TUNL

TRIANGLE UNIVERSITIES NUCLEAR LABORATORY

2023 Newsletter Fall Edition

Editor: Alex Crowell

From the TUNL Director by Robert Janssens

Welcome to the third TUNL Newsletter! The newsletter is the brainchild of the TUNL Climate Committee and it is meant to keep our entire TUNL community informed about major developments affecting our laboratory.

As of this writing, two major activities involving many TUNL members have just been concluded. As you are all aware, a new NSAC Long Range Plan (LRP) for nuclear science has been produced. Many members of the TUNL community have played important roles in the process such as helping organize and actively participate in Town Hall meetings and prepare white papers making the case for our science. Three members of TUNL were part of the committee in charge of writing the LRP. TUNL's activities are well aligned with the frontier areas mapped out in the LRP. For example:

LRP Recommendation #1 calls for: *Support of theoretical and experimental research across the country, thereby expanding discovery potential, technological innovation, and workforce development to the benefit of society.* Researchers at TUNL are leading efforts in the fields of Nuclear Structure and Nuclear Astrophysics, Hadron Structure, Phases of Quark-Gluon Plasma, Fundamental Symmetries, Neutrino Physics, and Nuclear Data. In addition, TUNL is the forefront training ground for workforce development by producing nearly 10% of the US Ph.Ds. in experimental nuclear physics.

LRP Recommendation #2: "*As the highest priority for new experiment construction, we recommend that the United States lead an international consortium that will undertake a neutrinoless double beta decay (0νββ) campaign."* TUNL researchers have key leadership roles in the 0νββ ^{76}Ge-based LEGEND collaboration that is operating LEGEND-200 and planning for the ton-scale LEGEND-1000 experiment.

LRP Recommendation #3: *"…the expeditious completion of the EIC as the highest priority for facility construction."* Faculty at the consortium universities have vested programs at EIC to study the mass and spin of the proton, the spatial and momentum distributions of low-x partons, possible gluon saturation, and hadron formation.

LRP Recommendation #4: *"… capitalizing on the unique ways in which nuclear physics can advance discovery science and applications for society by investing in additional projects and new strategic opportunities."* TUNL is a center where discovery and the science of tomorrow are at the forefront, including the next generation detector and accelerator R&D. We are also a trusted custodian of the nuclear data project and are embarking on new initiatives such machine learning and high-performance computing.

Over the last few months, TUNL has also prepared the proposal for the renewal of its major research grant. As evident from the considerations above, TUNL research fits well within the recommendations of the 2023 LRP. The proposal was submitted by the consortium institutions by November 15. All areas of the program utilize TUNL's research infrastructure, which includes engineering, technical, and administrative support; research facilities; and major equipment. One of TUNL's strengths, as a Center of Excellence, is the ability to coordinate the efforts by the research teams and to prioritize the use of common technical resources.

The next phase in this renewal process is a site visit by an ad-hoc review panel set up by DOE's Office of Nuclear Physics. This review will take place on January 17 - 19, 2024. We have a strong case to make with many new initiatives such as the start of LENA-2, the ongoing upgrade of the injectors for the Tandem, the plan to boost available

(continued on p.2)

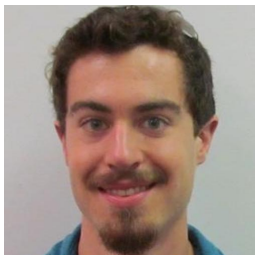
From the TUNL Director (cont. from p.1)

beam hours at HIγS to 3000 and to increase photon energies to 150 MeV. In addition, the LEGEND collaboration is taking data at Gran Sasso while working on the next phases of the project. Other initiatives in the area of fundamental symmetries have made much progress as well, although TUNL's efforts toward the measurements of the neutron EDM will need to be redefined. While all these activities are important for TUNL's future, one can never lose sight of the fact that recent successes and accomplishments are due to the dedication and the many contributions by everyone, from students to postdocs, and from technical and administrative staff to scientists and faculty. Because of everyone's efforts, we can look forward with optimism to the upcoming review and the challenges ahead.

Graduate Student Achievements

- **William Fox** (NCSU, advisor Richard Longland) defended his dissertation entitled "Investigating Nucleosynthesis in Massive AGB Stars with Transfer Reactions." Will is looking at a variety of job possibilities.
- **Keith Mann** (NCSU, advisor Matt Green) successfully defended his dissertation, "Measuring the Coherent Elastic Neutrino-Neutron Scattering Cross Section in Germanium" and is currently searching for a job.
- **Matt Morano** (NCSU, advisor Paul Huffman) defended his dissertation entitled "Development of Electronics and Simulations for the nEDM@SNS Experiment." Matt will soon begin a postdoctoral position at Cal Tech.
- **Morgan Clark** (UNC, advisor John Wilkerson) successfully defended her PhD thesis, "Development of a Characterization Facility and Analysis Process for LEGEND-200 HPGe Detectors." Morgan has a postdoctoral position at NRL lined up.
- **David Hervas Aguilar** (UNC, advisor John Wilkerson) defended his thesis entitled "Characterizing Bulk Signals in an Inverted Coaxial Point-Contact Detector to Inform Rare Event Searches." David will soon start a postdoc at the Technical University of Munich.
- **Anna Reine** (UNC, advisor John Wilkerson) defended her research thesis, "An Improved Background Model and Two-Neutrino Double-Beta Decay Measurement for the MAJORANA DEMONSTRATOR." Anna will begin a postdoctoral position at Indiana University this spring.
- **Christopher Haufe** (UNC, advisor John Wilkerson) defended his dissertation entitled "A Study of MAJORANA DEMONSTRATOR Backgrounds with Bayesian Statistical Modeling." Chris is currently looking for positions in industry.


William Fox


Keith Mann


Matt Morano


Morgan Clark

David Hervas Aguilar


Christopher Haufe


Anna Reine

Grad Students and Post-Docs Organize for Friday Fun

by David Gribble, UNC

This semester, graduate students and post-doctoral researchers at the lab have begun a new initiative to provide an opportunity for regular socialization and community-building. Graduate students and post-docs are now holding semi-weekly "happy hour" socials. Our goal is to provide students from different universities and from different labs with an opportunity to socialize with each other, in a low-stakes environment, and in a way that doesn't require significant additional commitment to attend. It can get quite lonely at the lab sometimes, especially when you're away from your home institution every day, or for the Duke students, when you're siloed off from the rest of the Duke Physics building — to this end, it's really important for us to build connections with other students at the lab and create some sense of community here. But at the same time, it can also be exhausting as a graduate student to add yet another thing to your plate when you're already so busy, or may already have evening plans. To balance these two needs, we've started doing a happy hour every other Friday, in the early evening right after 5, so that people can still get to any other plans they have for the evening, or not get home too late to relax, and for which people can drop into at any time. We alternate between going to a different interesting pub around Durham, within short driving distance from the lab, and going to one of the bars on the Duke campus, so that our grad students and post-docs who are at the lab can just walk over from their desk with minimal effort.

A valuable part of these socials has been generous funding support from the lab to buy appetizers and small plates for attendees. The lure of free food encourages more people to come, and it also makes the environment not strictly a drinking one, making it more comfortable for all. We're able to proudly say that every one of these events has included representation from three of our four member institutions at TUNL, and the attendees include both graduate students and post-docs.

A photo from one of the recent TUNL grad student/post-doc happy hour events. From left to right: Kaxin Song (NCSU), Ethan Mancil (Duke), Billy McRay (NCSU), Antonella Saracino (UNC), Thanassis Psaltis (NCSU), and David Gribble (UNC).

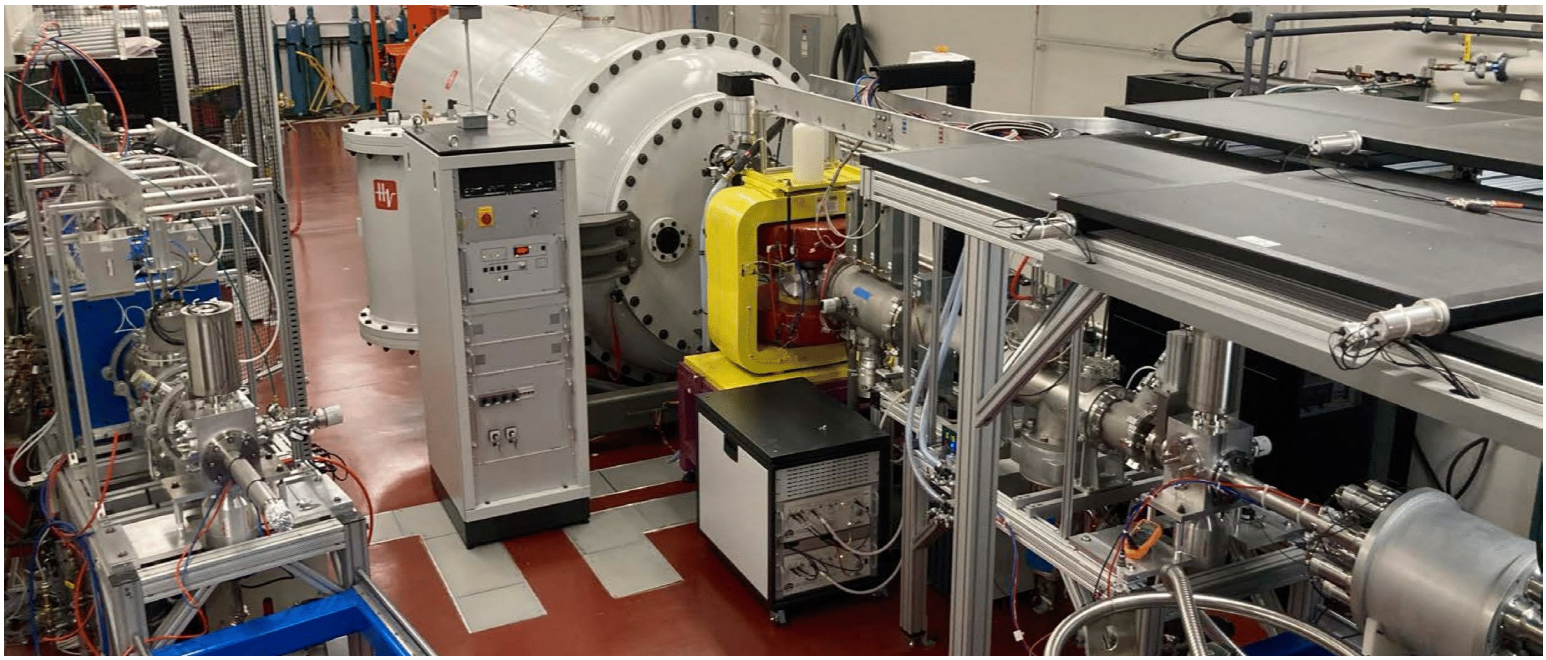
"I really love the happy hours!" says UNC graduate student, Samantha Johnson. "I've met people there from other TUNL universities that I wouldn't have had the opportunity to talk to otherwise. I also heard the lab might have a TUNL prom/formal next semester? I want to go to that!"

Students and post-docs with ideas for additional types of social events they would like to see are encouraged to send an email to David Gribble at gribbled@live.unc.edu.

Accelerator Updates

LENA II Upgrade: by Art Champagne (UNC)

TUNL's upgraded Laboratory for Experimental Nuclear Astrophysics (LENA) is nearing completion. LENA features two unique accelerators: a 230-kV, high current ECR source and a 2-MV Singletron accelerator, built to our specifications by High Voltage Engineering. The Singletron is the first of its kind, combining high beam currents (2 mA for H and He) with fast pulsing (~2 ns pulse widths with frequencies up to 4 MHz). Pulsed beams will be used to suppress cosmic-ray and environmental backgrounds and will also allow for time-of-flight measurements. The Singletron (below) has recently passed its commissioning tests, exceeding its specifications for H beams and meeting those for He beams. It promises to greatly extend the reach of measurements at LENA when regular operations commence in early 2024.



The LENA upgrade: The ECR beam transport and target station are on the left and the new Singletron and its beam transport are in the center/left, extending to the right. On the right-hand side is the Singletron target area. The black panels are a cosmic -ray veto system and gamma-ray detectors are below.

FN Tandem Accelerator by Chris Westerfeldt (Duke)

The tandem accelerator continues to be heavily utilized, having operated 7800 hours since its last maintenance in July of 2021 until the recent one of October 2023.

Preventive maintenance was performed at the end of October which proved to be timely as two sets of chain idler wheels were failing, and the high-energy column was found to be covered with plastic dust. Two weeks were scheduled for this maintenance, but only six days were required before the tank could be closed again, and the tandem made operational once more. During this time, attempts to repair two small pressure leaks on the tank were made. After re-pressurizing to 190 psi, we verified that those repairs were successful. However, a new, more serious leak had developed. Tom Calisto managed to reduce this new leak to an acceptable level so that we should be able to operate until our next planned maintenance in May of 2024.

The tandem continues to operate with an administrative voltage limit of 7 MV due to damage to acceleration tubes #2 and #3. Checks conducted during the latest maintenance found no new damage. Current plans are to replace tubes #2 and #3 during the installation of the new tandem ion sources in mid-2025. This schedule will facilitate proper alignment of the injectors with the tandem and the 20-70 switching magnet.

Accelerator Updates (continued from p. 4)

Tandem Injector Upgrades by Richard Longland (NCSU)

Great progress is being made on the tandem accelerator low-energy injector upgrade. TUNL staff have worked tirelessly to prepare the area while supporting the ongoing operation of the Tandem accelerator. The Atomic Beam Polarized Ion Source was removed, along with other retired facilities to make room for delivery of the TORVIS ion source in the first quarter of 2024. The floor in the back of the low-energy bay will be prepared with a new easy-clean Polyurea coating shortly before the holidays, and the walls have already been cleared of unused equipment and given a fresh coat of paint.

The vendor, National Electrostatics Corporation (NEC), is currently building the TORVIS source and has invited TUNL engineers to visit their facility for training in early 2024. Following delivery, the source will be fitted with a beam optics diagnostic station and new high-efficiency ^{3}He recirculation system that are currently under development at TUNL. Meanwhile, beam optics calculations for the injector are underway. The beamline design (see image on left) incorporates a new buncher from NEC that should help us achieve 1 ns pulses on target. Expected delivery of the new injector is Spring 2025.

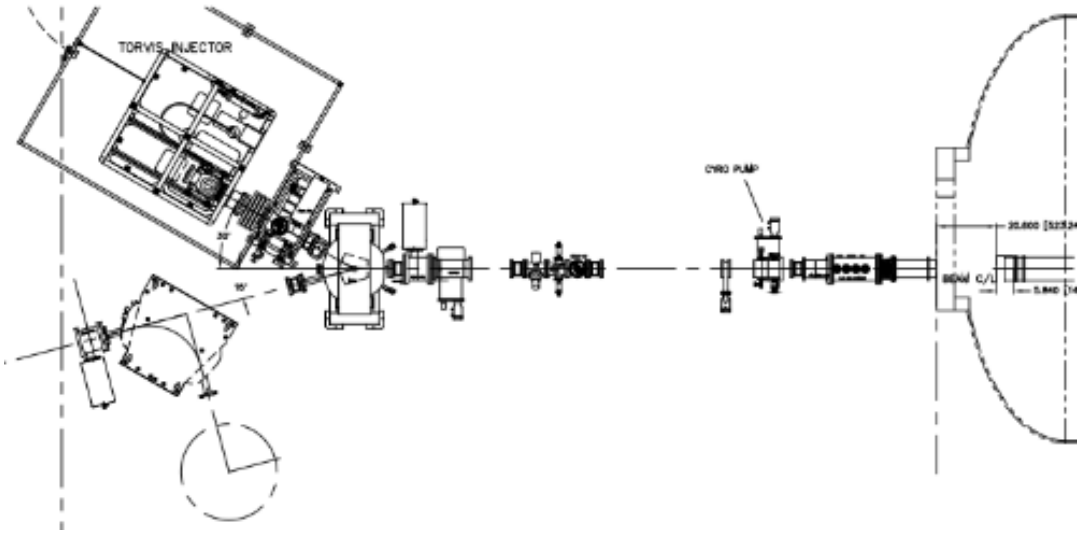
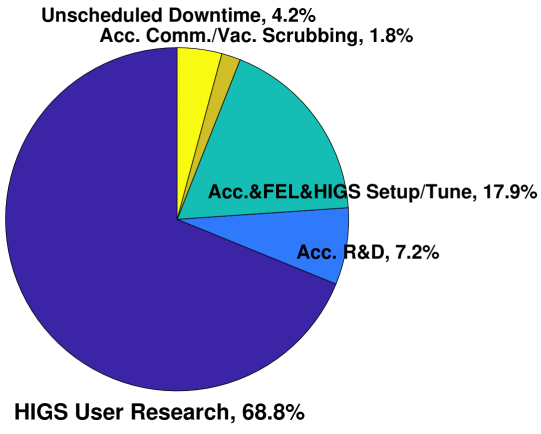


Diagram of the new tandem low-energy injector system.

HIγS Updates by Ying Wu (Duke)

Operations: During the recent three-year period, from July 1, 2020, to June 30, 2023, we focused on delivering γ-ray beams to nuclear physics research with great success. The HIγS accelerator facility provided 7,451 hours of beam time for various research programs and accelerator-related activities, with a total of 5,130 hours of HIγS γ-ray beam time (or about 1,710 hr/yr) delivered to basic and applied nuclear physics research programs. The three-year availability of HIγS accelerators and light sources was about 95.8%, with only 4.2% unscheduled downtime. The distribution of HIγS beam time is illustrated in the pie chart to the right.



Proposed New Operation Mode for HIγS: We have recently proposed a detailed plan to the Department of Energy to double the γ-ray availability for research to about 3,000 hrs/yr. This can be realized with a modest investment in personnel and equipment while reducing the cost of unit beam time hours. In our plan, we will expand and optimize the HIγS operation schedule while maintaining a consistently high level of accelerator availability and reliability. With additional resources, we can significantly increase the number of weeks during which 24-hour operations will be conducted, spanning five days and five nights. This new operational schedule would allow for more continuous and efficient usage of the HIγS facility.

Accelerator Updates (continued from p. 5)

Proposed New Operation Mode for HIγS (cont.): To ensure the success of this new mode of operation, we will continue improving the reliability and availability of the HIγS accelerators by tracking and analyzing equipment failures, enhancing the accelerator maintenance program, securing critical equipment and hardware, and expanding our staff's cross-training to cover all critical areas.

New Capabilities at HIγS: In recent years, we have continued to develop several new γ-ray capabilities at the HIγS, with the following becoming available routinely for user research:

1. We have developed a new mode of γ-ray beam production with lower bremsstrahlung radiation background. For beam energies from 1.8 MeV to about 20 MeV with circular polarization, bremsstrahlung background can be reduced by a factor of five to ten.
2. We have developed and expanded the high-resolution operation mode to cover the energy range from 3—16 MeV. This is achieved by reducing the FEL power, which accompanies a γ-ray flux reduction of a factor of two to four compared to the high-flux operation mode.
3. We have expanded our list of production FEL wavelengths to eight by adding 630 nm, optimized for producing high-flux γ-ray beams from 10.5 to 7 MeV.
4. We have improved the high-flux mode of operation for a range of energies by successfully increasing the maximum electron beam current in the storage ring from 90–110 mA to 120–170 mA. Recently, we achieved the highest γ-ray flux of approximately 3.5 x 10^{10} γ/s (total in 4π solid angle) around 9 MeV.

We are continuing to develop the following new capabilities as user capabilities:

1. *Gamma-ray helicity switch*: This capability has been demonstrated with good consistency between left- and right-circular polarizations. It will need to be commissioned as a user capability with a dedicated nuclear physics experiment.
2. *Linear polarization switch*: A feedback system for the FEL laser cavity is being developed to make this capability available for routine HIγS operation.
3. *High-energy beams from 100 to 120 MeV*: This new energy range is now available with the successful development of 175 nm VUV FEL mirrors and will be commissioned as a user capability in the near future.

VUV FEL Mirror Research and Development: Funded by the DOE, we have successfully carried out an R&D program for 175 nm FEL mirrors and are currently conducting a program to develop FEL mirrors at even shorter wavelengths. This effort is in collaboration with a world-leading thin-film coating company, LZH in Germany.

1. *175 nm Mirror R&D:* We have successfully developed high-reflectivity, thermally stable, and radiation-resistant 175 nm FEL mirrors. With these mirrors, we expanded our FEL operation into a novel VUV wavelength range while setting a new short-wavelength record for FEL oscillators at 168.6 nm. Additionally, circularly polarized gamma rays up to 120 MeV were generated, extending the HIγS operation into a new high-energy region.
2. *155 nm Mirror R&D:* Leveraging the knowledge gained from the 175 nm FEL mirror development, we have moved to develop even shorter wavelength VUV mirrors at 155 nm. The success of this research will propel the HIγS into a new high-energy range of 130 to 150 MeV.

The generation of high-energy Compton γ rays will open up new opportunities for experimental study of the nucleon's structure through the lens of Chiral Perturbation Theory. Stringent tests of Chiral effective field theory predictions can be conducted through Compton scattering experiments involving the proton, the deuteron, and light nuclei. High-energy Compton scattering probes the electromagnetic properties of the nucleon, encompassing electric and magnetic dipole polarizabilities, as well as spin polarizabilities.

A NEW ERA OF DISCOVERY: *The 2023 Long Range Plan for Nuclear Science*

By Calvin R. Howell (Duke) and John F. Wilkerson (UNC)

On October 4, 2023, the Nuclear Science Advisory Committee (NSAC) voted unanimously to approve the new long-range plan for nuclear science in the U.S., **A New Era of Discovery:** *The 2023 Long Range Plan for Nuclear Science*. It is the eighth long-range plan published by NSAC since 1979. The plan, which delineates the highest priorities of the US nuclear physics community, provides guidance to the agencies and is a tool for advocacy with Congress. The full document and associated materials can be found at https://nuclearsciencefuture.org.

The plan highlights major accomplishments since the last long-range plan in 2015 and identifies scientific opportunities and recommends priorities for the U.S. nuclear science community for the next decade. The development of this LRP followed the tradition of being a grassroots effort with broad input from the U.S. nuclear science community. The NSAC LRP Writing Committee consisted of 60 members broadly selected from the U.S. nuclear science community and participation by two international representatives from Asia and Europe. Three TUNL faculty were members of the Writing Committee: Haiyan Gao (Duke/BNL), Calvin Howell (Duke) and John Wilkerson (UNC).

Inputs to the planning process were collected through discussions at and the resulting whitepapers from three topical town-hall meeting organized by the Division of Nuclear Physics of the American Physical Society (DNP/APS):

1. 2022 Town Hall Meeting on Hot and Cold Quantum Chromodynamics, Sept. 23 – 25, 2022, hosted by MIT,
2. NSAC Long Range Plan Town Hall Meeting on Nuclear Structure, Reactions, and Astrophysics, Nov. 14 – 16, 2022, hosted by Argonne National Laboratory, and
3. Fundamental Symmetries, Neutrons, and Neutrinos Town Meeting, Dec. 13 – 15, 2023, hosted by UNC.

TUNL research groups participated in all three town-hall meetings, hosted the town-hall meeting on Fundamental Symmetries, Neutrons, and Neutrinos, and contributed to writing the town-hall meeting whitepapers. A photograph of in-person participants at the town-hall meeting hosted by TUNL is shown below.

Using broad community input from the DNP town-meeting whitepapers and other whitepapers from various sub-community planning activities, the NSAC writing committee produced a new LRP for nuclear science that describes the scientific opportunities and identifies the priorities of U.S. nuclear science for the coming decade. As is customary for nuclear science, the future directions for the field are summarized through recommendations and discussed in detail in the chapters of the Plan.

Participants at the town-hall meeting on *Fundamental Symmetries, Neutrons, and Neutrinos*, held on Dec. 13-15, 2022 in Chapel Hill, NC.

The 2023 Long Range Plan for Nuclear Science (continued from p.7)

This LRP has four recommendations. Each is written with supporting text to be self-contained, so this article will not provide interpretation. However, clarification of the ordering of the recommendations is given. The first recommendation is the highest priority for the field. It includes the community's strong commitment to sustaining strong support for the development of talent with emphasis on compensating graduate researchers at levels consistent with the actual cost of living around their institution. The order of recommendations 2 and 3 are the same as in the 2015 LRP and does not reflect relative priority. The four recommendations are listed below:

RECOMMENDATION 1: The highest priority of the nuclear science community is to capitalize on the extraordinary opportunities for scientific discovery made possible by the substantial and sustained investments of the United States. We must draw on the talents of all in the nation to achieve this goal.

RECOMMENDATION 2: As the highest priority for new experiment construction, we recommend that the United States lead an international consortium that will undertake a neutrinoless double beta decay campaign, featuring the expeditious construction of ton-scale experiments, using different isotopes and complementary techniques.

RECOMMENDATION 3: We recommend the expeditious completion of the EIC as the highest priority for facility construction.

RECOMMENDATION 4: We recommend capitalizing on the unique ways in which nuclear physics can advance discovery science and applications for society by investing in additional projects and new strategic opportunities.

Following the approval of the LRP by NSAC on October 4th, there were several events this fall for rolling out the plan: a nationwide webinar involving institutions and national laboratories on October 6; Nuclear Physics Day on Capitol Hill on November 8 where members of nuclear science community met with congressional staff; and the presentation of the LRP by Prof. Gail Dodge, the NSAC Chair, at the Joint DNP/JPS Meeting on November 28 (Plenary I) in Hawaii. The DNP meeting was originally scheduled for early October but because of the fires in Maui was moved to the Big Island and rescheduled to the week after Thanksgiving. Twenty-one universities and national labs hosted webinars as organizational participants in the national rollout of the LRP on October 6. The webinar hosted by TUNL had great participation. A photograph of the TUNL-hosted webinar gathering is shown below.

Participants at the TUNL hosted webinar held on October 6, 2023 as part of the national rollout of the LRP.

The Fourth International Conference on Nuclear Photonics

by Calvin R. Howell, Duke University

The Fourth International Conference on Nuclear Photonics, Nuclear Photonics 2023 (NP2023), was hosted by TUNL. The conference was held at the Durham Convention Center on September 11 – 15, 2023. This conference series was initiated in 2016 with a goal of stimulating collaborations in the emerging interdisciplinary field of nuclear photonics by bringing together leading scientists and technologists from around the world working in the areas of high-energy density physics, high-power laser photonics, nuclear physics, astrophysics, accelerator science and particle detection technologies. The conference is held every two years and rotates between the U.S., Europe and Asia. The first three conferences in the series were hosted by national laboratories: the inaugural conference in 2016 by the Lawrence Livermore National Laboratory (LLNL) in Monterey, CA; in 2018 by the Extreme Light Infrastructure for Nuclear Physics (ELI-NP) in Brasov, Romania; and in 2021 by the Institute of Laser Engineering (ILE) and the Research Center for Nuclear Physics (RCNP) in Japan. The third conference was delayed by a year and held in hybrid mode (in-person + remote) due to the Covid pandemic. TUNL is the first university-based research center to host this conference, and this conference was a return to an in-person gathering post-Covid travel restrictions.

The NP2023 was co-sponsored by the TUNL consortium institutions, CAEN Technologies, Inc. and SYDOR Technologies. The conference co-chairs were Mohammad Ahmed (NCCU), Christopher Barty (UC Irvine), and Calvin Howell (Duke). The NP2023 brought together about 100 participants from 13 countries who are conducting research in the development and use of ultrahigh intensity lasers and gamma-beam systems for nuclear physics research and applications. The science program was organized into plenary sessions and a poster session around the following topics: nuclear structure, reactions, and astrophysics with photons; high intensity laser–plasma interaction; photon-based hadron beams and applications; photon-based production of rare isotopes; non-destructive material imaging and evaluation; photon-enabled pulsed neutron generation; photon-enabled pulsed positron generation; and strong field QED. In addition to an interdisciplinary science program, the conference featured a special webinar session on Inertial Confinement Fusion that was open to the public. The speakers were Riccardo Betti of the Laboratory for Laser Energetics, who spoke on the direct confinement method, and Benjamin Bachmann from LLNL, who presented the recent fusion experiments at NIF that achieved energy break even using an indirect confinement method. The conference activities included an outing to a Durham Bulls baseball game, tours of Duke Chapel and the TUNL accelerator laboratories, and a banquet. Two TUNL students, Jingyi Zhou (Duke) and Innocent Tsorxe (NCSU) received outstanding poster awards. The science program and other information about the conference can be found on the conference website at https://sites.duke.edu/np2023/. The next Nuclear Photonics Conference will be in 2025 and hosted by the Technische Universität Darmstadt.

NP 2023 Participants

25th International Spin Symposium

by Anselm Vossen, Duke University

The 25th iteration of the International Spin Symposium (SPIN 2023) was organized by Duke University and was held September 24 – 29, 2023 at the Durham Convention Center. The Symposium is one of the pre-eminent venues bringing together theorists and experimentalists in the field of spin physics. It is held every two years, alternating between the U.S., Europe and Asia. The conference series has been held jointly since 2000, combining the High Energy Spin Symposia and the Nuclear Polarization Conferences.

The most recent symposia were held in Charlotteville, VA (2008), Jülich, Germany (2010) Dubna, Russia (2012), Beijing, China (2014), Urbana Champaign, IL (2016), Ferrara, Italy (2018) and Matsue, Japan (2021). More information on the conference can be found on the conference homepage https://spin2023.phy.duke.edu/. The next symposium will be held at Shandong University in Qingdao, China. The conference is organized under the auspices of the International Committee for Spin Physics Symposia (ISPC). The current membership can be found at http://www.spin-community.org/public_files/ISPC-Membership_2022-2023.pdf.

The program was organized along the following topics: Nucleon helicity structure, Spin physics in Nuclear Reactions and Nuclei, 3D Structure of the Nucleon: TMDs, 3D Structure of the Nucleon: GPDs and Form Factors, Low Energy Spin Physics with Lepton, Photon and Hadron Probes, Fundamental Symmetries and Spin Physics Beyond the Standard Model, Acceleration, Storage and Polarimetry of Polarized Beams, Polarized Ion and Lepton Sources and Targets, Future Facilities and Experiments, Application of Nuclear Polarization Techniques to Other Fields, and Spin in Heavy Ion Collisions. Each topic had a parallel session associated with it as well as one or more plenary talks. While most of the topics have been covered by previous SPIN conferences, the topic "Spin in Heavy Ion Collisions" was first addressed at SPIN 2023 with a successful parallel session and two plenary talks on theoretical and experimental aspects.

The conference attracted 255 registered participants; the vast majority (about 240) attended in person. The conference was organized along 8 parallel and 10 plenary session blocks as well as one poster session over 5 days. There were 258 contributions, 239 talks and 19 posters.

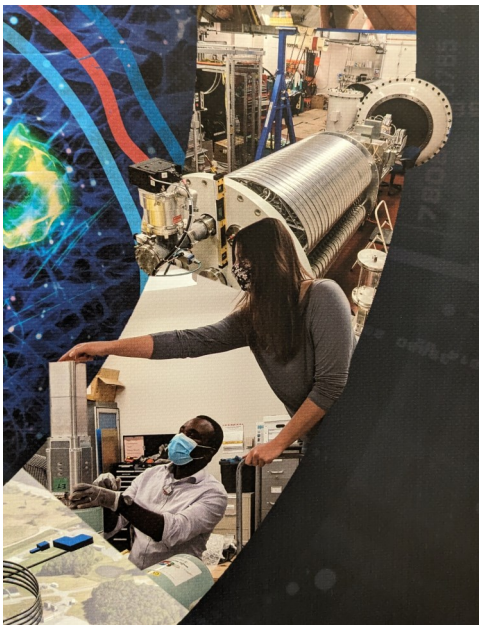
To the knowledge of the author, this made it the largest SPIN conference so far and is a measure of the success of the conference.

Proceedings will be published in "Proceedings of Science".

SPIN 2023 Participants

TUNL Represented in the LRP Cover Graphic

The research and facilities at TUNL are prominently featured in the new Long Range Plan (LRP) in both the text and in associated graphics. For the LRP rollout webinar, each hosting organization was sent a poster with the cover graphic from the document. In the photo to the left, UNC graduate student, Samantha Johnson, is shown pointing to an area of the graphic where the new LENA Singletron accelerator is pictured along with a photo of her and UNC faculty, Akaa Ayangeakaa, working on the Clover Array at HIγS. A close up of that area of the poster is shown below.



Please join us for the next TUNL Day on Tuesday, December 19, 2023, from 1:30—3:00 in Physics Room 130 as we discuss the grant renewal proposal that was submitted to DOE and what we might expect from the review on January 17—19, 2024.