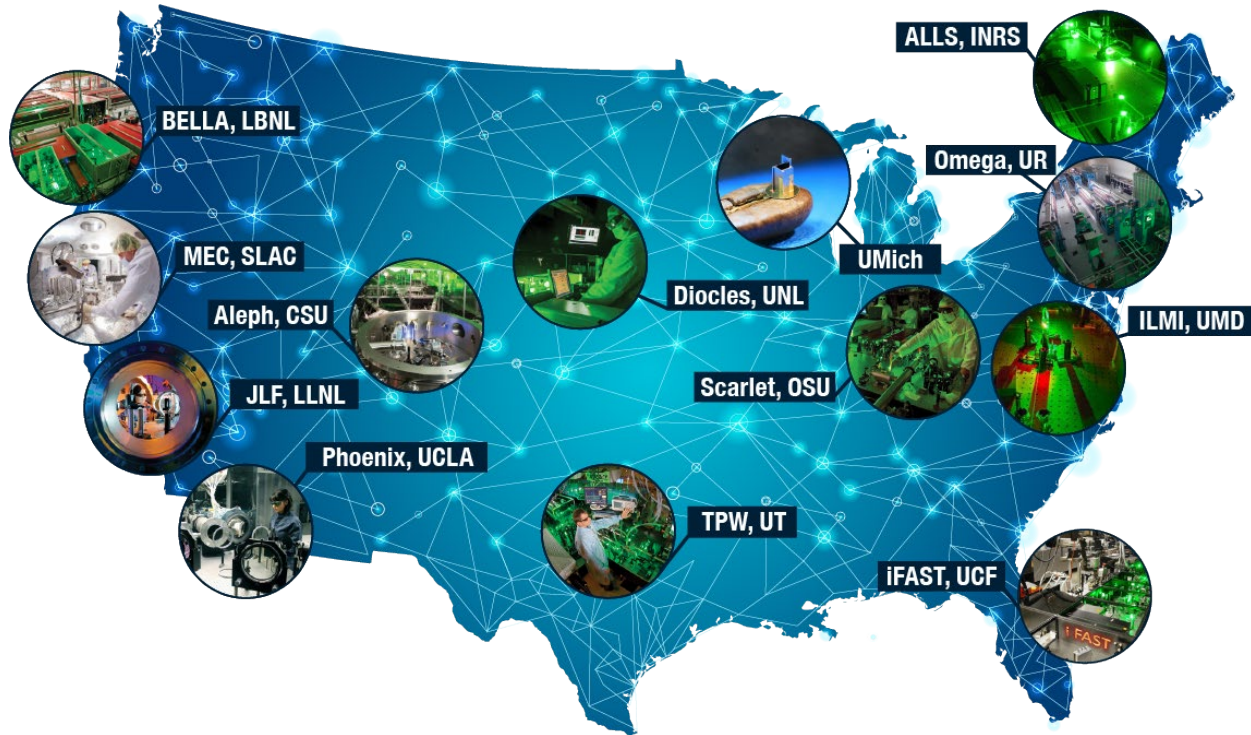


## A 2018 NAS report made recommendations to revive high intensity laser research in the US

In particular, that DOE should create a broad national network in coordination with OSTP, DOD, NSF, and others to support science, applications and technology.



# The LaserNetUS network was established in 2018



Our mission is to advance the frontiers of high-power laser science and applications by:

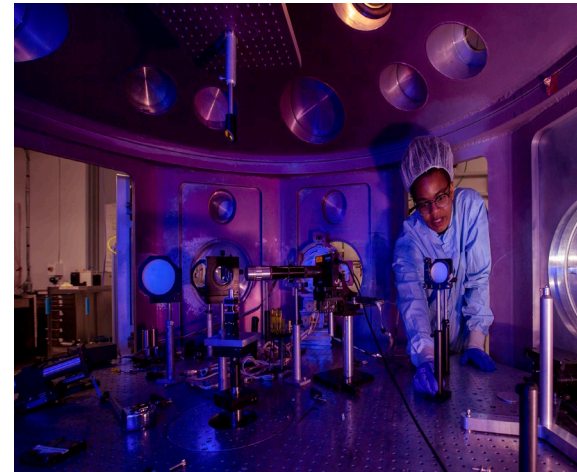
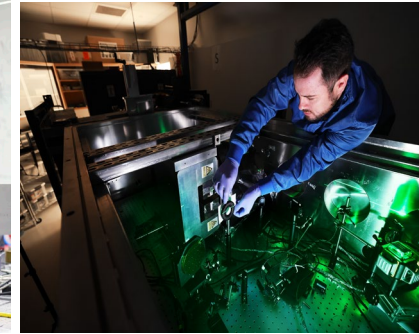
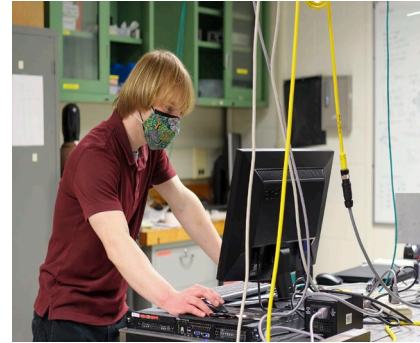
- Supporting cutting edge research with high-power lasers
- Providing access to unique facilities and enabling technologies
- Fostering collaboration among researchers around the world
- Providing training and leadership opportunities for students and early career researchers





# Benefits of the LaserNetUS network

- ✓ A coordinated network enables sharing of knowledge, resources, and best practices among researchers and institutions.
- ✓ Networking can accelerate scientific progress, optimizes research efforts, and minimize duplication of work.
- ✓ Networking can contribute to diverse workforce development if it provides opportunities for students, postdocs, and early career scientists.





# 13

## HIGH-POWER LASER & SUPPORT FACILITIES

ACROSS NORTH AMERICA



# 142

## EXPERIMENTS

SINCE THE PROGRAM WAS ESTABLISHED IN 2018

# 1200+

RESEARCHERS, ENGINEERS, TECHNICAL  
PERSONNEL

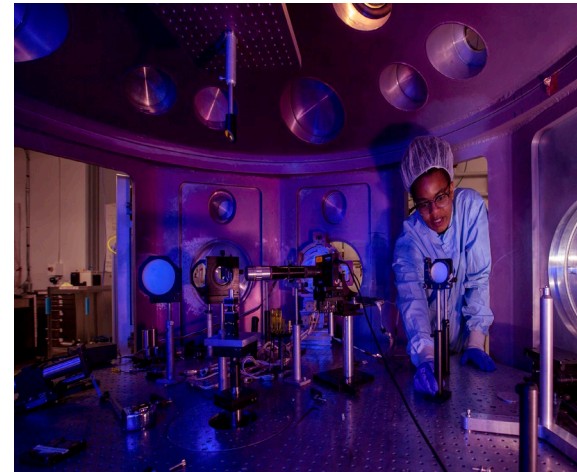
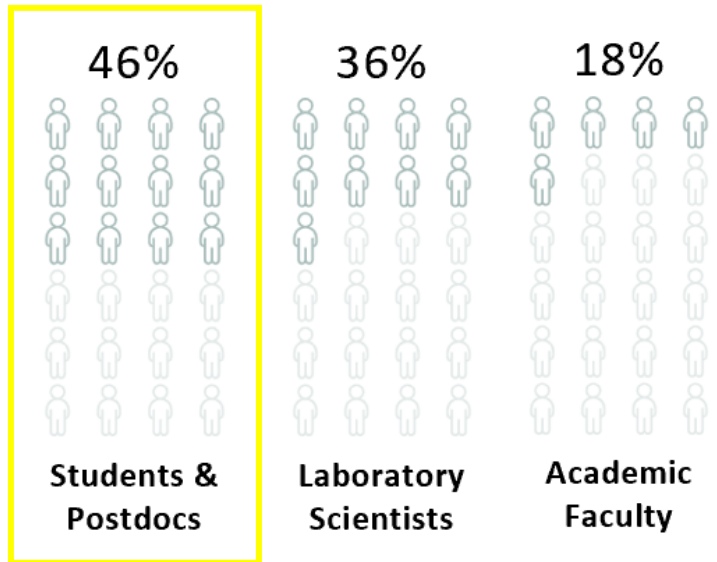
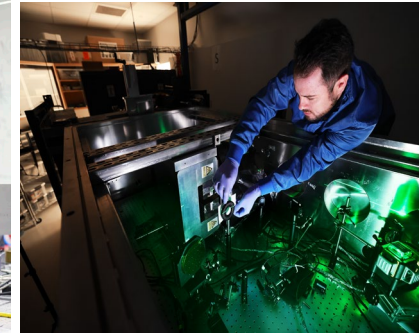
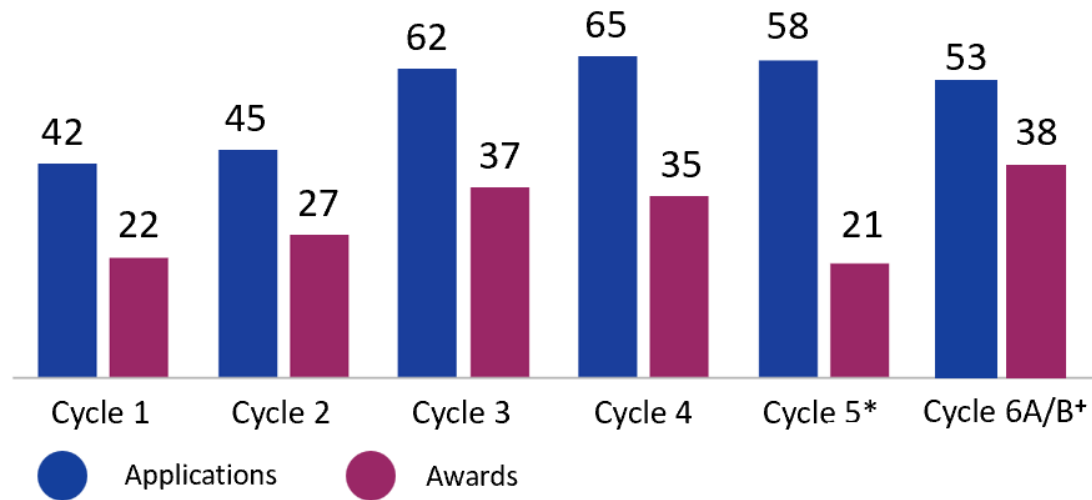
# 45+

## PUBLICATIONS

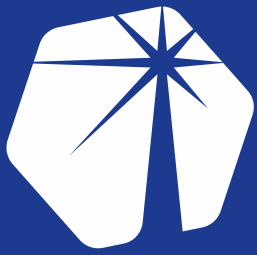
IN PEER REVIEWED JOURNALS



# We have had 6 calls for proposals and a broad base of early career users







# The first five years of LaserNetUS



Scientific Advisory Board forms under Dr. Sean Finnegan



Formation of the LaserNetUS Committees  
i-USE: intense-light USers Engagement, Diagnostics and Data Committee, and Simulations Committee



**2018:** Prof. Jorge Rocca became the first Chair of LaserNetUS  
First meeting in Lincoln, NE



**2020:** LaserNetUS was renewed



**2023:** DE-FOA-0002982: LaserNetUS For Discovery Science And Inertial Fusion Energy

Established by DOE FES in 2018

LaserNetUS looks forward



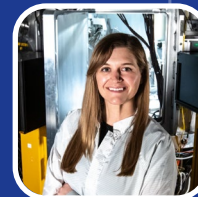
Dr. Kramer Akli  
DOE FES



Dr. Tammy Ma developed the Proposal Review Process



2020: Dr. Félicie Albert became the second Chair of LaserNetUS



2021: Dr. Chandra Breanne Curry was appointed as the LaserNetUS Coordinator



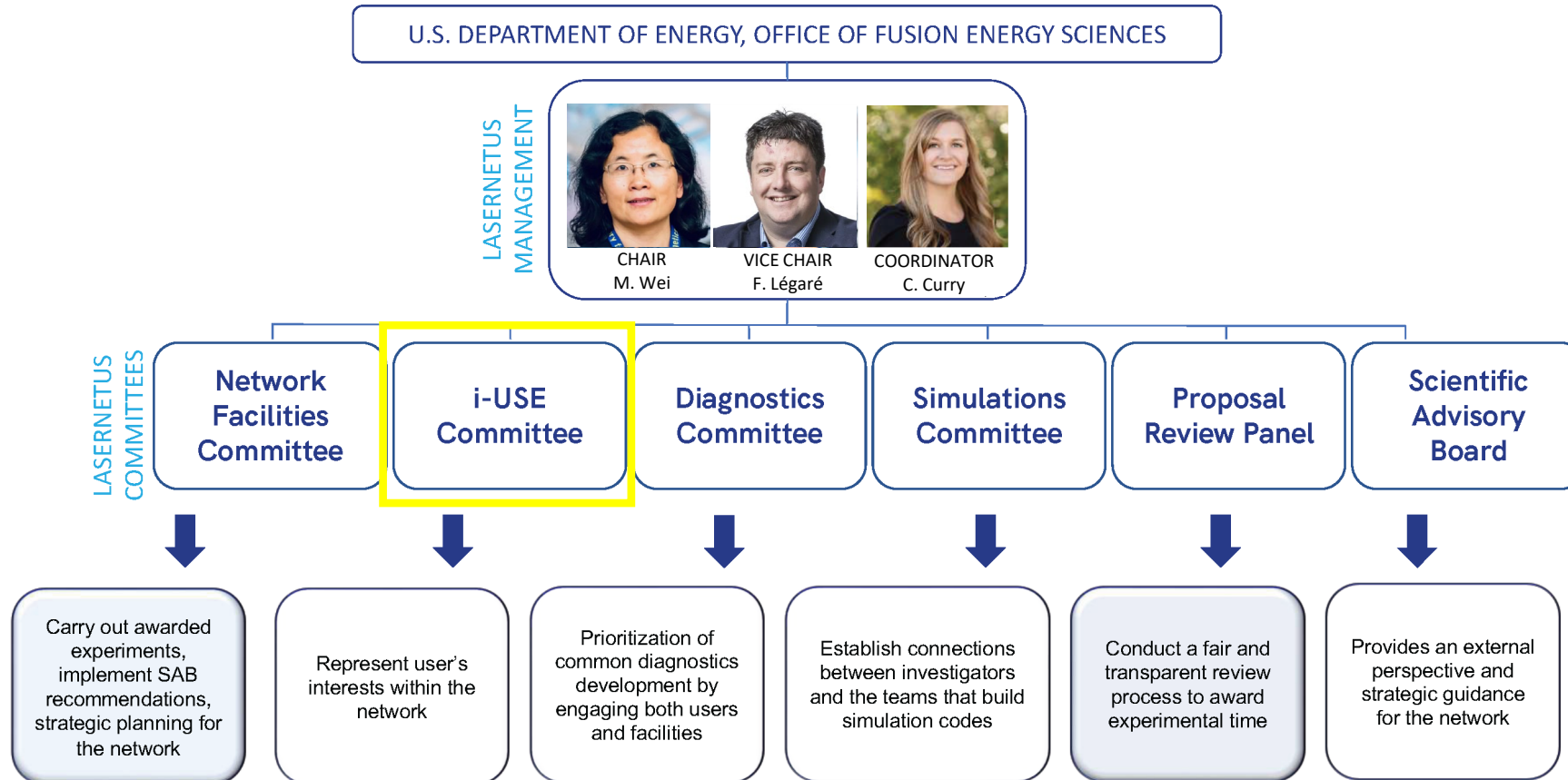
**2022:** Prof. Douglass Schumacher and Dr. Mingsheng Wei become Chair and Vice-Chair of LaserNetUS





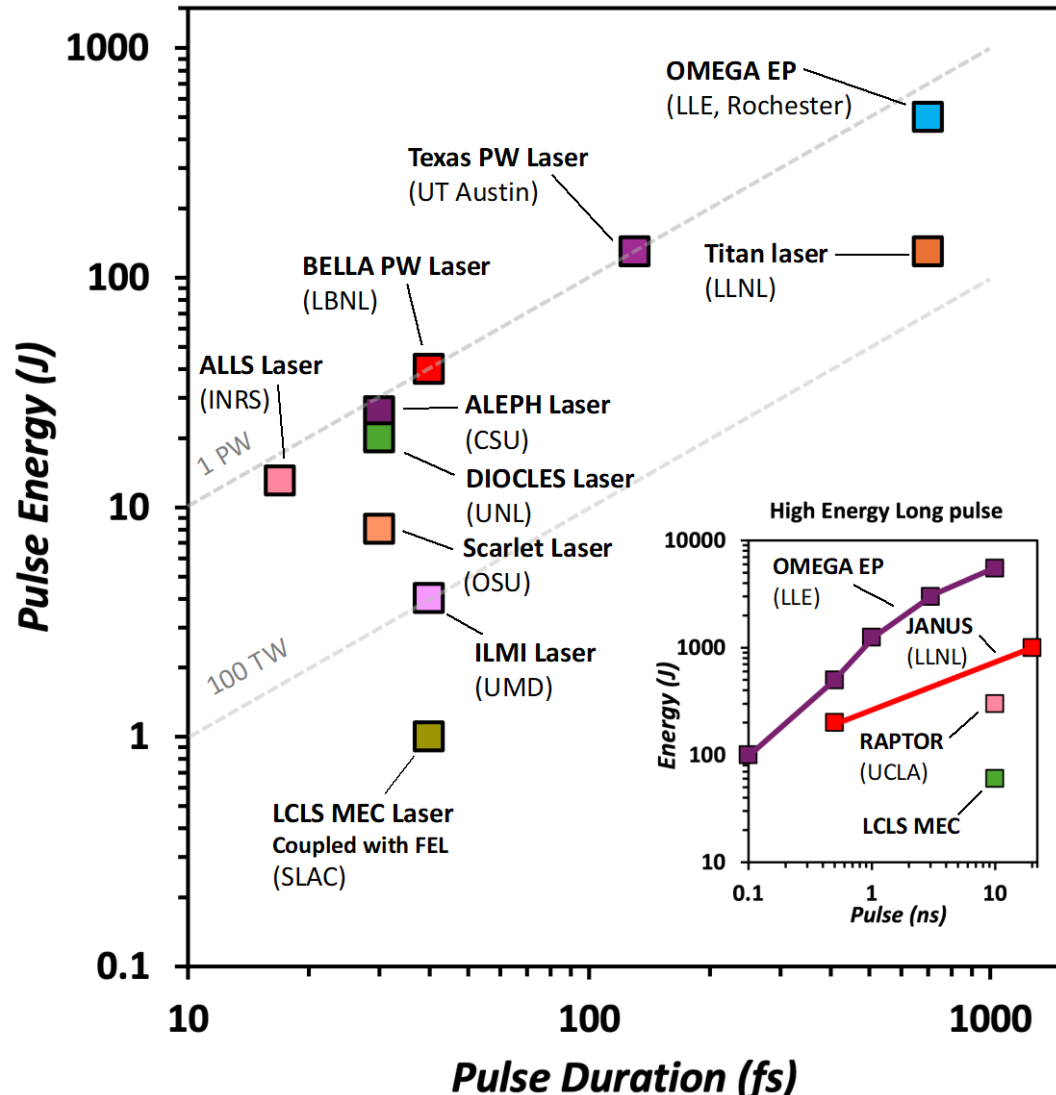


# LaserNetUS now has a structure that provides broad support for its users





# Our capabilities enable science and applications of interest to the AAC community



High intensity laser pulses at high repetition rate

High energy (up to kJ) pulses with precision control and flexible configurations

High repetition rate targetry and diagnostics

Multiple wavelengths from 0.4 to 2  $\mu\text{m}$

High energy x-ray beam synchronized to optical lasers



# A common diagnostic program augments impact



2023 LaserNetUS Data & Diagnostics Workshop

Common Diagnostic Program

Accessible online infrastructure

Diagnostic library

Diagnostic lending program

Funding opportunities

High Repetition Rate Diagnostics

Electronic readouts

Improve dynamic range and radiation hardening

Develop calibrations methods in situ

Develop ML/AI algorithm for data processing

Diagnostics for New Generation of Facilities

Remote operation

High SNR in noisy environments

High flexibility

Data Collection and Processing Tools

Standardization of data formats

Real time analysis

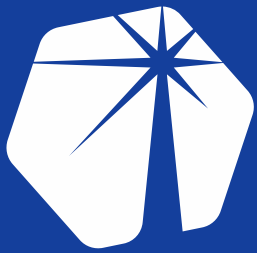
Data accessibility, retention, archiving



U.S. DEPARTMENT OF  
**ENERGY**

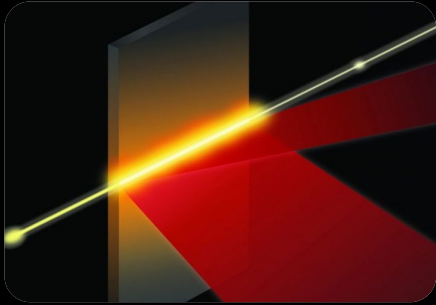
Office of  
Science



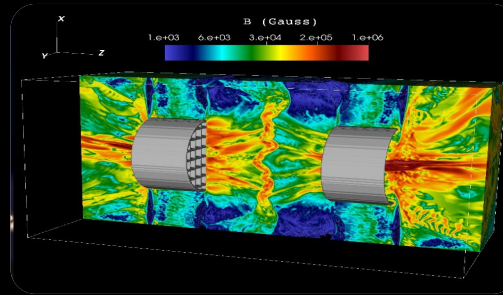


# LaserNetUS science overlaps with AAC

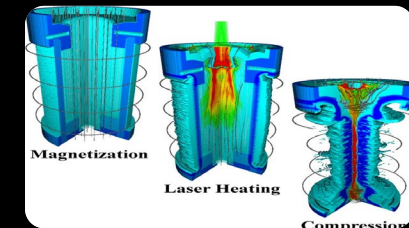
## Plasma Photonics



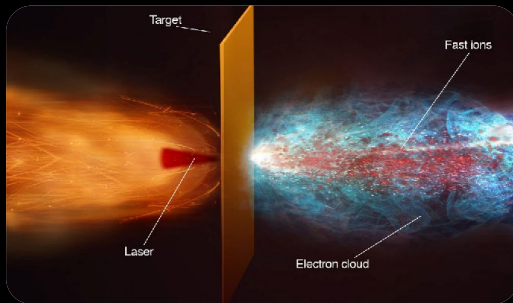
## Hydrodynamics



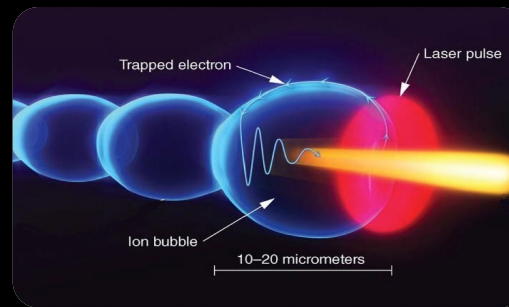
## Magnetized Plasmas



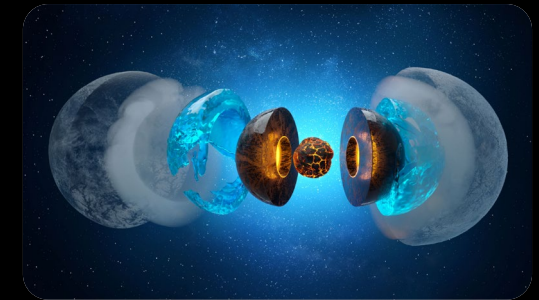
## Ion acceleration and Neutron sources



## Electron acceleration and Photon sources



## Astrophysics & Planetary Science





# Science highlight: accelerating electrons to multi-GeV with plasma waveguides

K155/180 – PI Howard Milchberg (UMD)

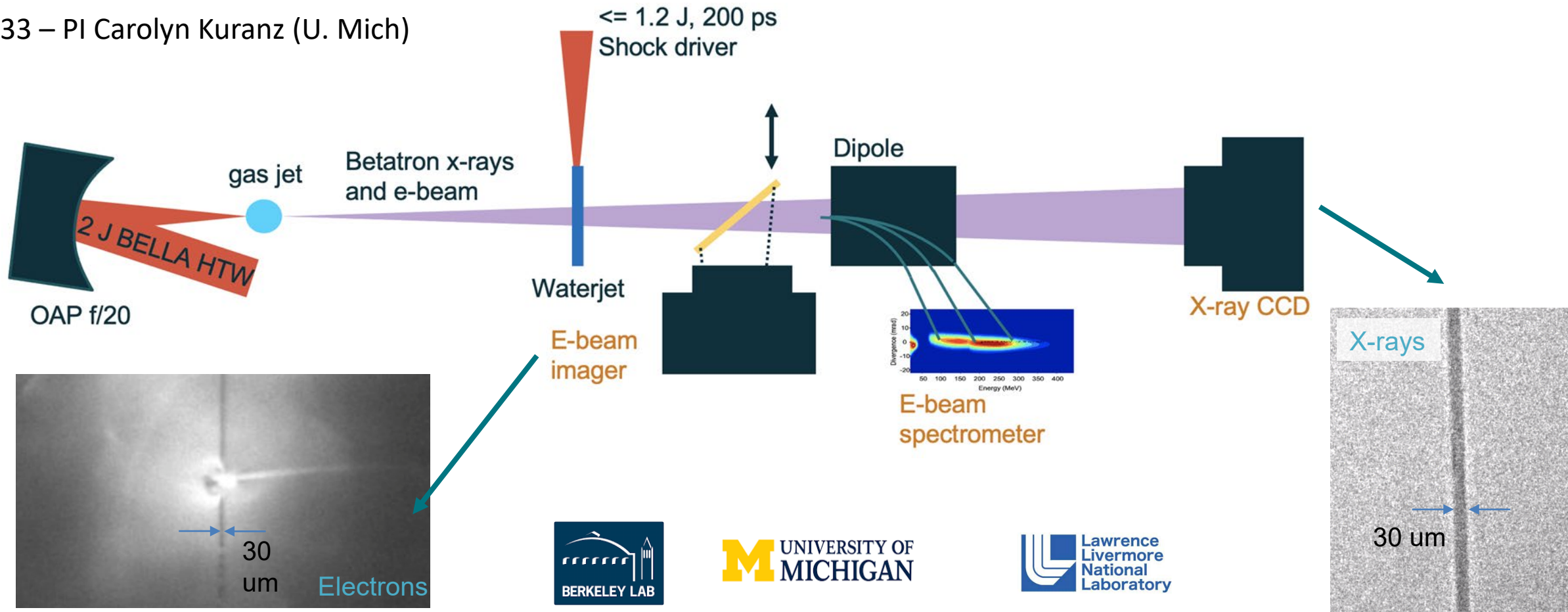


*B. Miao, J. Shrock et al, PRX (2022)*



# Science highlight: imaging hydrodynamic shocks with betatron x-rays

K33 – PI Carolyn Kuranz (U. Mich)

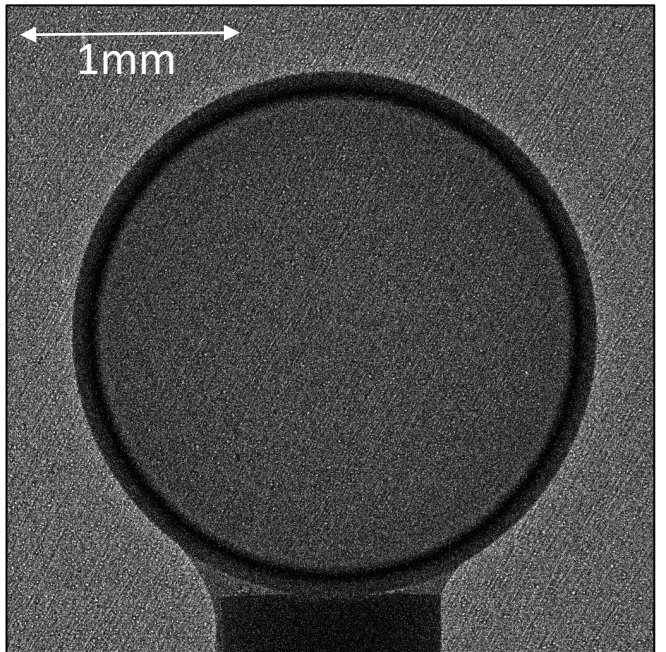
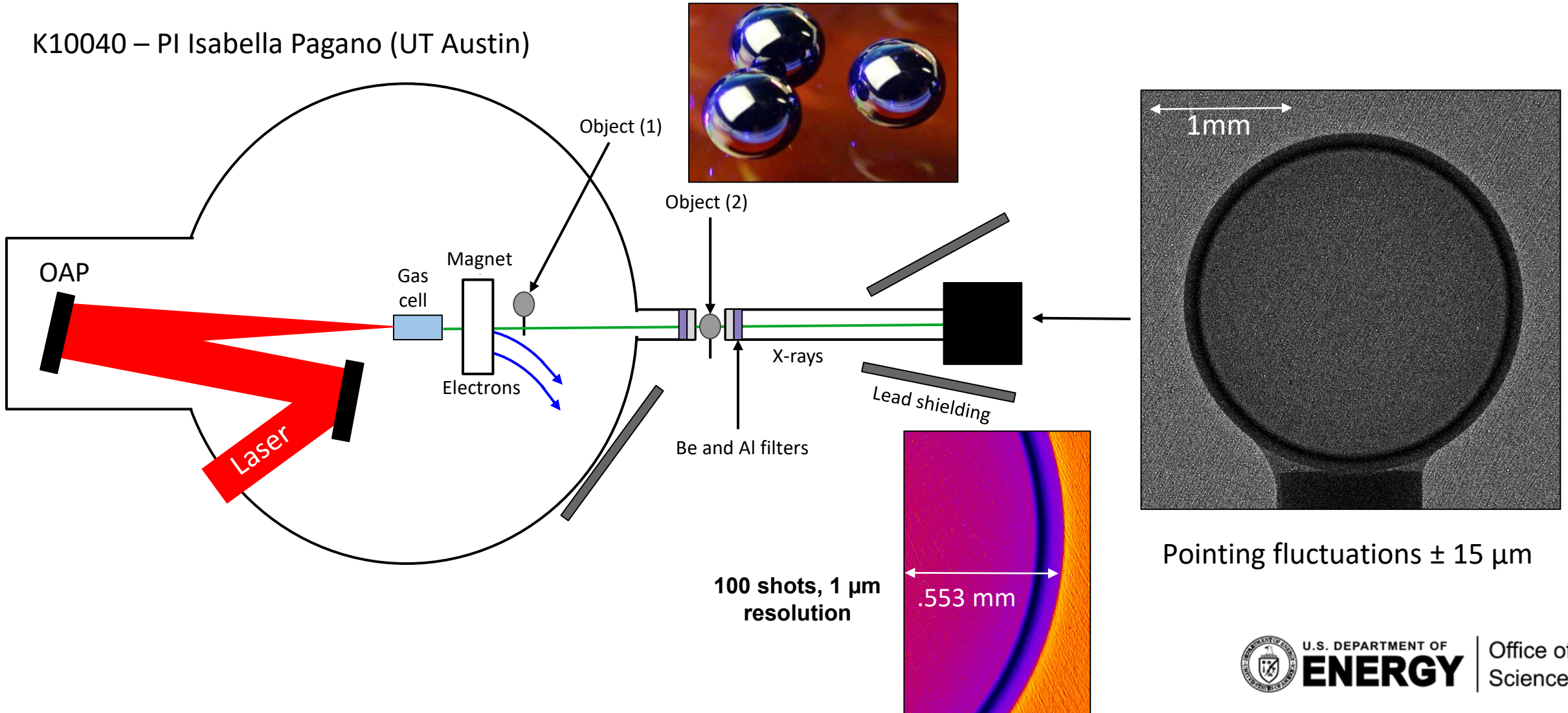






# Science highlight: phase contrast imaging of inertial confinement capsules with $\mu\text{m}$ resolution

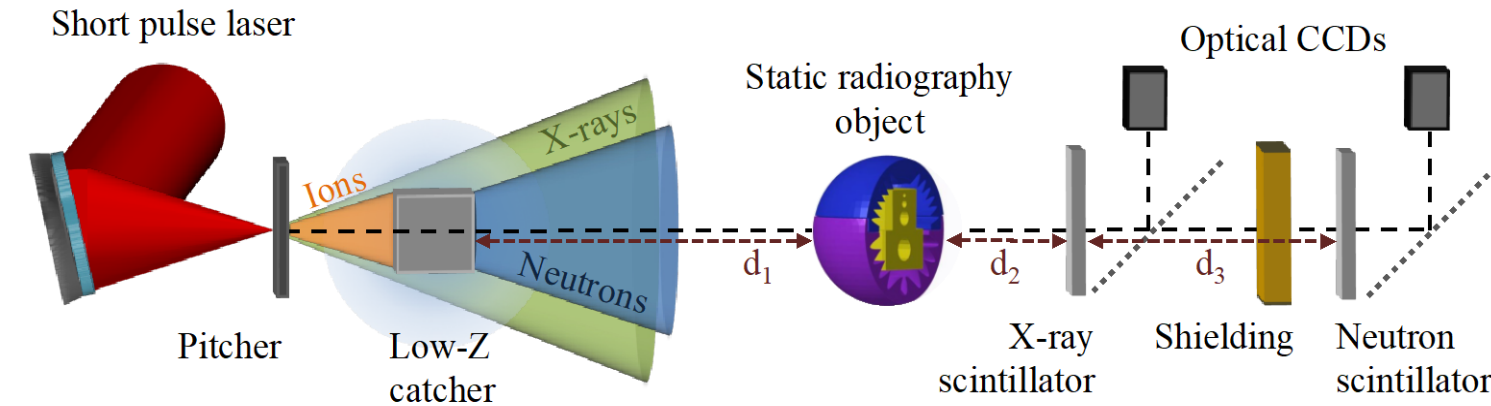
K10040 – PI Isabella Pagano (UT Austin)



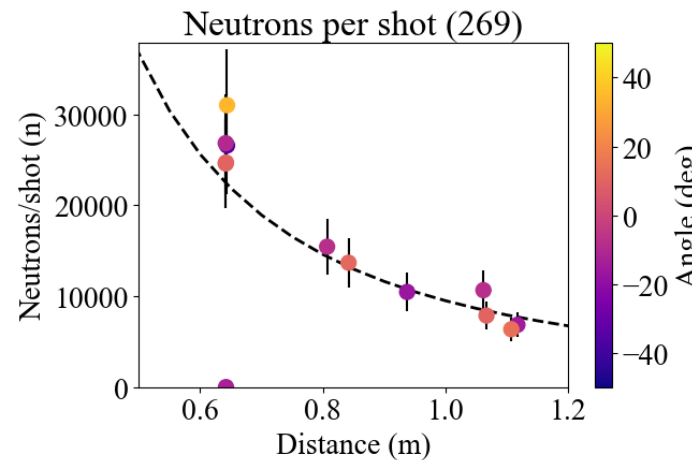
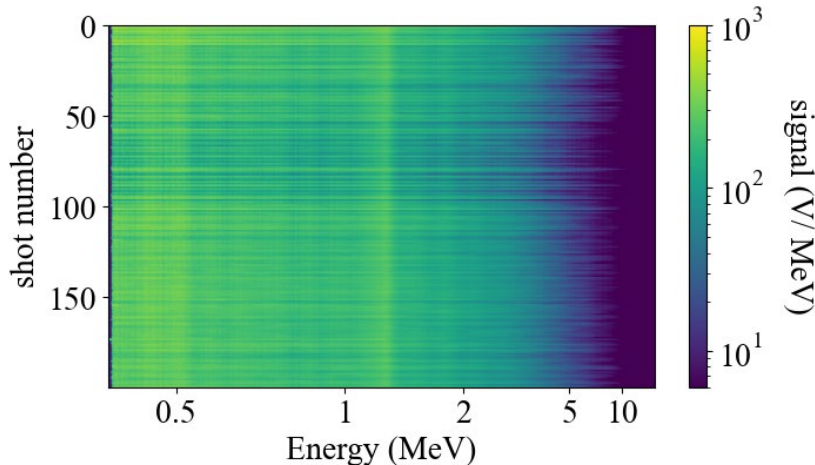
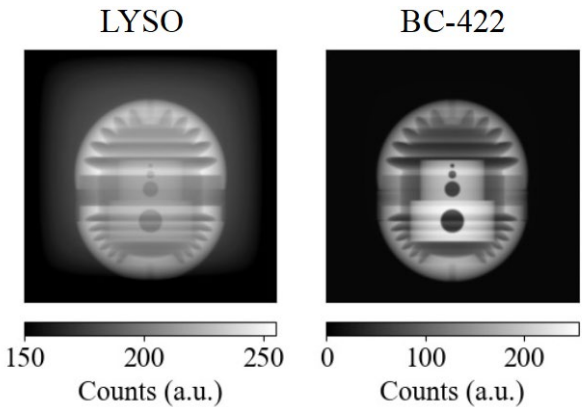
Pointing fluctuations  $\pm 15 \mu\text{m}$

# Science highlight: high flux directional neutron generation for static radiography

K072 – PI Franziska Treffert (LLNL)



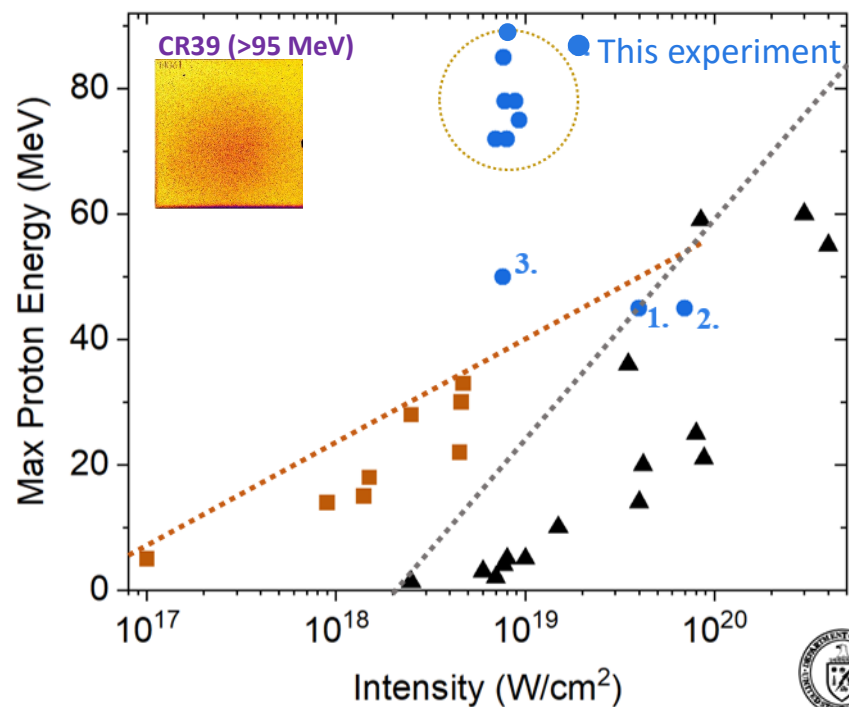
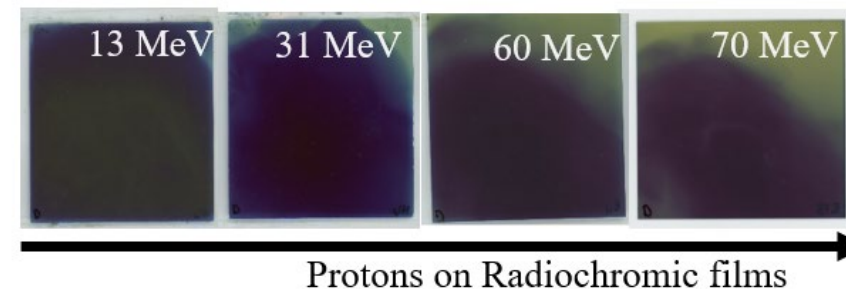
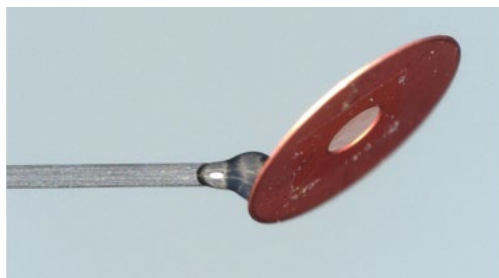
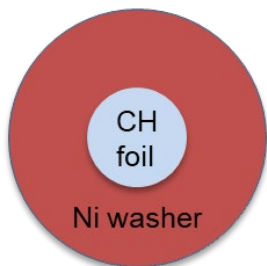
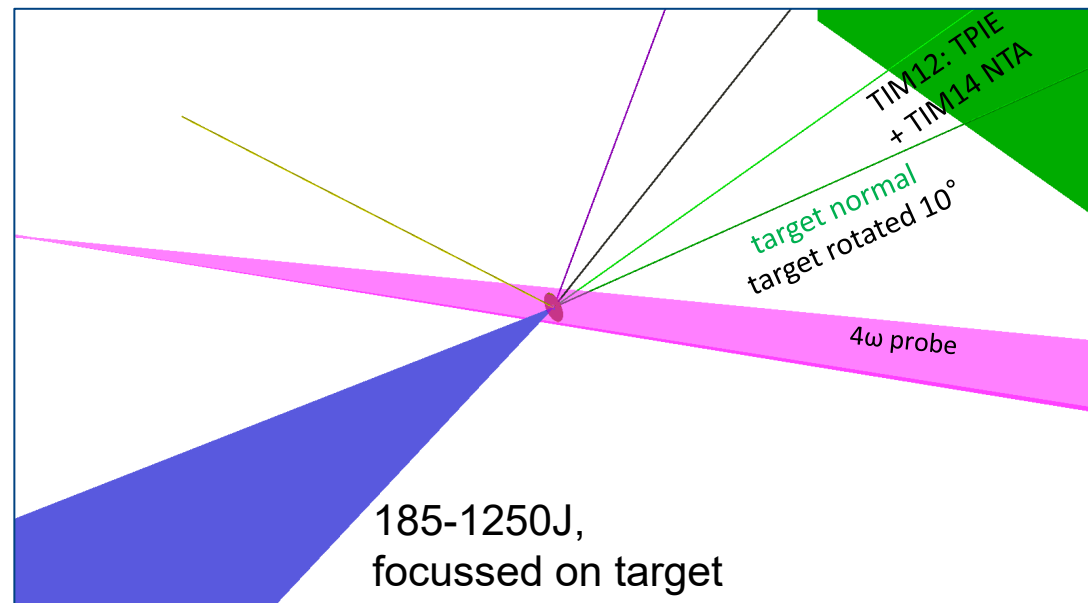
Simulated Radiographs at Titan (JLF)



Rep-rate capable high power lasers will enable laser-driven single shot radiography of fast evolving systems.

# Science highlight: Ion Acceleration by Continuous Fields in Target Transparency Regime

K089 – PI JooHwan Kim (UCSD)



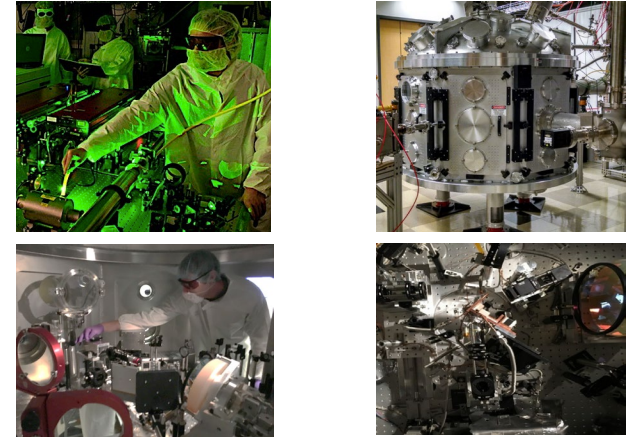




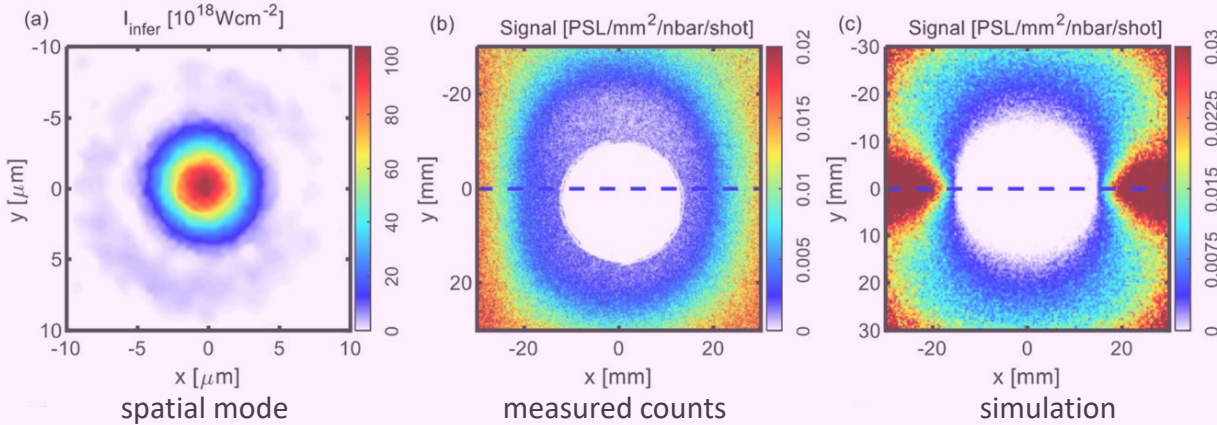
# Science highlight: Direct measurement of laser intensity at the Scarlet Laser Facility

K104 – PI Wendell Hill (UMD)

- *Directly* measures the absolute intensity profile *at full power*.
- Critical as intensities above  $10^{22}$  W/cm<sup>2</sup> become more common.
- Method based on measuring nonlinear, relativistic Thomson scattered electrons from a dilute gas.

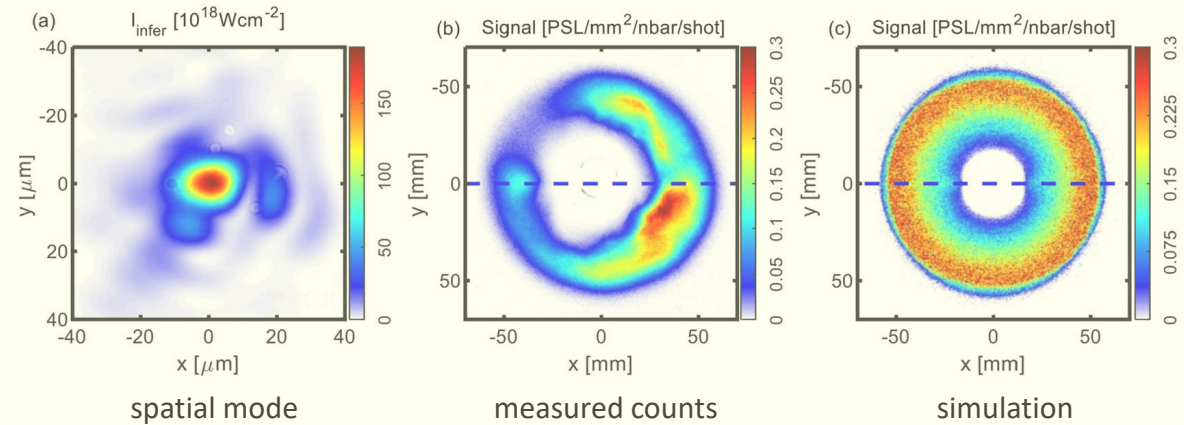


Scarlet (OSU, LaserNetUS)



Nominal intensity:  $10.5 \pm 2.9 \times 10^{19}$  W/cm<sup>2</sup>  
 Measured intensity:  $8.2 \pm 2.2 \times 10^{19}$  W/cm<sup>2</sup>

VEGA3 (CLPU)



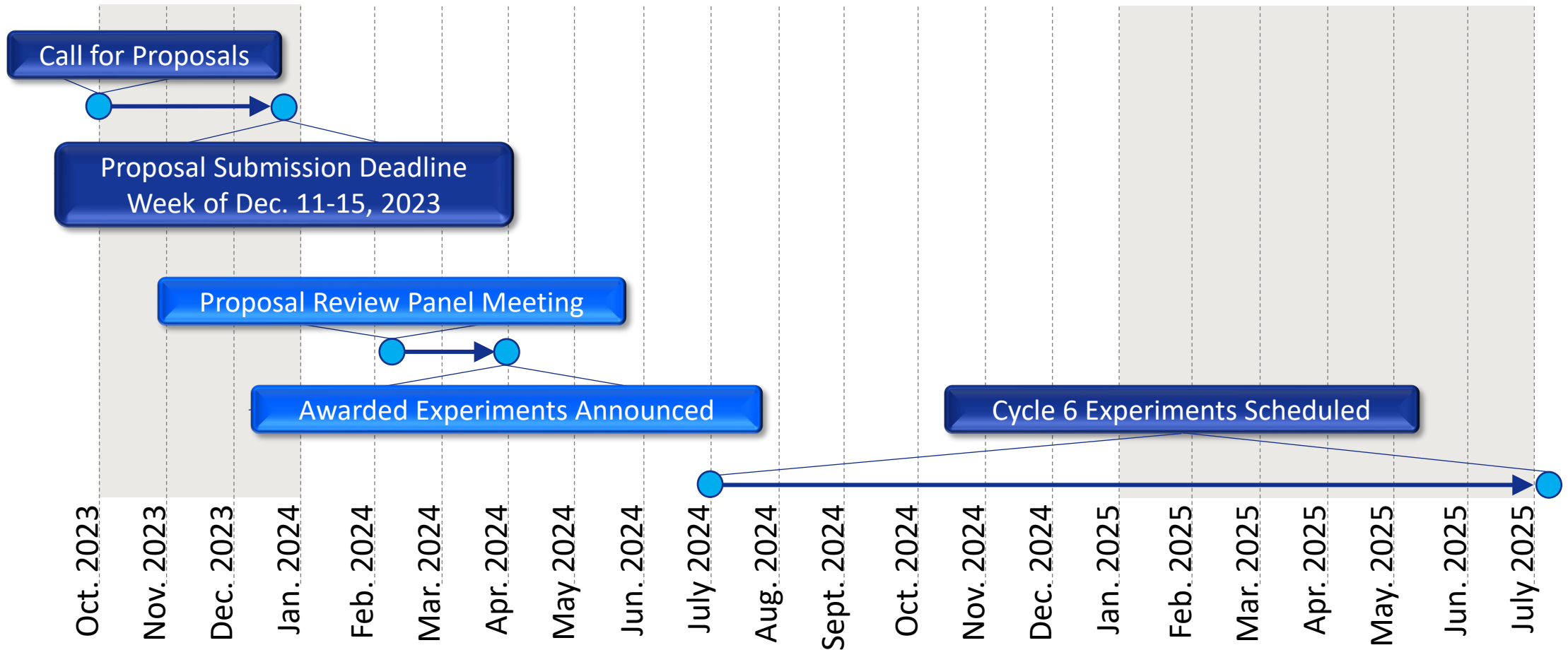
$18.4 \pm 3.5 \times 10^{19}$  W/cm<sup>2</sup>  
 $9.1 \pm 0.8 \times 10^{19}$  W/cm<sup>2</sup>

HOW TO GET ACCESS TO  
**LASERNETUS**

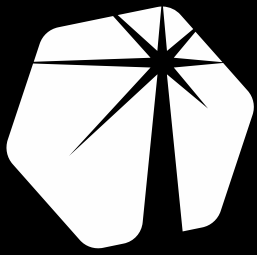




# We have an annual call for proposals



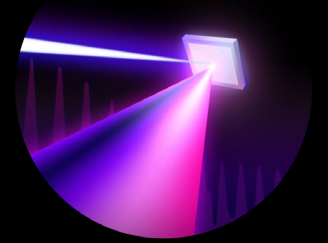




# Users showcase their research at our annual meeting



## 2024 LASERNETUS USERS' MEETING



- The 3 day meeting was held in Austin, TX, July 16-18 2024.
- 150+ attendees with over 50% students and postdocs
- Exhibitors from national labs or private industry
- *LaserNetUS provided support for 62 students and postdocs to attend the meeting and present their research*





# REaching a New Energy sciences Workforce (RENEW) at LaserNetUS

We are partnering with three Minority Serving Institutions (MSIs) to attract and train undergraduate students from underrepresented populations

- 1 Expose and train MSI students and faculty to LaserNetUS Science
- 2 Host cohorts of MSI undergrads and faculties at LaserNetUS
- 3 Support ongoing engagement with students to bring them into the field
- 4 Develop capabilities and expertise at MSIs to create new programs



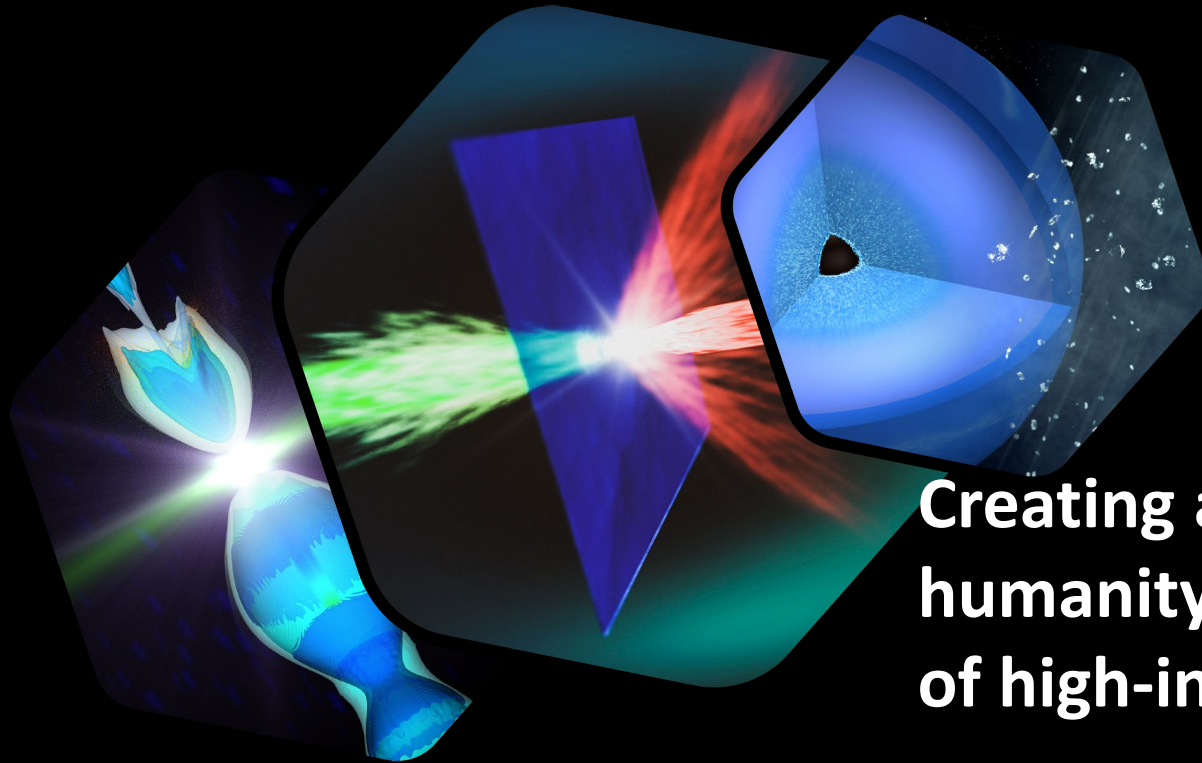
U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

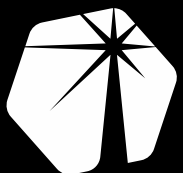


# QUESTIONS?

---



**Creating a brighter world and better humanity through the innovation and use of high-intensity lasers.**



**LaserNetUS**



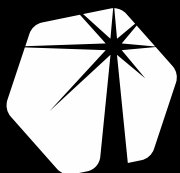
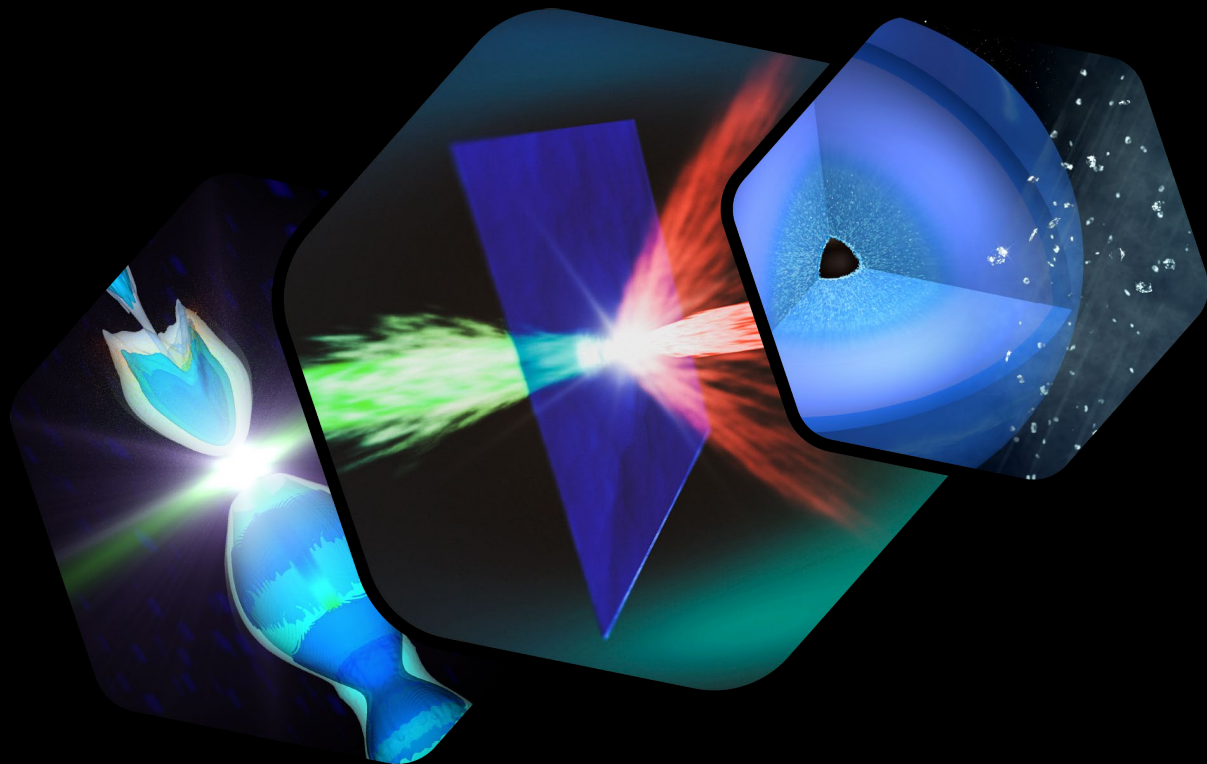
U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science



# BACKUP SLIDES

---



LaserNetUS



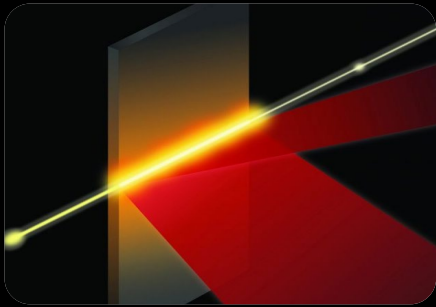
U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

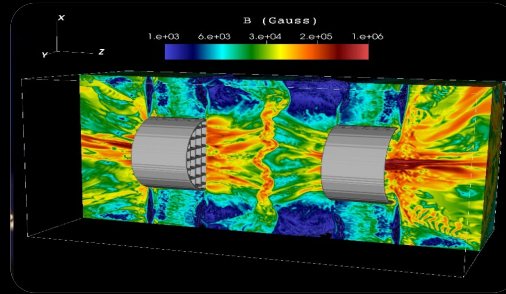


# Network capabilities enable science and applications of interest to the AAC community

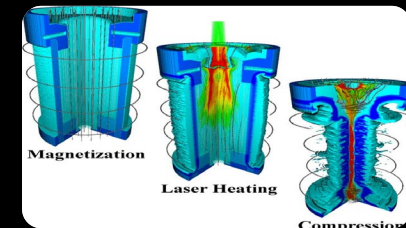
## Plasma Photonics



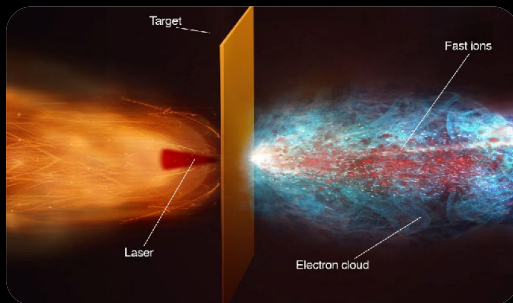
## Hydrodynamics



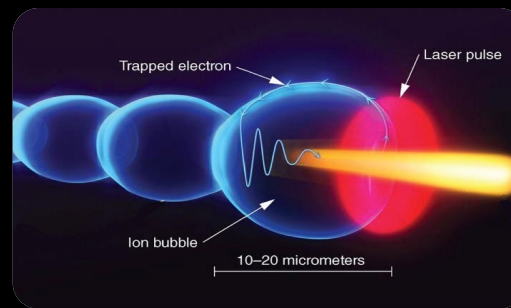
## Magnetized Plasmas



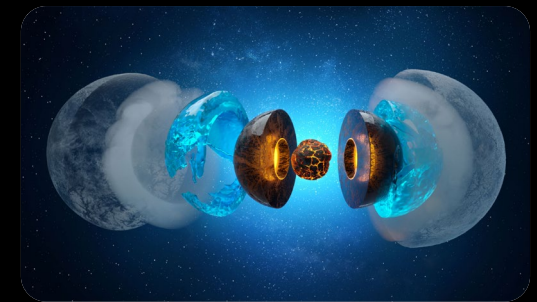
## Ion acceleration and Neutron sources



## Electron acceleration and Photon sources



## Astrophysics & Planetary Science



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science



# DEVELOPING PROPOSAL WRITING RESOURCES TO SUPPORT NEW USERS

How to Write a Successful LaserNetUS Proposal

HOW TO WRITE A SUCCESSFUL LASERNETUS PROPOSAL

Watch on YouTube

Webinar on how to write a proposal organization

## 2nd How to Write a Successful LaserNetUS Proposal

Learn what it takes to prepare a top-ranking proposal for LaserNetUS.

**When and where**

**Date and time**  
Wed, October 26, 2022,  
10:00 AM – 12:00 PM PDT

**Register Now**

ate with detailed instructions, s, and writing prompts

LaserNetUS

et including parameter table.

on of provide They should

ed in made (2.5 cm), left

llections ac

LaserNetUS permission system. g used, and a ined table.

Query or

System Name

**LaserNetUS Proposal for Cycle 5**

Cycle 5 Experiment Dates: September 2023 – July 2024  
*\*Earliest start date will depend on the site readiness and proposal availability*

Proposal Deadline:

**Title of Proposed Experiment:**

Provide a descriptive title of your proposed experiment that you would be willing to be made public if awarded experiment time.

**Spokesperson:**  
 First Name Last Name  
 Division/Department  
 Institution  
 Job Title/Role  
 Mailing Address Line 1  
 Mailing Address Line 2  
 E: abc@xyz.edu  
 T: +1 (xxx) xxx-xxxx

**Lead Principal Investigator (PI):**  
 First Name Last Name  
 Division/Department  
 Institution  
 Job Title/Role  
 Mailing Address Line 1  
 Mailing Address Line 2  
 E: abc@xyz.edu  
 T: +1 (xxx) xxx-xxxx

**Co-PI(s):**  
 First Name Last Name  
 Division/Department  
 Institution  
 Job Title/Role  
 Mailing Address Line 1  
 Mailing Address Line 2  
 E: abc@xyz.edu  
 T: +1 (xxx) xxx-xxxx

The "Spokesperson" is the primary point of contact for the proposed experiment. The Lead PI typically conceives of the idea, designs the experiment, and leads the experimental team and analysis effort. In most cases, the "Spokesperson" and "Lead PI" are the same.

A Co-PI is required for all submissions when a student or postdoc is the Lead PI. In the case, the Co-PI is typically the supervisor and is expected to provide the necessary training, oversight, findings, and resources to successfully execute the experiment. Additionally, the Co-PI will be contacted (if the student/postdoc leaves the field).

A list of all participants that you expect to be involved in the proposed research is required. It should include students, lab figures/moderators, target fabricators/technicians, etc. This information is also used in appendix II, "Intensive Research Team." This information is critical to assess if the team has adequate experience and staffing level is compatible with the support provided by the facility.

Page 2 of 15







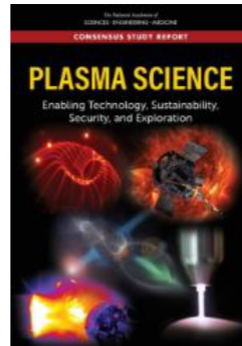
# LASERNETUS FIGURES PROMINENTLY IN THE COMMUNITY



*“Expanding the scope and capabilities of LaserNetUS”*



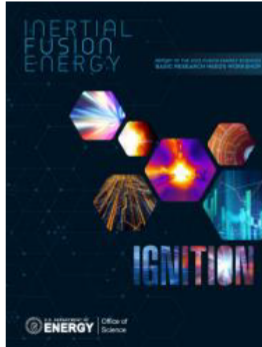
*“Improve and upgrade existing LaserNetUS facilities”*



*“This is an opportune time to address [...] challenges, with increased access through LaserNetUS”*



*“Increase operations support and aggressive upgrades to the LaserNetUS network to expand the base of users”*



*“Leverage existing facilities (including LaserNetUS), ..., to advance IFE S&T. Explore ways to expand shot time on existing U.S. facilities and develop upgrades to meet IFE-specific needs”*



*“Access to Premier U.S. Facilities in High Energy Density Science Is Essential for the Workforce ..... LaserNetUS is a new entity, and its continued growth benefits HED science and the workforce”*

The HEDP and fusion communities recognize the **broad range of capabilities of the LaserNetUS network facilities, open science mission, and demonstrated success in user research** puts it in an excellent position to play an even stronger role in advancing science, technology, and the workforce for frontier HEDP research and IFE.



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science



# INTENSE-LIGHT USERS ENGAGEMENT (i-USE) COMMITTEE



**Ronnie Shepherd**  
Chair  
LLNL



**Amina Hussein**  
Co-Chair  
UAlberta

**i-USE is the User Group of LaserNetUS. The mission of i-USE is to grow the high-intensity laser community by:**

- [Supporting users](#) on the LaserNetUS facilities;
- Advocating for member facilities and the user community;
- Providing an official channel of communication between users and LaserNetUS management;
- [Fostering collaborations](#) with the research community and industry; and
- Promoting [training and education](#) of students, post-docs and early-career scientist in laser-matter interactions;



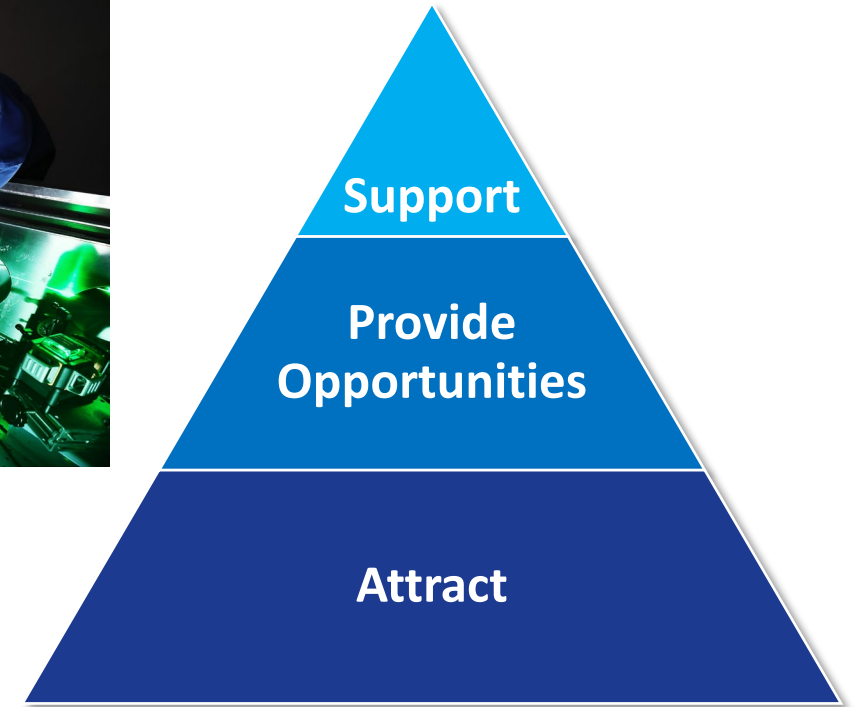
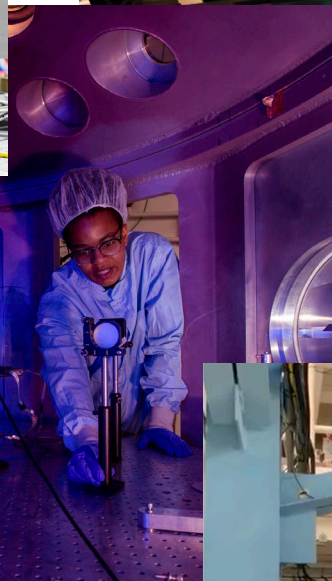
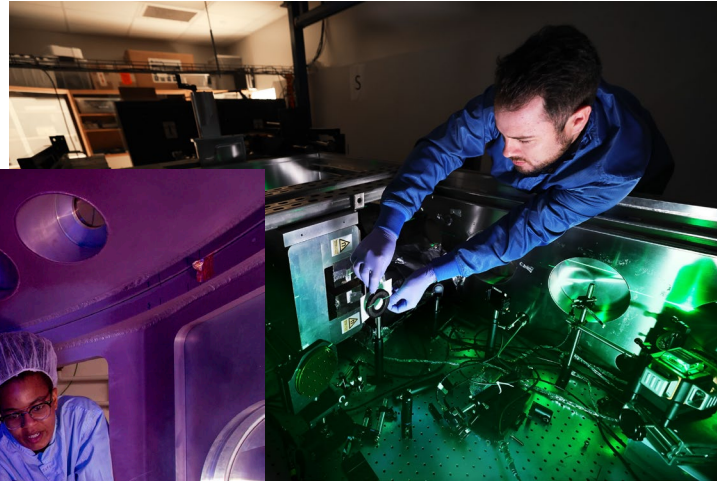
U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science





# LASERNETUS ENCOURAGES STUDENTS TO SUBMIT PROPOSALS AS PI



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science



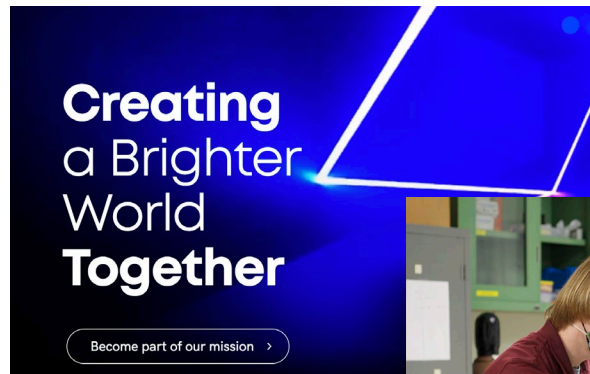


# YOUNG CAREER SCIENTISTS ARE CRITICAL TO OUR COMMUNITY

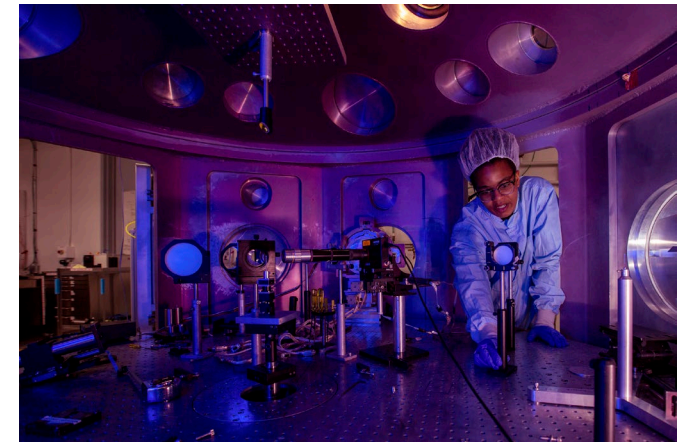
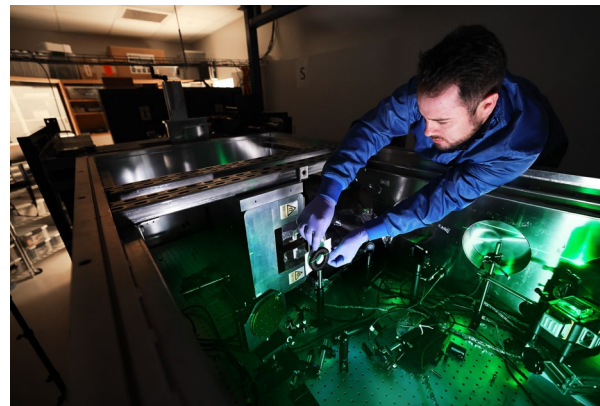
LaserNetUS encourages students to submit proposals as PI

Proposal review assesses broader impacts in addition to intellectual merit

Impact on the Scientific Community & Society Impact on Workforce



*46% of experimenters were at an early career stage (students & postdocs)*



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science