World’s fastest burst-mode X-ray camera hits the road

Sandia partners with startup to move highly sought tech from the lab to market

By Troy Rummler

Nuclear reactions are fast. Really fast. Faster than billionths of a second. Your best shot at catching one is with a high-speed X-ray camera that can only be obtained from Sandia. But these cameras could soon become more widely available.

Sandia has partnered with Albuquerque-based startup Advanced hCMOS Systems (pronounced “H C moss”) to commercialize ultrafast

New solar thermal tower key component of national energy goals

By Kelly Sullivan

Sandia hosted a Feb. 16 groundbreaking ceremony to begin the construction of a new solar tower at the National Solar Thermal Test Facility. The tower is part of the $25 million award announced by the DOE to include the building, testing and demonstration of a next-generation concentrating solar thermal power plant.

The project is part of DOE’s effort to develop concentrating solar power technology that may provide clean, utility-scale electricity. The knowledge gained through this research will help address the country’s climate goals of 100% carbon-pollution-free electricity by 2035 and net-zero emissions by 2050.

“Proof of this new CSP technology could be an important piece in how we advance climate security, both globally and
Three Sandia professionals recently received 2023 Black Engineer of the Year Awards. Danielle Stephenson was lauded as a Senior Technology Fellow, Coby Davis as a Science Spectrum Trailblazer and Ned Adams as a Modern-Day Technology Leader.

The recipients, all with advanced degrees or certificates, perform several roles at Sandia and with research and academic partners across the country, and have received numerous professional accolades.

In addition to their professional pursuits, each winner is active within their communities as STEM mentors and tutors for local underserved youth and hosts for local, regional and national STEM education and career events.

**Senior Technology Fellow winner Danielle Stephenson**

Danielle is a principal research and development engineer for the surety engineering organization based in Kansas City, Missouri. Over the past four years, Danielle has been the quality lead for...
a dynamic team of system surety engineers that supports cable qualification for multiple national security programs using engineering, tools and processes to prevent defects and reduce risk in all phases of product realization. She also serves as an instructor for the National Security Quality Training Program. Danielle is a mentor to other engineers and new hires at Sandia, and has been deeply involved in her community, participating in events that increase interest in STEM education and careers for students in grade school and at the university level.

Modern-Day Technology Leader Ned Adams

Ned is an information technology solutions architect in systems development. He designs information systems hardware, software, database, networking and security architectures across key Sandia centers, developing solutions to complex problems. Ned joined Sandia more than 40 years ago in the microwave metrology lab where he learned instrument control language. Ned is a strong supporter of diversity and inclusion initiatives at Sandia and is a role model for aspiring minorities in STEM.

“Sandia Labs is proud of this year’s BEYA winners, not only for outstanding impact in their respective fields, but also their unwavering commitment to energizing underserved youth about the excitement and opportunities in STEM careers,” Sandia Chief Diversity Officer Larry P. Thomas said.

The Black Engineer of the Year Awards is a program of the national Career Communications Group, an advocate for corporate diversity, and is part of its STEM achievement program. The awards annually recognize the nation’s best and brightest engineers, scientists and technology experts. This year’s conference was held Feb. 9-11, when the awards were announced.

Labs leader receives Women in Technology Award

STEM INFLUENCER — Susan Seestrom, associate laboratories director for Advanced Science and Technology, has received a Women in Technology Award from the New Mexico Technology Council. The annual recognition honors women in New Mexico’s STEM fields for their industry and community contributions. Award criteria include professional impact, volunteerism, mentorship and entrepreneurialism. The New Mexico Technology Council named Susan’s championing of diversity and inclusion at Sandia along with many more successes.

BEYA TECHNOLOGY LEADER — Black Engineer of the Year Awards Modern-Day Technology Leader Ned Adams is an information technology solutions architect in systems development.

Photo by Lonnie Anderson

Photo by Lonnie Anderson

BEYA TRAILBLAZER — Black Engineer of the Year Awards Science Spectrum Trailblazer Coby Davis is a mechanical engineer working in materials aging research and development.

Photo by Lonnie Anderson

Science Spectrum Trailblazer Coby Davis

Coby is a mechanical engineer working in materials aging research and development. Coby joined Sandia in 2002 as a product design engineer. Since, he has worked as a principal investigator in surveillance and electromechanical components. He also has served as a team lead in product realization and as a manager in materials reliability. Outside of his work, Coby strives to better the education of our communities’ youth, particularly the underprivileged. He has tutored hundreds of students one-on-one and in small classes, focusing on those who do not have the resources to attend college without help.
If you’ve searched online for a plane ticket recently, you may have noticed new information on display: the relative emissions of your flight. But what if this dropped to zero? An effort recently recognized by the secretary of energy is focused on just that — decarbonizing not just passenger flights, but the entire aviation sector.

**Sustainable aviation fuel**

In January, Secretary of Energy Jennifer Granholm announced the recipients of the Secretary’s Honor Awards for 2022. Anthe George, a senior manager in Applied Biosciences and Engineering, was named as one of the national lab contributors for the multiagency and multilab team which received a Secretary of Energy Achievement Award for their work on the Sustainable Aviation Fuel Grand Challenge.

According to the grand challenge’s website, it resulted from the DOE, the Department of Transportation, the Department of Agriculture and other federal government agencies collaborating on a comprehensive strategy to produce sustainable aviation fuels on a commercial scale. An announcement from the DOE Bioenergy Technologies Office congratulated the team and lists more than 43 contributors from government agencies and national laboratories.

The grand challenge and increased production of sustainable aviation fuels are integral to reducing emissions and meeting national and international goals for decarbonization.

“With our partners, Sandians are working hard to advance sustainable aviation fuels and other biofuels, research which is critical to promoting the bioeconomy and combating climate change,” Anthe said. “The SAF Grand Challenge road map describes six areas where we need to focus our energies for SAF to become a reality.”

**What’s up in the air?**

According to the Environmental Protection Agency, greenhouse gas emissions from aviation comprise about 8% of the country’s transportation emissions. Aviation is a sector that will be difficult to decarbonize because of the lack of viable alternatives to energy-dense liquid fuels.

Due to this, sustainable aviation fuel is being ambitiously pursued...
CLEANER TRAVELS — Sandia scientists along with researchers from several other agencies and labs are working on a comprehensive strategy to produce sustainable aviation fuels on a commercial scale as part of the Sustainable Aviation Fuel Grand Challenge.

Photo by Craig Fritz

to reduce global and national greenhouse gas emissions and meet the national goal of achieving net-zero emissions by 2050. Currently, the U.S. can produce approximately 4.5 million gallons of sustainable aviation fuel each year. The grand challenge team identified two goals to meet emission reduction targets: produce 3 billion gallons of sustainable aviation fuel per year by 2030 and 35 billion gallons per year by 2050. The effort’s road map provides a “flight plan” for sustainable aviation fuel to be produced on a commercial scale.

Climate security strategy

National laboratories have been contributing research capabilities to the science of biofuel and sustainable fuel production for decades. Recently, Lawrence Berkeley National Laboratory publicized promising research about a supercharged organism with the energy potential to become rocket fuel. Sandia supplied computer simulations to evaluate the product’s performance. Just last year, Sandia scientists published research that showed how cycloalkanes when used in jet fuel could reduce condensation trail formation and soot emissions compared to current fuels in use. Sandia’s work to develop biofuel components for sustainable aviation fuel and technologies to reduce climate-forcing aviation emissions also contributes to Labwide strategic efforts to advance climate security.

“I’m really inspired by the work I see every day from Sandia’s bioenergy teams,” said Sarah Allendorf, director for the Transportation & Industrial Processes Program. “Anthe’s invitation to contribute to the strategy that will guide the nation’s investments towards commercial-scale sustainable aviation fuels is a clear indication of Anthe’s and her team’s scientific leadership. It’s wonderful that Secretary Granholm has chosen to highlight this important transportation energy problem, and I’m delighted that she has included Anthe among the honorees of her Secretary of Energy Achievement Award.”

According to the formal announcement, the Secretary’s Honor Awards remain the DOE’s highest internal form of recognition for employees and contractors who “accomplished significant achievements on behalf of the Department of Energy.”

“I hope that our awardees derive as much enjoyment from their work as the pride we draw from their contributions,” Granholm said at the award’s event. “But I suspect that what ultimately motivates them is service to their country and the members of their community.”
imaging technology invented at the Labs and used extensively in fusion research. If successful, the collaboration could move the world more quickly to limitless clean energy by accelerating such research, while potentially impacting many other research and development areas.

“A perfect example is glass research,” said Liam Claus, cofounder of Advanced hCMOS Systems. “The Gorilla Glass that’s in your iPhone so it doesn’t shatter every time it slips out of your hand — there’s a ton of materials science that’s gone into that. They need to understand how it fractures, and glass fractures can propagate at extremely high speeds.”

Claus and his fellow co-founders Marcos Sanchez and Matthew Dayton say they plan to make the cameras available to new markets, including organizations developing other advanced materials, studying astrophysics or designing lasers, all of which could benefit from high-speed imaging, they said.

“Liam’s dream is to see one of these in every university physics lab,” Sanchez said.

Ongoing collaboration lays groundwork for redesigning cameras

Sandia issued its first commercial license for the ultrafast X-ray imager — the fastest multiframe digital X-ray camera in the world — to the company in July 2022. The following month, Sandia and the startup began a one-year collaboration to develop a road map for redesigning the sensors for new applications.

As part of the collaboration, Sandia is testing how well its sensors capture and amplify forms of light besides X-rays, such as visible light. The team evaluates images pixel by pixel for consistency.

“It’s a success so far,” said engineer Rex Kay, Sandia’s lead on the collaboration. “We’ve been testing our old devices in this new mode of operation and were able to demonstrate that they do actually exhibit gain in the right region that we’re looking for for this project.”

This ongoing project is funded by the TRGR Technology Readiness Initiative, formerly the Technology Readiness Gross Receipts Tax Credit program, a partnership between the state of New Mexico, Sandia and Los Alamos National Laboratory. The program helps New Mexico companies grow, strengthening the local economy, by funding projects that mature technology so it can be marketed.

Demand is high for Sandia camera tech

Sandia’s decision to commercialize the technology comes at a time when demand for the sensors is pushing labs’ limit to produce them.

Camera sensors built at Sandia’s Microsystems Engineering, Science and Applications Complex can be found at major research facilities such as the National Ignition Facility at Lawrence Livermore National Laboratory in California, which achieved fusion ignition in 2022, the OMEGA laser at the University of Rochester in New York and Sandia’s own Z Pulsed Power Facility.

“The demand for product is many dozens per year” in addition to service calls and requests for replacement parts, said Tony Colombo, Sandia’s manager over camera production.

To put that demand into context, each batch Sandia produces, usually consisting of around 20 sensors, takes six to nine months to process. Much of the time-intensive work takes place at a semiconductor fab in Sandia’s MESA complex, with some steps outsourced to private companies. It’s possible to start multiple batches throughout the year, but the time it takes to finish them depends on the availability of Sandia’s contracted manufacturers and machinery at the fab.

MESA’s primary purpose is to produce microelectronics for the U.S. nuclear stockpile, while serving as a research and development facility for a host of other projects.

After the sensors are completed, they are integrated into hardware, usually built by the customer, to turn them into functional cameras.

“If all the production and ordering parts could be taken over by a small company, Sandia as a federally funded research and development center would go back to its primary core competency, which is research and development of new, advanced, cutting-edge capabilities,” Tony said, which includes building variations of the cameras with new features and better performance.
Small startup has big plans for speedy sensors

Claus said his company will use licensed Sandia patents to create their own product line of ultra-high-speed cameras. “We offer technical engineering services, whether it’s consultation, whether it’s design or whether it’s manufacturing — for the existing users and existing technology that was developed and manufactured at Sandia,” he said.

Sanchez and Claus are both former Sandia employees. The pair were granted leave in 2021 to start Advanced hCMOS Systems through a program at the Labs called Entrepreneurial Separation for Technology Transfer. Through the program, employees are guaranteed reinstatement if they choose to return within two years. Dayton was formerly employed at Lawrence Livermore National Laboratory.

Sandia is mandated by the DOE to move its technology to the marketplace for the benefit of the U.S. economy. Given the Labs’ national security focus, government is the primary customer for many licensees, but Sandia technologies also find use in the industrial and consumer markets. Sandia issues licenses to companies ranging in size from startups to multinationals.

“That’s a win for the (DOE) complex overall because that technology then gets fed right back into the laboratory at a benefit, whether that be time, cost or quality,” Sanchez said.
National excellence award exalts Sandia Labs executive

American Indian Science and Engineering Society honors Chris O’Gorman

By Luke Frank

Sandia Labs mechanical engineer and senior executive Chris O’Gorman was recently awarded the 2022 American Indian Science and Engineering Society Executive Excellence Award.

As director of Research and Development Science and Engineering, Chris leads national security programs for nuclear stockpile systems, surveillance and numerous testing technologies. His experience ranges from experimental structural dynamics and mass properties measurements to software development for artificial neural networks and national security systems.

Chris leads a team of three senior managers, 19 managers, four team leads, and close to 400 technologists, scientists, and engineers at Sandia.

“This award is about my colleagues, family, community and Sandia Labs. I’ve learned so much about community and work through those around me over the years,” Chris said. “I’ve also greatly benefited from my affiliation with AISES as a student and a professional. I hope to share their wisdom with future generations of scientists and engineers, both inside and outside of AISES.”

Looking to the horizon

Chris is one of the first American Indian executives at Sandia. But his journey hasn’t been easy.

A proud member of the Winnebago Tribe, Chris spent his early years on a small family farm on the reservation in northeast Nebraska. From an early age, Chris pondered his course to adulthood looking to a future that could foster opportunity for himself, his family and his people.

“I encountered my share of hardships growing up but was able to keep my focus forward,” Chris said.

At the impressionable age of 15, he decided to attend school 400 miles away from his home and family. With encouragement from a high school counselor, Chris enrolled at St. Martin’s Academy, a school in South Dakota that provided an opportunity to live with host families. There, he remembered the words of Chief Little Priest, the last warrior of the Winnebago, “Be strong and educate my children.” He also remembered his grandmother’s encouragement that education was key in overcoming struggles.

St. Martin’s was a significant cultural shift for Chris, and he missed his family and community deeply. “I wanted to quit and move back to Winnebago on many occasions,” he said. Chris worked hard focusing on math and science using the answers in the back of books as a form of self-teaching. With his family’s support, he prevailed, graduated from the academy, moved to Albuquerque and enrolled in the University of New Mexico’s School of Engineering.

Finding AISES

Looking for familiar faces and a path forward, Chris joined the college’s Native American program and the American Indian Science and Engineering Society. “I found a much-needed support system in these organizations,” Chris said. “They understood me. They experienced similar cultural and academic challenges and shared their ideas about how to draw on strengths and overcome obstacles unique to American Indians.”

College engineering courses did not come easily for Chris, and he fought his way through, studying long hours every chance he got. Having developed his work ethic on the family farm, he refined it in high school and applied it to his college studies. He was beginning to realize that perseverance was probably more important than being gifted.

In 1994, Chris earned his bachelor’s degree in mechanical engineering. He was on his way to graduate school and was accepted to multiple nationally recognized engineering programs. At the same time, he was hired at Sandia as a technical staff member and seized an opportunity to continue his education through Sandia’s One-Year-On-Campus program. He attended Stanford University and earned his master’s degree in mechanical engineering.

Building professional bridges

Having spent a good deal of his academic and professional career trying to overcome a sense of living in “two worlds,” Chris became more active with AISES and Sandia’s American Indian Outreach Committee, or AIOC. “The culture I grew up in on the reservation is very different from the corporate world,” he said. “I saw these two organizations as a means to bridge these differences.”

Chris joined AIOC in 1995. He spent a year as an executive on loan from Sandia
to AISES and managed more than 160 university and college chapters working with government and industry partners to set up scholarships, internships and employment opportunities for AISES students.

Chris served as the AIOC in-reach chair from 2001-2005 and contributed to many outreach activities, including elementary and high school science fairs, while leading a professional chapter and fostering university partnerships and corporate engagement with student chapters. He also has participated in the AIOC-hosted Dream Catcher science program, which educates native youth in STEM disciplines.

At the same time, Chris judged AISES National Conference science fairs and helped lead local planning committees. He has served in leadership roles, as president of the AISES New Mexico Professional Chapter from 1999-2002 and treasurer from 2003-2004. He served a four-year term on the AISES board from 2000-2004. Through a Sandia-sponsored program, Chris also has served as a physics instructor at Southwestern Indian Polytechnic Institute in Albuquerque.

Building personal bridges

Closer to his roots, Chris and his family participate in powwows and homecoming celebrations every year, while spending time with family and friends in Winnebago, Nebraska.

Chris has been a guest speaker on tribal initiatives on the digital divide and participated in discussions regarding tribal alternative energies. He continues to help and support American Indian students in their journey through high school and college while promoting STEM careers.

“There’s so much to learn and teach one another about living, learning and working together for the benefit of everyone,” Chris said. “It’s about the connectivity we can create within ourselves and one another along the way. I want to help people make those connections.”

Solar thermal tower

CONTINUED FROM PAGE 1

locally,” Associate Laboratories Director Andy McIlroy said.

Current concentrating solar power technology uses mirrors to gather the sun’s rays and heat molten salt, reaching a maximum of 1,049 degrees Fahrenheit (565 degrees Celsius). Based on research findings from emerging technologies, DOE chose Sandia to develop a technology using the existing thermal test facility’s field of heliostats to concentrate sunlight toward a particle receiver that will heat a curtain of flowing sandlike particles.

The proposed multimegawatt Generation 3 Particle Pilot Plant system will enable at least six hours of particle-based energy storage and will heat a supercritical carbon dioxide working fluid to temperatures of 700 degrees Celsius (1,292 degrees Fahrenheit) or higher. The pilot plant will be operated for more than 1,000 hours to demonstrate its ability to meet cost and performance goals.

The pilot plant will also serve as a centralized test facility with an adaptable modular system design for exploring the full potential of particle-based thermal technologies. These technologies include power production, energy storage and grid stability, industrial process heat, green solar fuels and hydrogen production, and desalination.

“Sandia has been a leader in concentrating solar technology research since the 1980s. We are excited to partner with the Department of Energy and drive innovation and advancement in the next generation of particle-based concentrating solar with this Gen 3 Particle Pilot Plant,” said Margaret Gordon, manager of Sandia’s National Solar Thermal Test Facility and Concentrating Solar Program.

The groundbreaking ceremony included representatives from DOE’s Office of Energy Efficiency and Renewable Energy, New Mexico’s congressional delegation, Bridgers & Paxton Consulting Engineers Inc., Summit Construction and the NNSA.

“Next-generation CSP has the potential to be a game changer,” said Alejandro Moreno, acting assistant secretary for energy efficiency and renewable energy. “This pilot facility will demonstrate how CSP systems can meet the challenges of providing long-duration energy storage while reducing costs and complexity for solar thermal technology.”
Sandia Fellow Theodore Kim: A steady hand

By Neal Singer

Sandia Fellow Ted Kim is chief engineer for Sandia’s Hypersonics Advanced Targets program. Working across Sandia technical centers, involving hundreds of engineers and the latest technologies, his steady guidance has directed the technical team from concept through development and on to product realization of hypersonic systems expected to be used as computing platforms in selected programs.

He led adaptation of Sandia’s previous ground-launch architecture into an air-launched vehicle — the first time a hypersonic vehicle of this class demonstrated that capability.

Ted advises high-ranking government and military officials on technical issues involving navigation, guidance and control on hypersonics and satellite systems, and helps set the direction of this technological research at the national level.

Though his achievements are many, he deflects all praise toward the engineers he works with daily.

“I have been fortunate to work with hundreds of talented people in the 28 years that I have been at Sandia,” he said. “Some common traits of these folks are that they care deeply about the Sandia mission and work hard to apply their many talents towards delivering timely solutions for customers.”

Challenges appear constantly, he said, some beyond the bounds of the directly technical. “One of the most critical challenges that I think we face today,” he said, “revolves around attracting and retaining critical people to work at Sandia, especially as the world changes.”

Two Sandians whom he particularly admired and learned from were Al Watts and Kurt Lanes, both long retired, who “used their phenomenal technical abilities to develop cross-discipline engineering solutions to really difficult problems as they led large teams of people,” Ted said.

His colleagues describe Ted as “open, honest, trustworthy, proactive, engaged, approachable, technically competent” and “an excellent partner who works seamlessly across organizational boundaries.”

He had an early affinity with mechanical things. From his earliest years, “I do remember always being interested in how things work. This evolved through the years to me taking apart — and sometimes fixing — things like toasters, then bicycles, then cars, etc. So it seemed natural for me to pursue engineering.”

And so he did. He was a President’s Endowed Scholar for his Bachelor of Science in aerospace engineering at Texas A&M University, achieved in 1989. In 1994 — the same year he came to work at Sandia — he received a doctorate in aerospace engineering from the University of Texas at Austin, where he was an Office of Naval Research Fellow and a graduate fellow.

As for his promotion to Sandia Fellow, Ted said, “I am very honored to have this opportunity to serve in this role, especially given the wide range of phenomenal talent at Sandia. I would hope that I can leverage my existing relationships with staff and management to help continue tighter integration of activities across the Labs, perhaps including easier exchanges of information.”

Given Ted’s accomplishments to date, it would be foolish to bet against his success.

Sandia Fellows program adds five

Labs Director James Peery recently announced five new Sandia Fellows. For the first time in Labs history, the fellows program has expanded beyond research and development positions to include all professions that are required to meet Sandia’s mission.

“This is a rare and highly selective honor that recognizes pioneers with the highest accomplishments among their peers,” James wrote in his announcement. “A promotion to this level allows each fellow to focus on advancing the frontiers of their fields and enhancing Sandia’s reputation.”

Cynthia Phillips, Tina Nenoff, Ted Kim, Elizabeth Roll and Amber Romero joined the Sandia Fellows this year. Lab News will profile each fellow.
Inspiring students in West Texas

By Katrina Wagner

Last month, Pantex Women in Nuclear hosted Introduce a Girl to Engineering, an event geared toward inspiring girls to pursue careers in STEM. Sandia employees from the Weapons Evaluation Test Laboratory and Tri-Labs, both located at the Pantex Plant outside Amarillo, Texas, participated in the event where students did hands-on activities and had career conversations with STEM professionals.

Infrared Encounter — Students explored different temperatures of objects using infrared cameras at exploration stations during the Introduce a Girl to Engineering event in Amarillo, Texas.  

Photo courtesy of the Pantex Plant

Meet an Engineer — Engineers Kimberly Tabor, Katie Printz, Jessica Kohler and Victoria Miles represented Sandia at the Introduce a Girl to Engineering event that drew 500 girls in grades six-12 to learn about careers in STEM.  

Photo courtesy of the Pantex Plant

Women's History Month

For more information and Teams links to these events, visit the event page on the Sandia Women’s Action Network site.

Women in Research: Susan Esfahani  
Thursday, March 9, 10-11 a.m. MT

The Women in Research series seeks to encourage the professional development of women on the technical ladder, where women are still underrepresented. The format includes mentoring talks from successful women researchers with time for questions and answers and open discussion. The Sandia Women’s Action Network hopes to support the careers of women in research as they seek advancement. This session is open to all staff interested in technical advancement.

Senior scientist and engineer Susan Esfahani will discuss her career path and share success stories. Contact Sharlotte Kramer or Rekha Rao with questions.

Women's Leadership Panel  
Tuesday, March 14, 11:30 a.m.–12:30 p.m. MT

What happens when women’s stories aren’t being told by women? What positive impacts have been experienced because stories were shared? Join the Sandia Women’s Action Network for a panel discussion of these questions and more with Chief of Staff Lindsay Klennert, Business Management Director Delfinia Salazar and Associate Labs Director Susan Seestrom.

50 Ways to Fight Bias  
Wednesday, March 22, 11 a.m.–12 p.m. MT

Join the Sandia Women’s Action Network and Sandia Women’s Connection as they virtually host a “50 Ways to Fight Bias” workshop. Come ready to learn about bias that happens in the workplace and concrete ways to help stop it. There will be facilitated discussions using the “Lean In” card decks.

No Woman Left Behind: Bridging the Gap  
Thursday, March 30, 10-11 a.m. MT

For the final Women’s History Month event, join the Sandia Women’s Action Network and the Sandia Women’s Connection for a special event hosted by the Women’s Interlaboratory Network, a group from national labs across the DOE complex. In a world where professional women have faced different career challenges than their colleagues, labs leaders will facilitate discussion of ways to ensure that no women are left behind. This event will feature panelists from four national labs and highlight experiences navigating career breaks, caretaking and more.