



We hope you are doing well as we move through 2021. At FRIB, we remain focused on the start of user operations in early 2022.

The FRIB Project is on track to deliver the baseline early, in late 2021. While we move ever closer to user operation, we are cognizant that the last mile is as critical as the first 25 in this marathon project. The FRIB staff is committed to completing the project and starting user operation, while also operating the standalone NSCL science program.

As we usher in summer, we send you this newsletter to highlight some of the biggest developments of 2021 so far. We [commissioned the entire linac](#), including all 46 cryomodules, and we [accelerated first beam in ReA6](#). This ushered in the [first scientific-user experiment in ReA6](#) and the first stand-alone experiments using [SOLARIS in AT-TPC mode](#). FRIB also successfully commissioned the liquid lithium charge stripper installed in the linac. FRIB is the first operating accelerator facility to use liquid lithium to charge-strip heavy-ion beams. The [FRIB Users Organization and FRIB Theory Alliance](#) reports below highlight many other activities over the past several months.

Looking ahead, the first Program Advisory Committee (PAC1) meeting will be held remotely 5-6 and 12-13 August. We thank in advance the [PAC members](#) for their time and commitment to FRIB. The committee will evaluate the scientific merit of proposals submitted for the first PAC period and recommend beam-time allocation. Read more about the [PAC process](#) below. Thank you again to everyone who responded to the [call for proposals for first FRIB experiments](#). We received eighty-two proposals and six letters of intent, representing 597 individual scientists. This response from the FRIB user community bodes well for an impactful science program starting in early 2022.

We eagerly anticipate the PAC meeting and look forward to collaborating with the community at the upcoming Low Energy Community Meeting in August.

In the COVID context and in alignment with MI OSHA, FRIB has resumed its on-site functions. Until 1 August, access to the laboratory is limited to designated employees, contractors, scientific users, and by appointment. We look forward to a very big 2022, in which we will commence user operation of FRIB as a DOE-SC user facility.

Sincerely,

Thomas Glasmacher and Brad Sherrill

FRIB Laboratory Director and NSCL Director

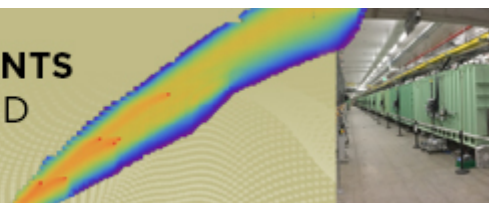
## MAJOR DEVELOPMENTS



## FRIB COMMISSIONS ENTIRE LINAC, INCLUDING ALL 46 CRYOMODULES

Ending April on a major high note, FRIB commissioned the entire linac, including all 46 cryomodules, on 25 April. The team commissioned a krypton-86 beam to 212 MeV/u, achieving 100-percent beam transmission in less than three hours on the first attempt. The team was distributed to five separate control rooms to comply with COVID-19 workplace safeguards. [Read more](#)

## PROPOSALS FOR FIRST FRIB EXPERIMENTS SPAN FRIB'S FOUR SCIENCE AREAS, AND MAXIMIZE FRIB'S CAPABILITIES

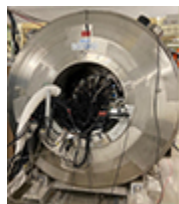


The countdown to first experiments continues. Scientists submitted eighty-two proposals requesting 9,784 hours of beam time and six letters of intent. Proposals span FRIB's four science areas and maximize FRIB's capabilities. [Read more](#)

To evaluate these proposals, the FRIB Program Advisory Committee (PAC) will hold its first meeting remotely 5-6 and 12-13 August. PAC will assign a primary and secondary reviewer to each proposal and letter of intent and will send the names of the assigned PAC members and the reviewer assignments to the primary spokespersons. Two weeks prior to the first PAC meeting, the reviewers will submit their top three questions to the spokesperson. One week prior, PAC will hold a video conference to answer any questions. During the PAC meeting, each proposal will be discussed and ranked. An observer from the U.S. Department of Energy will also attend the PAC meeting. PAC will make recommendations in writing to the FRIB Laboratory Director regarding beam-time allocation. [Read more](#)

## NSCL ACCELERATES FIRST BEAM IN REA6, USHERING IN FIRST EXPERIMENT OF STANDALONE PROGRAM

NSCL reached an important milestone on 16 April with first acceleration of beam in the ReAccelerator facility ReA6, the upgraded ReAccelerator facility at NSCL and FRIB. It provides broader opportunities for nuclear physics experiments with higher beam energies than the previous ReA3. This milestone ushered in the stand-alone ReA6 program on 12 May with the scientific user experiment of Kelly Chipps. [Read more about first beam](#) and [read more about the first experiment](#)



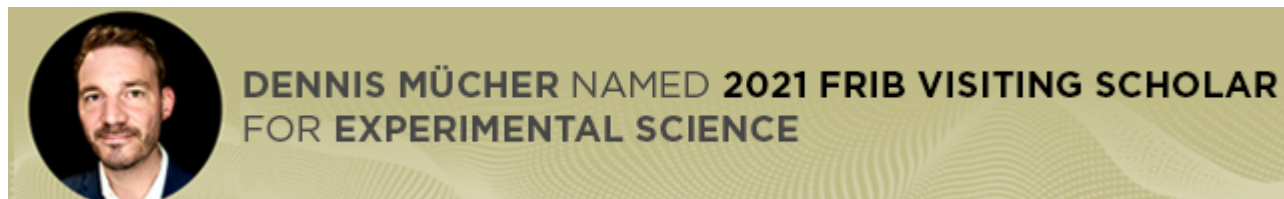
## FRIB SCIENTIFIC USERS COMPLETE FIRST SOLARIS EXPERIMENT

A team of FRIB scientific users completed the first SOLenoid spectrometer Apparatus for Reaction Studies (SOLARIS) solenoidal spectrometer system experiment in the Active-Target Time-Projection Chamber (AT-TPC) mode. FRIB partnered with Argonne National Laboratory in the development of SOLARIS, a dual-mode spectrometer for a broad range of reactions studies at FRIB using reaccelerated beams. [Read more](#)

## CONGRATULATIONS TO OUR COMMUNITY MEMBERS



Five scientists who have performed or will perform research at FRIB have received 2021 U.S. Department of Energy Office of Science (DOE-SC) Early Career Research Program awards. The FRIB scientific users are: Melina Avila Coronado, Heather Crawford, Andrew Jayich, Tara Mastren, and Maria Piarulli. Selection is based on peer review by outside scientific experts. [Read more](#)



**FRIB VISITING SCHOLAR PROGRAM FOR EXPERIMENTAL SCIENCE 2021:** Dennis Muecher from the University of Guelph in Ontario, Canada, is the award recipient for the FRIB Visiting Scholar Program for Experimental Science 2021. Initiated in 2016, the goal of the program is to recognize outstanding junior researchers in FRIB-rated research fields and encourage them to establish a research program at FRIB. [Read more](#)

**DO YOU HAVE ADDITIONAL GOOD NEWS? LET US KNOW!** Email [communications@frib.msu.edu](mailto:communications@frib.msu.edu).

## FRIB LABORATORY NEWS

**FRIB SCIENTIFIC USER PORTAL UPDATE:** The FRIB Scientific User Portal allows scientific users to interact with the FRIB Laboratory. FRIB sought feedback from the spokespersons following proposal submission on how well the user portal worked. Based on that feedback, improvements will be ready prior to the next PAC cycle. [Read more](#)

## REVIEW ROUNDUP

FRIB has been remotely involved in several reviews so far this year, including:

**DOE-SC OFFICE OF PROJECT ASSESSMENT REVIEW (11-13 MAY):** The U.S. Department of Energy Office of Science Office of Project Assessment held its independent project review of FRIB via remote participation 11-13 May. The main focus of the review was to assess overall FRIB Project progress since the last review in November 2020, with a focus on technical progress. [Read more](#)

## TRAINING THE NEXT GENERATION

**HIGH-SCHOOL STUDENT EYES SCIENCE FUTURE AT FRIB:** Maya Wallach is a high-school student who follows the Michigan State University (MSU) physics curriculum and takes courses at MSU. She is gaining first-hand experience at the FRIB Laboratory as she pursues a science career. Her time at FRIB is part of the Physicists Inspiring the Next Generation: Exploring the Nuclear Matter program. [Read more](#)

**ACCELERATOR TRAINEESHIP ADVISORY PANEL (ATAP) MEETING (2-3 June):** ATAP held a meeting via remote participation on 2-3 June 2021. The focus was to review the Accelerator Science and Engineering Traineeship (ASET) program at MSU and to provide recommendations to the FRIB Laboratory director. ASET is supported by the U.S. Department of Energy Office of Science (Office of High Energy Physics), and a DOE-SC representative participated in the meeting. [Read more](#)

## INSTRUMENT UPDATES

FRIB is on track for providing ability to commence world-leading science with fast, stopped, and reaccelerated beams in PAC1 period. The transition to commencement of user operations is in progress. Ongoing developments and instrument and vault completion support the PAC1 period science program. Improvements and maintenance of existing instrumentation and experimental vaults assures reliable operation when FRIB starts.

FRIB's technical systems are in place and functioning reliably as needed for each PAC-approved experiment. The rare isotope beam will be delivered with properties as needed for each PAC-approved experiment. Experimental instrumentation is ready and user support is in place.

**CRIS:** The Collinear Resonance Ionization Spectroscopy (CRIS) project will enhance the sensitivity of laser spectroscopy at FRIB by more than an order of magnitude.

- The design of the beam line extension of BECOLA for CRIS is near completion, and
- the extension will be in place in time for PAC1 experiments.

**FDSi:** The [FRIB Decay Station initiator \(FDSi\)](#) will be first step towards full FDS and will increase discovery potential of FRIB. Phase one of FDSi will be complete by start of FRIB user operation:

- Phase one includes common infrastructure,
- new charged-particle implant detector XSiSi, and
- first set of new electronics.

**GRETA:** The Gamma-Ray Energy Tracking Array (GRETA) is the realization of a full  $4\pi$   $\gamma$ -ray tracking detector, capable of reconstructing the energy and three-dimensional position of  $\gamma$ -ray interactions within a compact sphere of high-purity germanium crystals.

- GRETINA demonstrated the technology and scientific impact of a  $\gamma$ -ray tracking array.
- The GRETA project received CD-2 and CD-3 approval in November 2020 and commenced construction.

**HRS:** The [High Rigidity Spectrometer \(HRS\) project](#) accommodates different detectors, of which GRETA is one.

- The preliminary design has been advanced, and
- FRIB received \$3 million in funding for HRS for fiscal year 2022.

**SECAR:** The [SEparator for CApture Reactions \(SECAR\) recoil separator project](#) will be optimized for measurements of capture reactions of importance for nuclear astrophysics. The project is on track for critical decision 4:

- Installation is complete, and commissioning is underway.
- The second Wien filter has been commissioned, and the partial angular acceptance measurement is complete.

**SOLARIS:** [The SOLenoid spectrometer Apparatus for Reaction Studies \(SOLARIS\) solenoidal spectrometer system](#) is on track for completion for PAC1 experiments:

- Magnet is installed and energized, and fabrication of vacuum enclosure and beam line connection is complete.
- The first stand-alone experiments in AT-TPC mode successfully completed (May 2021), and preparation for first experiment in Si-array mode with ANL's Helios detectors is underway (August 2021).

## FRIBUO AND FRIB-TA UPDATES

**FRIB USERS ORGANIZATION:** The FRIB Users Organization Executive Committee has an update on some recent and upcoming news, including elections, Nuclear Physics DC Day/Nuclear Physics Congressional Advocacy Day 2021, and the Low Energy Community Meeting. [Read more](#)

**FRIB THEORY ALLIANCE:** FRIB Theory Alliance (FRIB-TA) just completed the first year of activities in the renewed five-year cycle of funding. Despite the many restrictions related to the COVID-19 pandemic, FRIB-TA continued its core initiatives and found innovative new ways to engage the science community. [Read more](#)

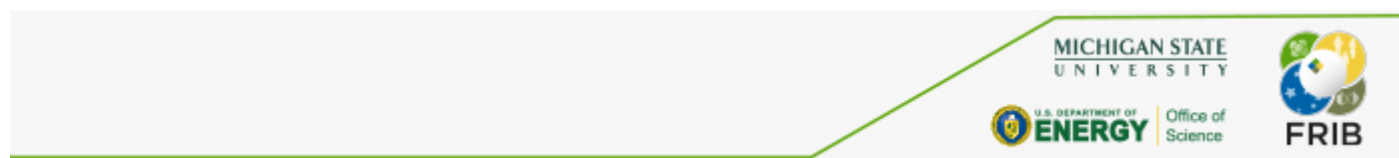
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## LOOKING AHEAD

<b>1 July</b>	High Rigidity Spectrometer Directors Review
<b>2-6 August</b>	SECAR Annual Progress Review (tentative)
<b>4-6 August</b>	FRIB Theory Alliance Summer School: A Practical Walk Through Formal Scattering Theory—Connecting Bound States
<b>5-6, 12-13 August</b>	FRIB Program Advisory Committee Meeting
<b>9-11 August</b>	Low Energy Community Meeting
<b>31 August-2 September</b>	High Rigidity Spectrometer OPA Review (tentative)
<b>21-23 September</b>	FRIB Science and Technology Review
<b>27 September-8 October</b>	FRIB Theory Alliance Topical Program: Nuclear Isomers in the Era of FRIB (tentative)
<b>5-7 October</b>	TSAC Review
<b>15 October</b>	Isotope Harvesting Project Annual Progress Review
<b>2-4 November</b>	DOE Office of Project Assessment Review of FRIB (tentative)

**THANK YOU TO OUR CONTRIBUTORS THIS ISSUE:** Jill Berryman, Jutta Escher, Zach Meisel

The FRIB Laboratory Update for Users is published by the FRIB Laboratory and distributed via email. Please e-mail questions, comments and contributions to [communications@frib.msu.edu](mailto:communications@frib.msu.edu).



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Michigan State University establishes and operates FRIB as a user facility for the [Office of Nuclear Physics](#) in the [U.S. Department of Energy Office of Science](#).

