SAND2021-12377PE

Sandia National Laboratories

Exceptional service in the national interest

A Career in Aerospace Engineering

Sort of.

Kathryn N. Gabet Hoffmeister

Howard EGPP101

October 7th, 2021

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia LLC, a wholly owned subsidiary of Honeywell International Inc. for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

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Systems Engineer
at Sandia National Laboratories

PhD in Mechanical Engineering

Inventor

Certified Project Management Professional (PMP)

Also: Wife, Mom, Baker

Where I Am From

Grew up in Jackson Township, Ohio

BS Aerospace Engineering from
Case Western Reserve University
MS and PhD Mechanical Engineering from
The Ohio State University

Work Experience:

NASA: Intern in Space Policy in the Science Mission Directorate

Sandia National Laboratories: Visiting Researcher (CA)

→ Postdoc (NM) → Mechanical Engineer (NM) → Systems Engineer (NM)

More on That Early Work Experience

- Host at an Italian Restaurant
- Snack Shop Attendant
- Mall Worker
- Nanny
- Physics Grader
- NASA Intern
- Undergrad Researcher
- TA for High-School Summer Course
- Party Planner
- Undergrad Tutor

Graduate School

Turbulence and Combustion Research Laboratory

Goal: Understanding how turbulence changes flame chemistry

Applications:

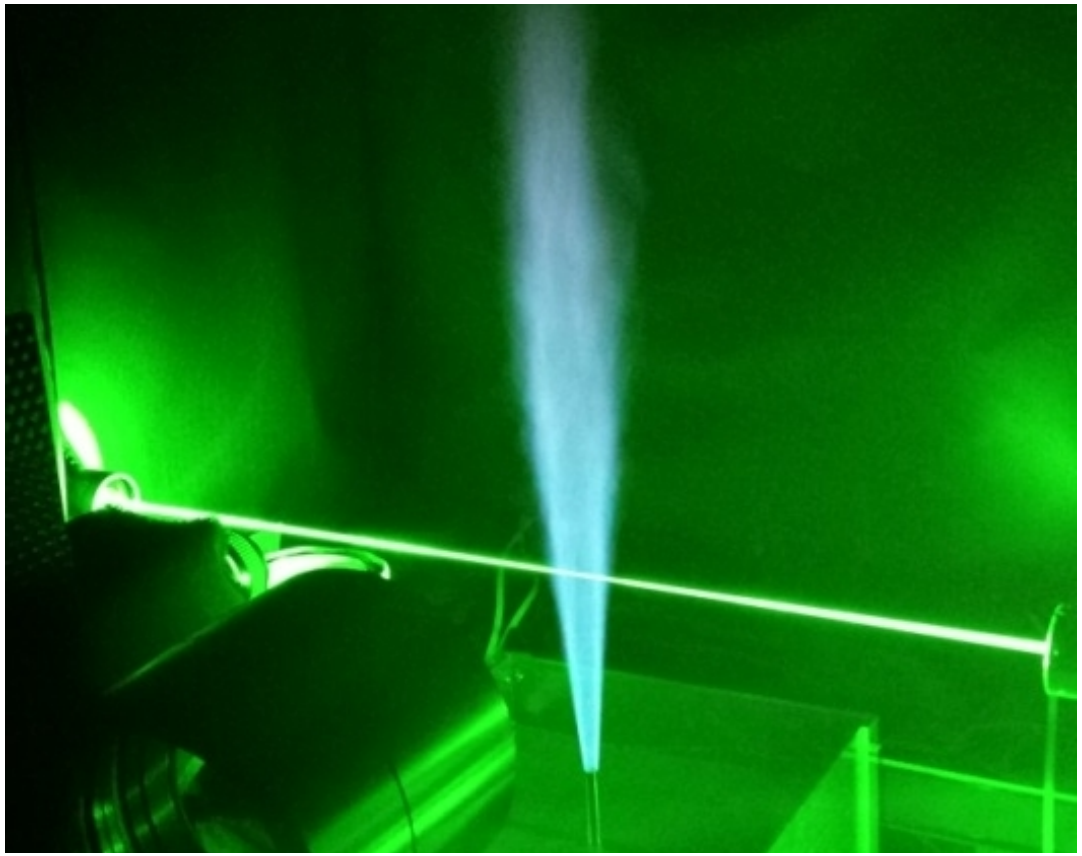
- Jet propulsion
- Automobile fuel efficiency and pollutant creation
- Industrial power generation

Laser diagnostics of combustion

- High-speed cameras
- High-power, pulsed lasers
- Flames

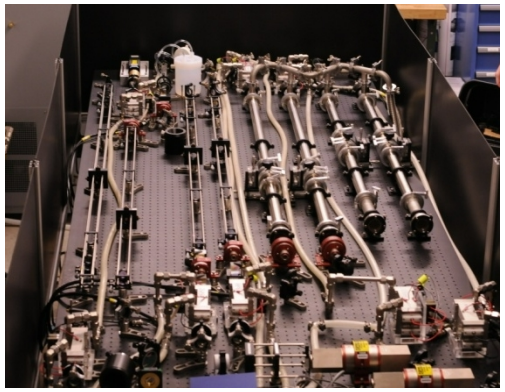
Work paid for by

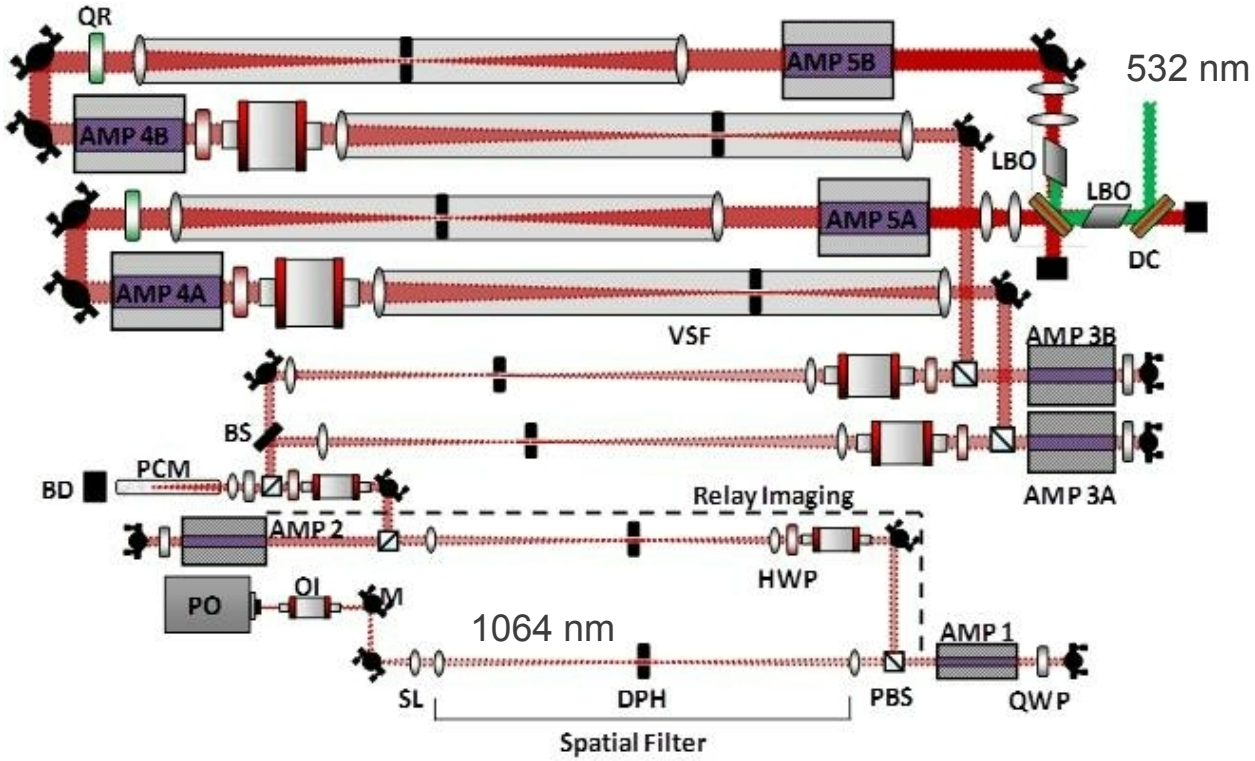
- Air Force Research Laboratory
- National Science Foundation
- Department of Energy



High-Energy Pulse Burst Laser System (HEPBLS)

Ohio State's ultra-high energy (and power) output pulse burst laser system

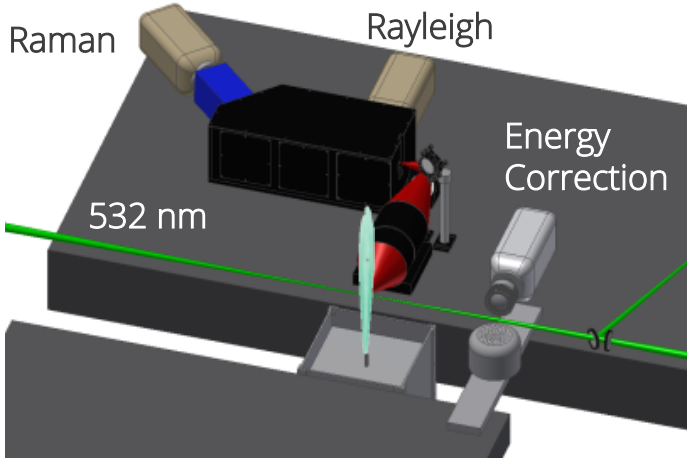


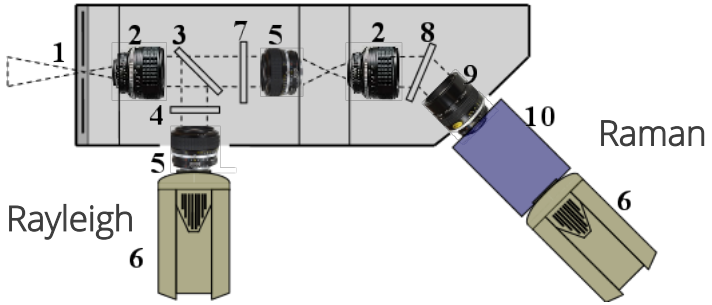


Output is > 2.0 J/pulse per leg at 1064 nm at 10 kHz
Output is > 1.0 J/pulse per leg at 532 nm at 10 kHz

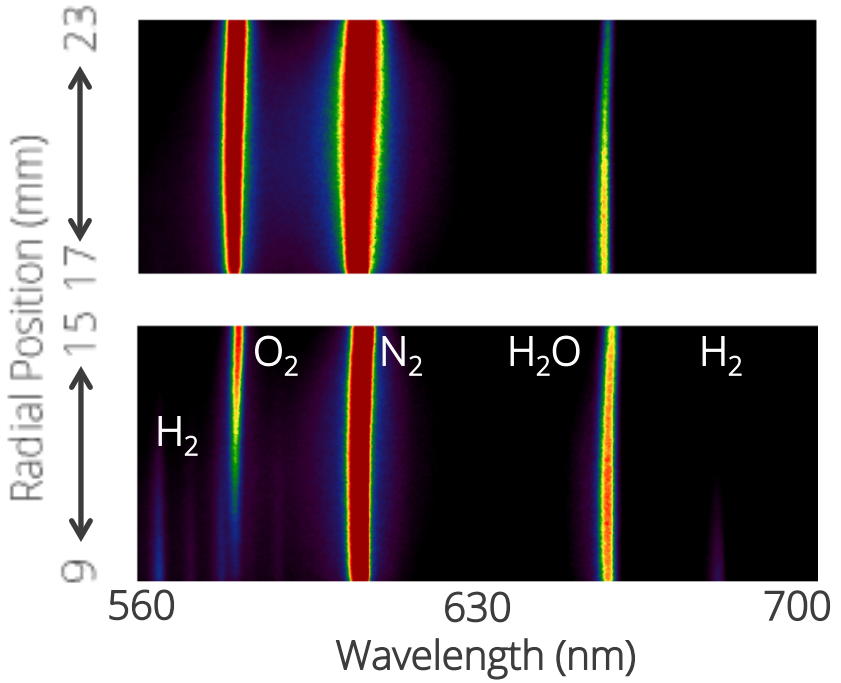
Work done at The Ohio State University Turbulence and Combustion Research Laboratory – Paid for by AFRL and NSF

High-Speed Raman/Rayleigh Setup





1 – adjustable slit	6 – V710 camera
2 – 85 mm f/1.4 lens	7 – 532-nm notch filter
3 – 550 nm LP filter	8 – VPH grating
4 – 532-nm BP filter	9 – 105 mm f/1.8 lens
5 - 50 mm f/1.2 lens	10 - HS-IRO intensifier



- HEPBLS output is coupled with custom imaging spectrometer
- 1:1 imaging on both Raman and Rayleigh cameras

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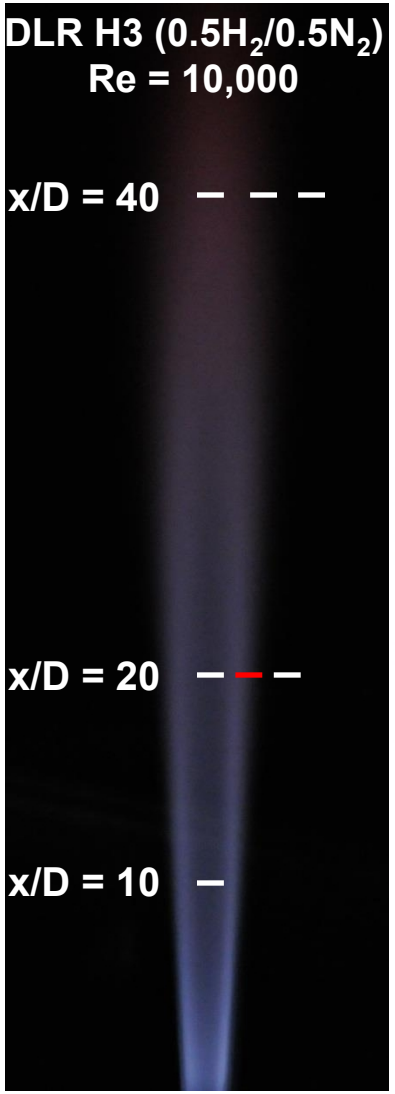
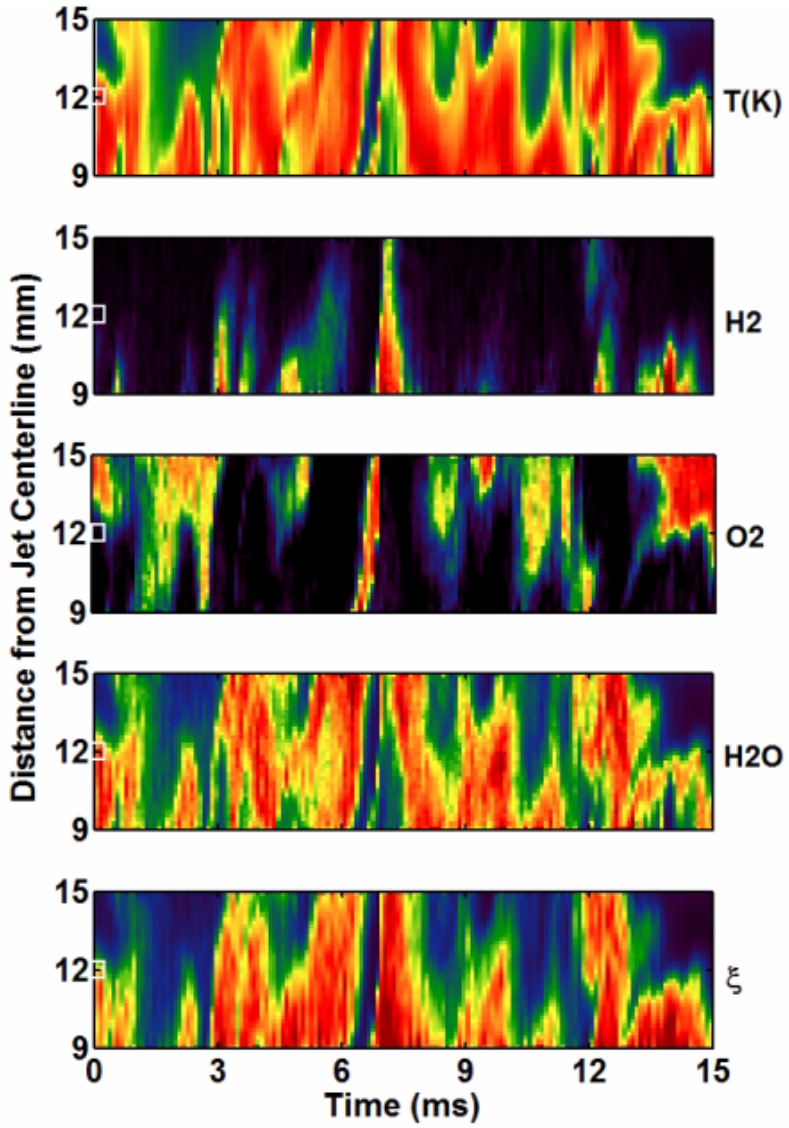
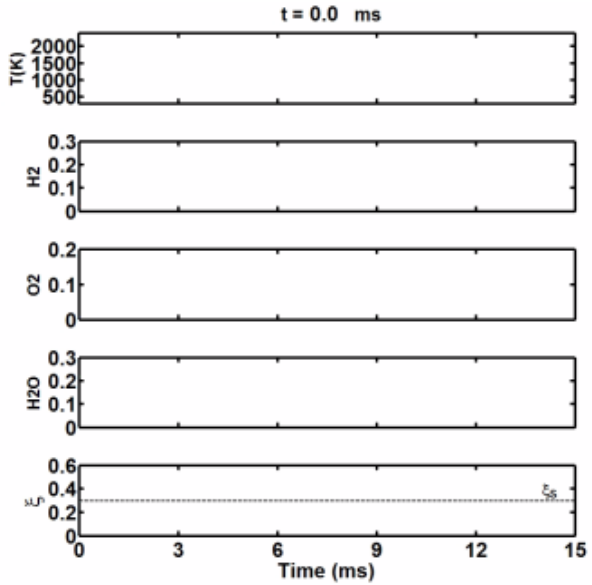
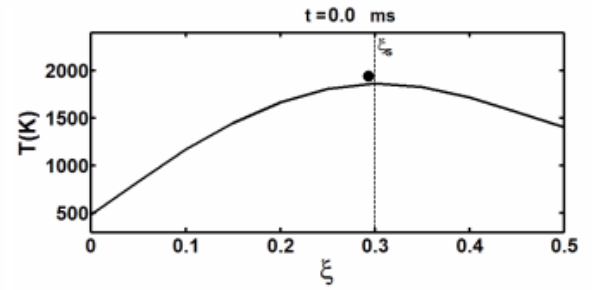
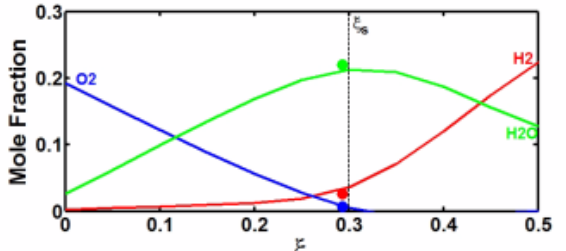
Scalar Time Traces











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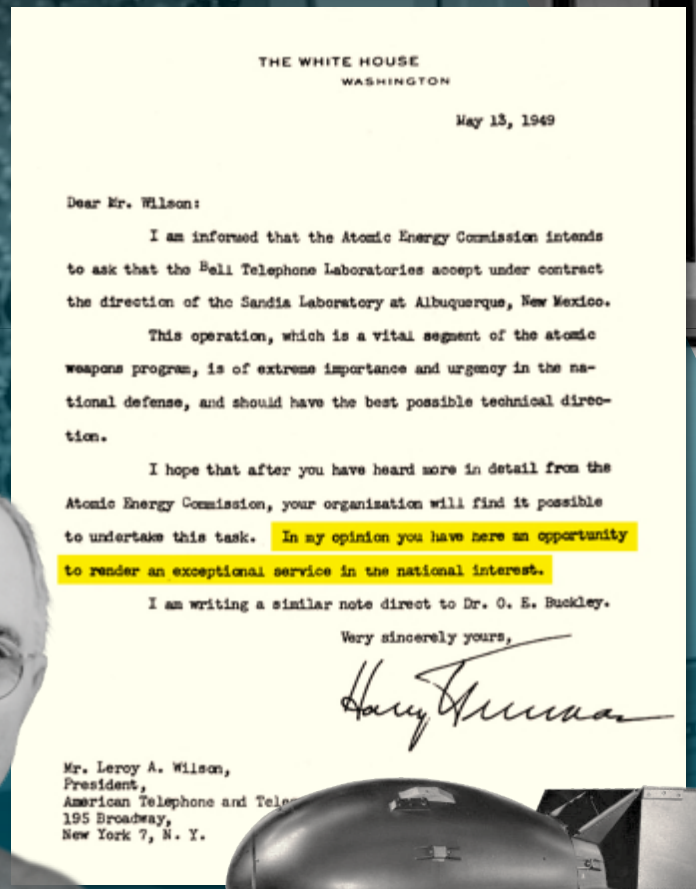
Sandia National Laboratories

SANDIA'S HISTORY IS TRACED TO THE MANHATTAN PROJECT



THE WHITE HOUSE
WASHINGTON

May 13, 1949

Dear Mr. Wilson:

I am informed that the Atomic Energy Commission intends to ask that the Bell Telephone Laboratories accept under contract the direction of the Sandia Laboratory at Albuquerque, New Mexico.

This operation, which is a vital segment of the atomic weapons program, is of extreme importance and urgency in the national defense, and should have the best possible technical direction.

I hope that after you have heard more in detail from the Atomic Energy Commission, your organization will find it possible to undertake this task. In my opinion you have here an opportunity to render an exceptional service in the national interest.

I am writing a similar note direct to Dr. O. E. Buckley.

Very sincerely yours,

Harry Truman

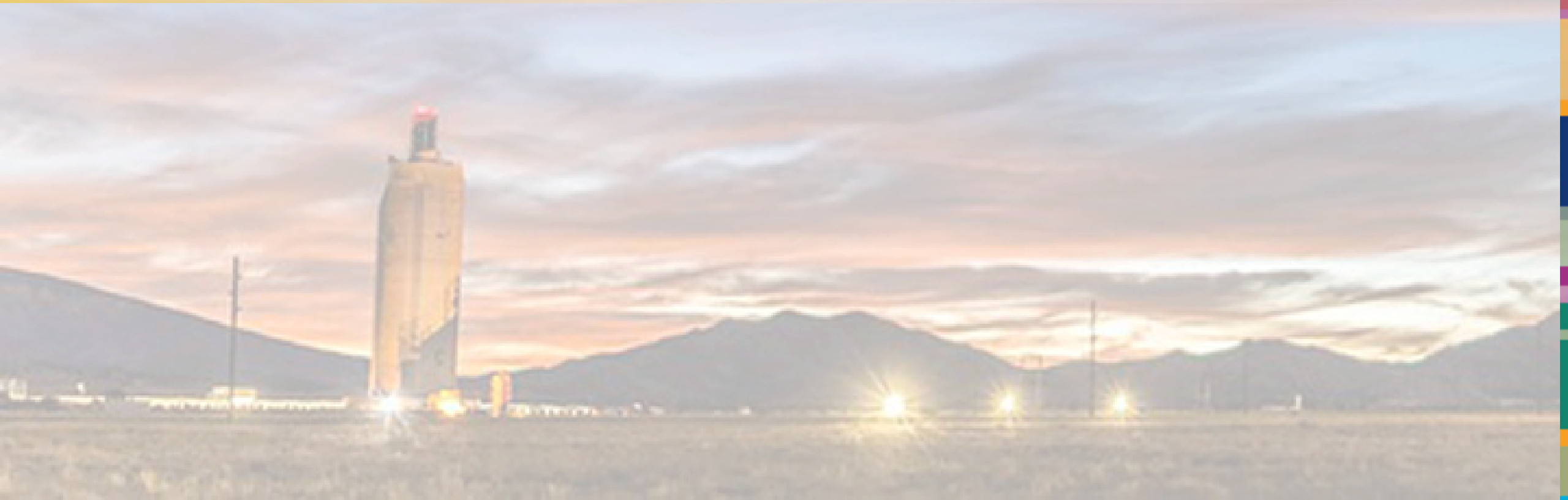
Mr. Leroy A. Wilson,
President,
American Telephone and Tele
195 Broadway,
New York 7, N. Y.

- July 1945: Los Alamos creates Z Division
- Nonnuclear component engineering
- November 1, 1949: Sandia Laboratory established
- AT&T: 1949–1993
- Martin Marietta: 1993–1995
- Lockheed Martin: 1995–2017
- Honeywell: 2017–present

Sandia - Today

As a multi-faceted national security laboratory, Sandia develops advanced technologies to ensure global peace.

At Sandia, you can become part of something more—and contribute to our quest to render exceptional service in the national interest.



Sandia's Impact

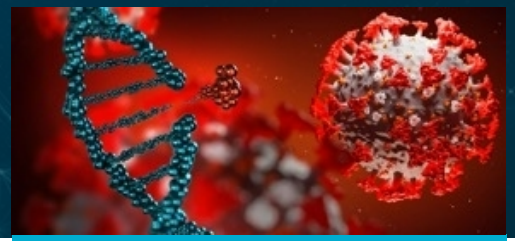
Sandia is often called upon to respond to high-profile events

Mars Perseverance rover

NASA's Perseverance rover landed safely on Mars after a seven-month journey through space. The event could only take place following a safe launch that had been vetted by Sandia scientists.
(Courtesy of NASA/JPL-Caltech)

Cleanroom invented 1963

As the birthplace of the modern cleanroom, Sandia helped revolutionize manufacturing in electronics and pharmaceuticals and advance space exploration. $50 billion worth of cleanrooms built worldwide.



COVID-19 Pandemic

Sandia researchers are using CRISPR based technology to genetically engineer a deployable antiviral countermeasure for COVID-19. Their goal is to create an antiviral that will be customizable to respond to many different viruses.
(Image by Loren Stacks)

Sustainable Energy

Sandia seeks to support the creation of a secure energy future for the US by using its capabilities to enable an uninterrupted and enduring supply of energy from domestic sources, and to assure the reliability and resiliency of the associated energy infrastructure.

Learn the 70 ways Sandia has impacted our nation

Postdoctoral Research - Propellants

National Security Mission

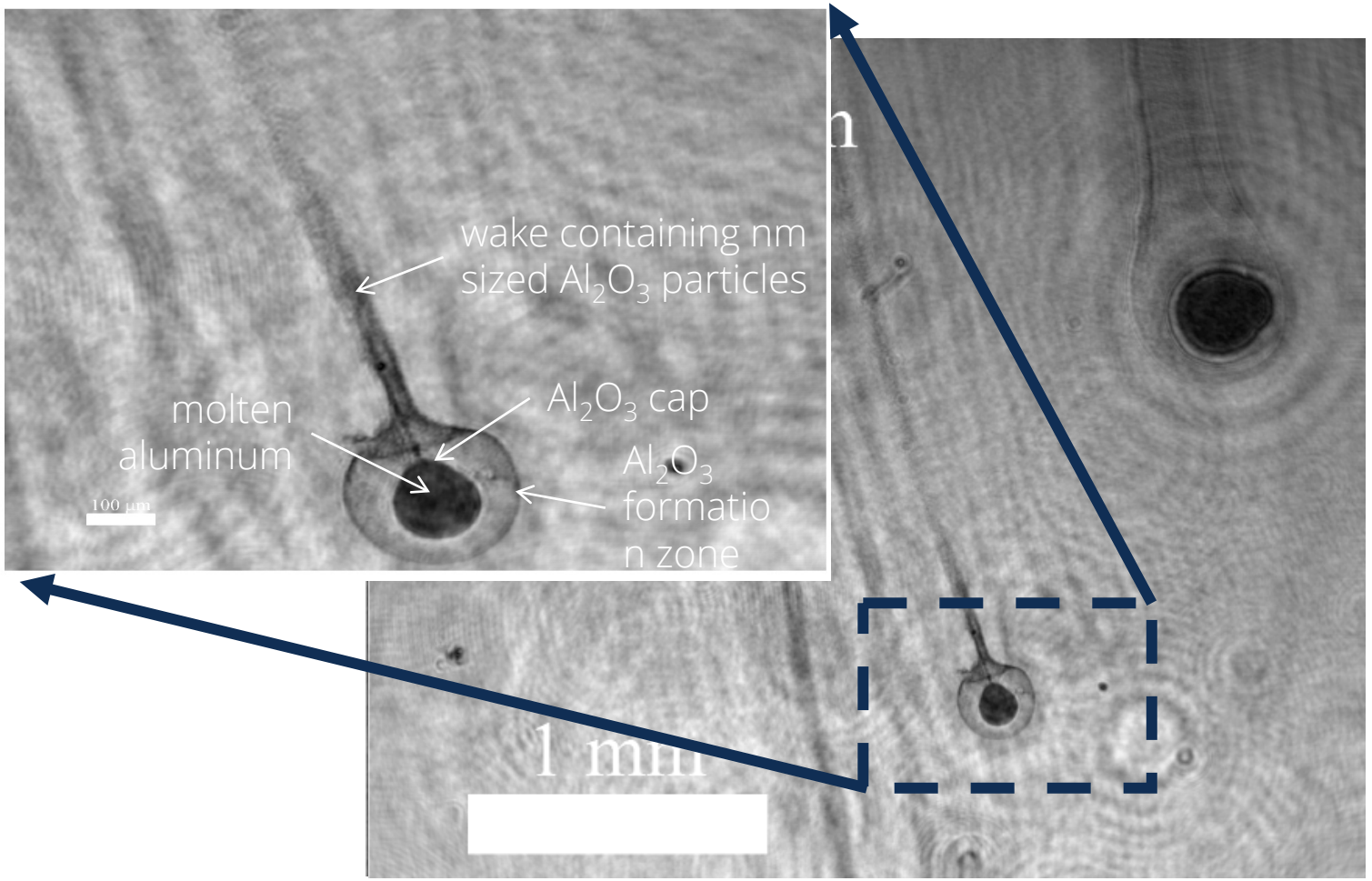
- DOE strategic systems safety
- DOD/NASA/Others

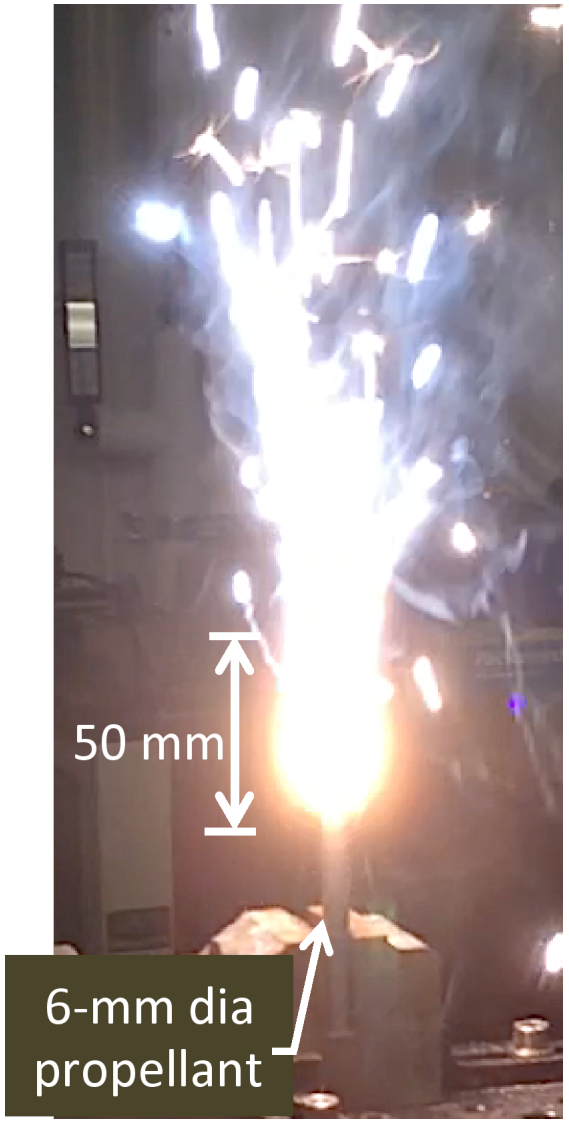
Challenging environments

- Large-scale
- Heat, blasts, particulates

http://www.cbsnews.com/news/rocket-crash-no-immediate-threat-to-station-but-cause-is-unknown/

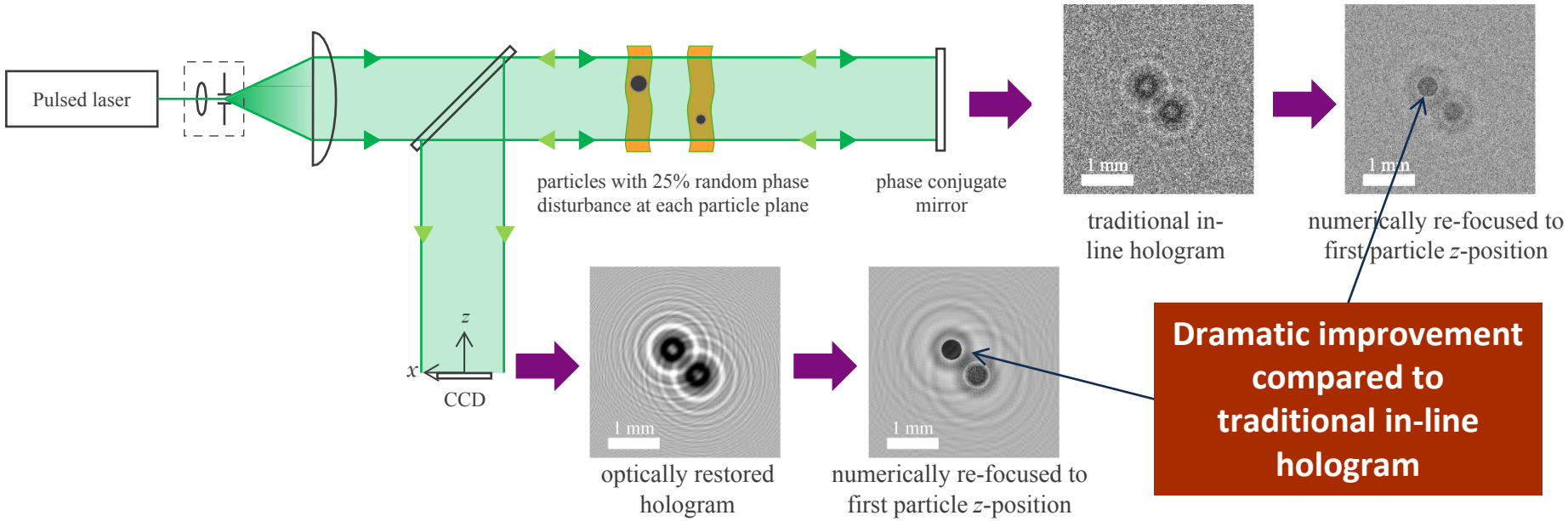
Aluminum drop combustion in propellants





Slide by D. Guildenbecher

Example Diagnostic – Phase-conjugate Digital Inline Holography (DIH)



Phase-conjugate mirror reflects the incoming wave with opposite phase

Non-linear optical effect achieved through passive means (stimulated Brillouin scattering) or active means (degenerate four-wave mixing)

After double passing, the phase disturbance is canceled

Slide by D. Guildenbecher

Staff Research – Full-Scale Testing Lead

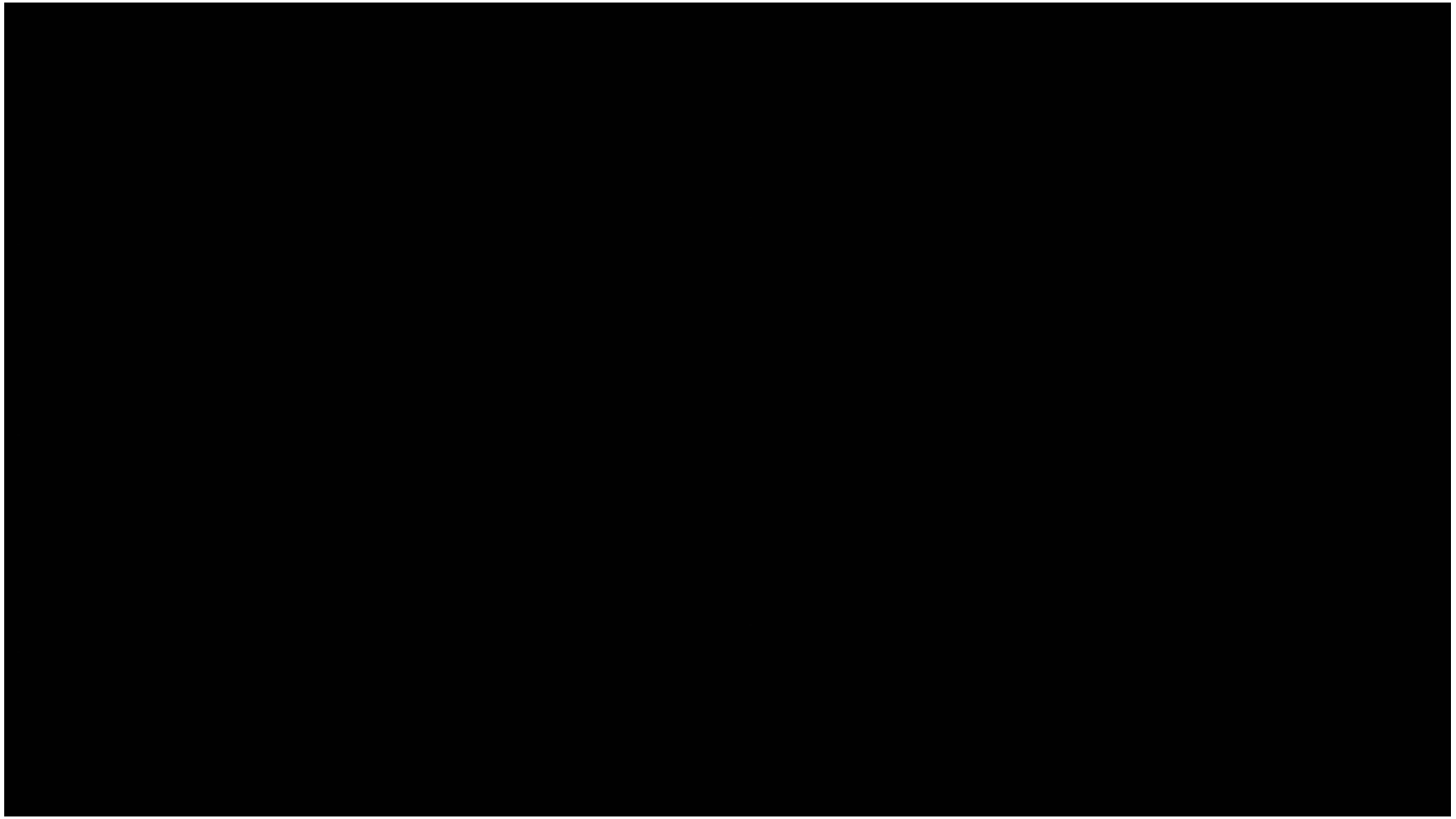
Validation and Qualification Sciences Experimental Complex

- Mechanical Environments (Shock, Vibration, Centrifuge)
- **Fire Science and Technology (Burn Site, Thermal Test Complex)**
- Energetic Environments (Test and Engineering leads for tests at ACF and RSF, Blast Tube)
- Experimental Operations (Aerial Cable Facility, Rocket Sled Track Facilities)
- Measurement Science and Engineering (Photometrics)
- Instrumentation and Explosive Science (Arming and Firing, Instrumentation)

Slide by J. Ferrizz

Test Video – Thermal Test Complex

Test Video – Thermal Test Complex

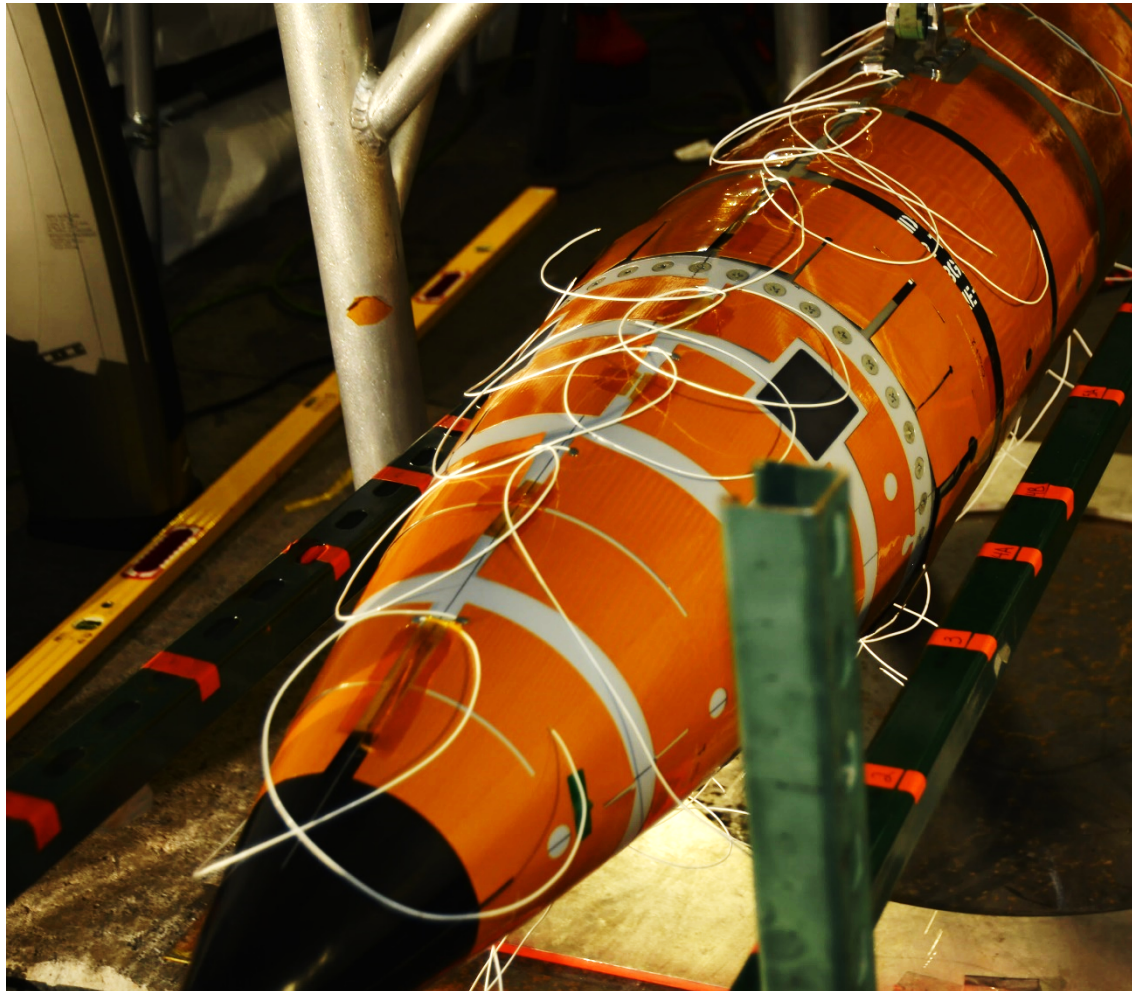


Experience as Test Director

Project lead on thermal tests
- Technical basis (ex: material properties)
- Components
- Qualification of JTAs
  - Lead B61-12 Normal Thermal Environments Test

Responsible for
- Project management
- Defining/negotiating test objectives
- Work planning and controls
- Test Execution

Communication with partners



Expanding Measurement Capabilities

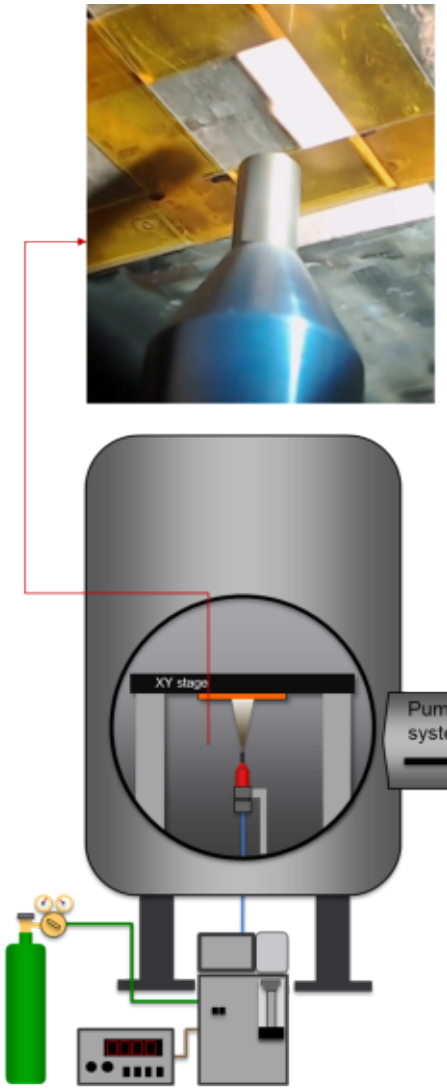
Built new laser diagnostic capabilities from ground-up
- Strategic planning
- Securing funding
- Coordinating technical activities among collaborators

Key Accomplishments
- ~$1 million dollars in year-to-year funding
- Two patent applications
  - One granted patent – so far
- FY2021 LDRD lead by Caroline Winters

Patent Applications

Aerosol Deposition of Thermographic Coatings

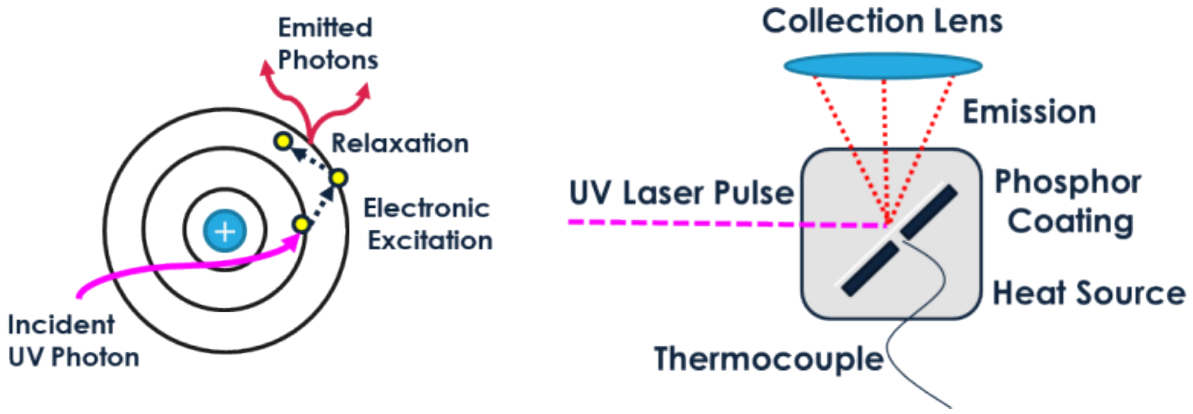
Temperature Dependent X-ray Fluorescence (Granted 2021)



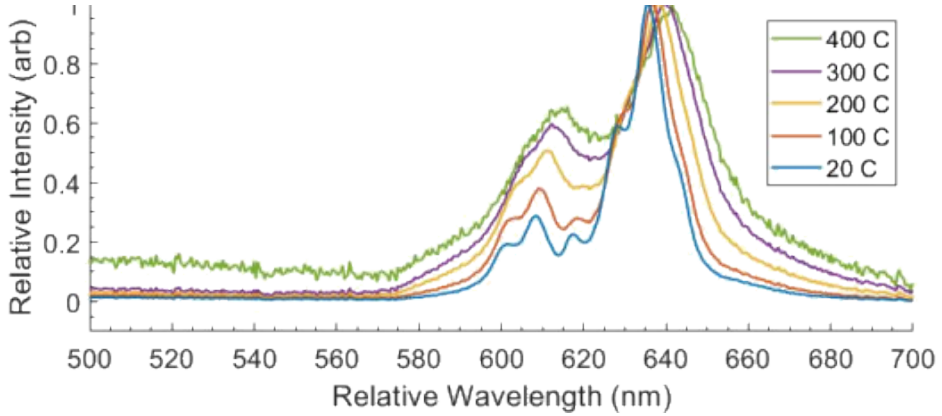
Example Diagnostic – Temperature Measurements Utilizing Phosphors

Phosphors are transition or rare earth elements doped into a ceramic material

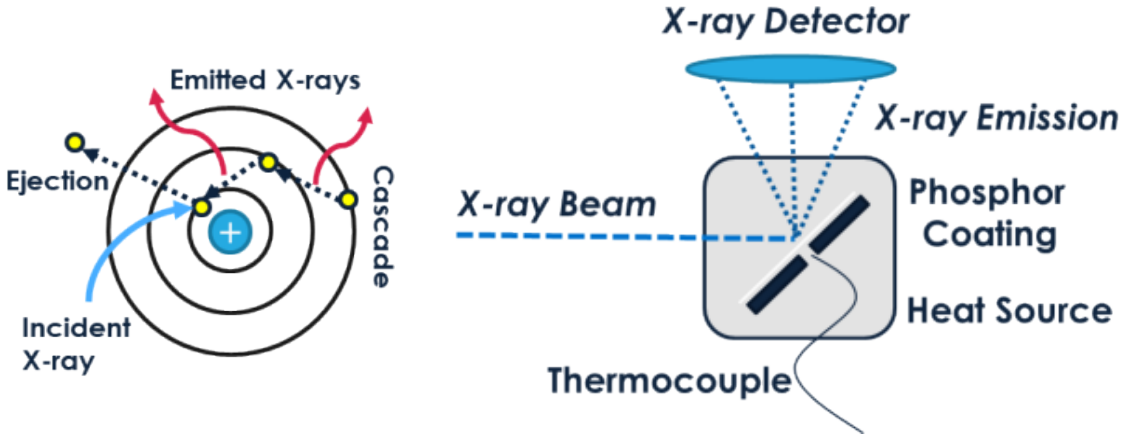
Optical Phosphor Thermometry



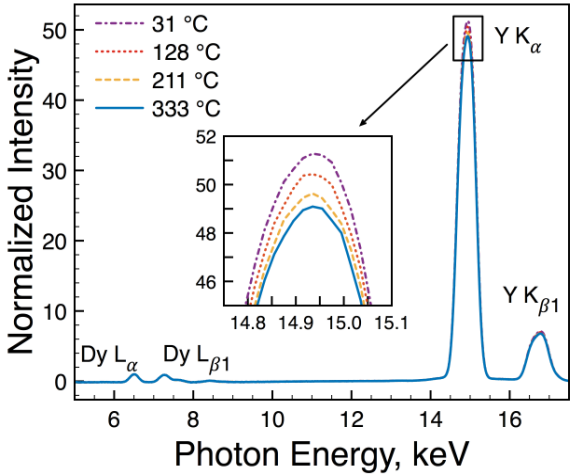
The spectral emission is temperature dependent



X-ray Phosphor Thermometry



X-ray emission demonstrated temperature dependence



Slide by C. Winters

Experience as Systems Engineer

Coordinate a Research and Development Portfolio

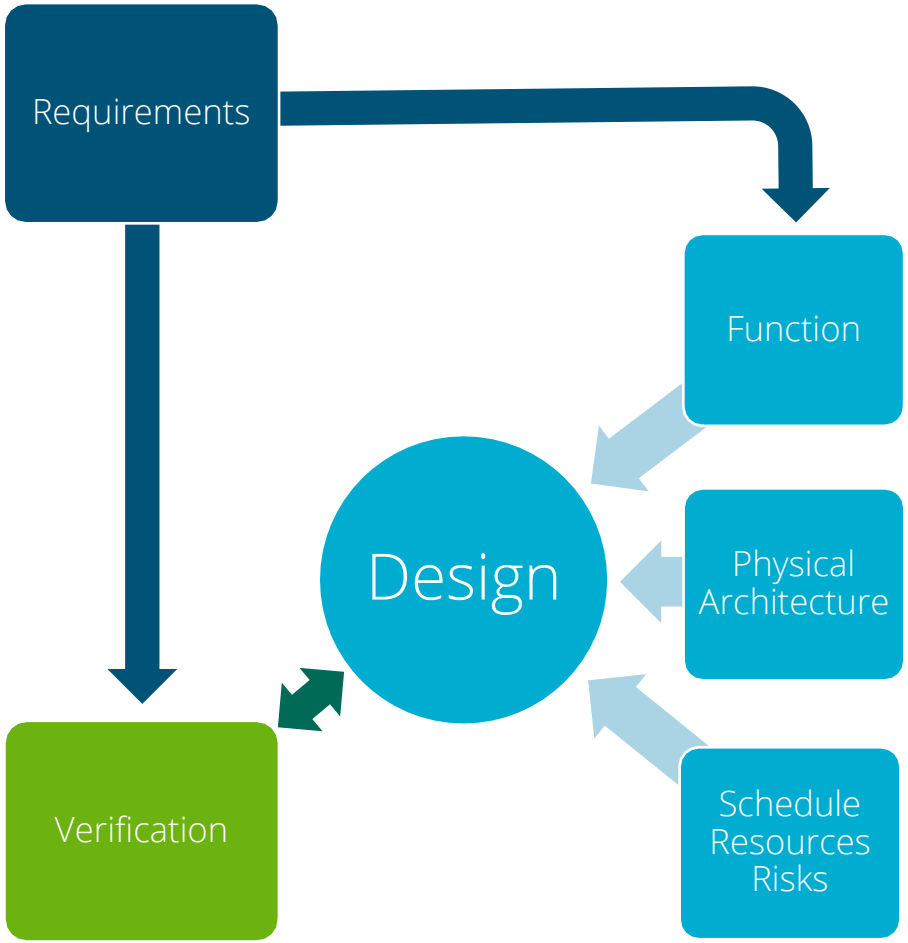
- Nuclear physics
- Plasma physics
- Additive manufacturing
- Materials science
- Electronics

Job includes:

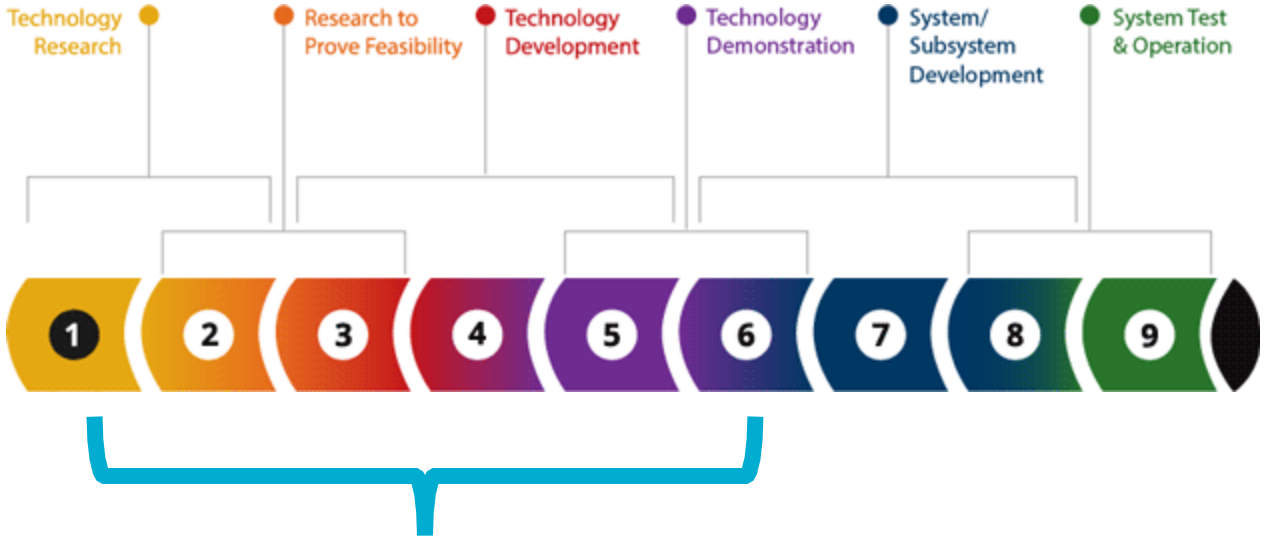
- Project management
- Technology maturation
- Communication with NNSA and foreign partners

What Is Systems Engineering?

Brings it all together



Technical Maturation



My role

- Going from ideas to working prototypes
- Making sure the solution meets the needs of the end users

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Thank you For Listening

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SAND2019-11784 PE

Advice

- Take classes you are interested in
- Get as much relevant experience as you can
- Go to professors' office hours
- Make friends