FRIB Project marks technical progress, meaningful collaborations, successful public open house in last quarter

by Thomas Glasmacher, FRIB

In our July issue, we celebrated the major project milestone of FRIB accelerating its first beams in three of forty-six superconducting cryomodules, demonstrating for the first time that FRIB's major systems (front end, liquid helium plant, superconducting cryomodules) which were commissioned individually, work well together and can successfully accelerate beams of atomic particles.

Since then, we've marked another significant accomplishment with the first circulation of liquid-lithium film in the FRIB charge stripper. This signifies a new era in stripper development as FRIB is the first in the world to use liquid lithium as a charge stripper. Following the successful first circulation in August, in September FRIB completed a successful 50-hour continuous attended operation of the stripper. Read more about it in the story below. We also report on several other technical developments in remote-handling, beam-instrumentation, and magnet installation.

We were pleased to host the Nuclear Structure conference at NSCL and FRIB in August, followed by the Low Energy Community Meeting, and look forward to the continued discussions and collaboration with the community. A whitepaper is being developed to summarize the exciting scientific opportunities of the primary beam energy upgrade to at least 400 MeV/u for all ions. Your input is welcome and encouraged. Read how to get involved in the story below.

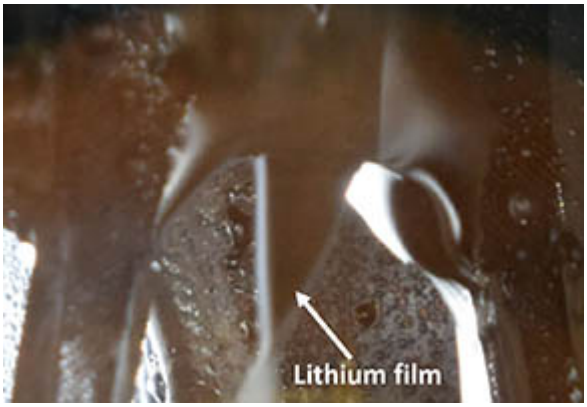
Also in August, the laboratory hosted another successful public open house. FRIB and NSCL provided 4,000 tours during the six-hour open house, and participants enjoyed demonstrations and presentations. We are privileged to work in a publically-funded one-of-a-kind research facility and we were delighted to convey our excitement to members of the public, who pay us.

We continue pushing to the finish line of the FRIB Project and are transitioning the project team again, this time from construction to operations, focusing on FRIB availability and users doing successful experiments. Thank you for continued excitement and support.

TECHNICAL INSTALLATIONS PROGRESS

Technical installation progress continues to advance at FRIB, with the project meeting new milestones on a regular basis. These articles highlight significant progress since what was featured in our last issue.

FRIB successfully circulates liquid lithium in charge stripper to establish lithium film; completes 50-hour continuous operations



Melted liquid lithium film as seen from a view port in the charge stripper.

On 3 August, FRIB successfully circulated liquid lithium and established a lithium film in its charge stripper. FRIB is the first in the world to use liquid lithium as a charge stripper, marking a new era in stripper development history.

The lithium charge stripper will play a critical role in the FRIB linear accelerator in order to achieve design-goal beam energies beyond 200 mega electron volt/nucleon (MeV/u) and beam power up to 400 kilowatts (kW).

This successful first circulation demonstrates that the system functions properly. It is a significant step toward future work on lithium stripper production.

During operation, the liquid lithium needs to be continuously circulated with a pump to produce the film. For this purpose, an electromagnetic pump was designed and fabricated based on original concepts developed by Argonne National Laboratory.

All systems were properly designed and implemented to work concurrently. The circulation was successful due to the effort of mechanical and controls engineers.

Following the first circulation in August, in September, the lithium charge stripper completed 50 hours of continuous attended operations with round-the-clock monitoring by trained operators. The stripper operated safely, reliably, and stably. The next step is to operate the system without direct supervision.

New vision system augments remote-handling operations

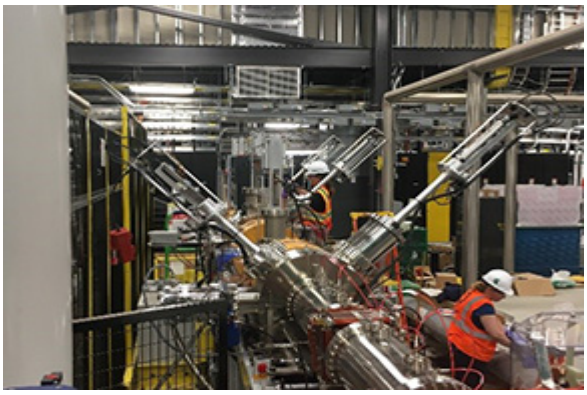
A new vision system will allow remote-handling operators to view and record work taking place. The operator is sitting next to a control unit that allows for remote operating of a crane. The crane uses guides to direct the magnet in and out of the beam-accelerating cryomodule (for more about the crane, read this article).

FRIB's remote-handling system allows maintenance on equipment difficult to handle in person. The remote-handling vision system permits FRIB staff to remotely view such maintenance.

The vision system is a collection of video cameras that can pan, tilt, and zoom as needed. The cameras can show multiple or single views and record the footage. The system lets the operator work from a separate room that contains the controls. The operator can remotely maneuver the crane to remove equipment from the beamline.

The design allows flexibility for alterations in the future. As operators train and the vision system is in use, FRIB can change it as needed.

FRIB successfully completes beam-instrumentation testing



Engineers and technicians work to install beam instrumentation on the FRIB Lower Energy Beam Transport (LEBT) line.

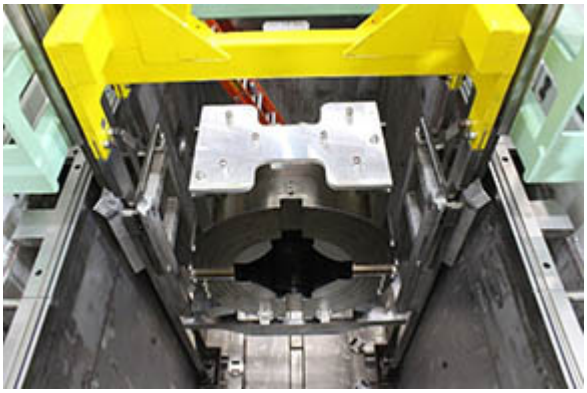
Recently, FRIB successfully completed beam-instrumentation testing, which ensures the beam doesn't destroy the linear accelerator.

FRIB will deliver up to 400 kilowatts of high-intensity and high-quality beam power—the highest-power heavy-ion beam in the world.

As accelerator facilities like FRIB push the boundaries of energy and intensity, specialized and larger amounts of instrumentation aid in more rapidly understanding the behavior of particle beams.

A variety of devices and processes comprise beam instrumentation and each of the beam-instrumentation systems must work in concert with each other. FRIB's beam instrumentation is being commissioned in several stages. Final validation of the instrumentation begins with beam commissioning. This began in early 2017 with the front end, and in summer 2018 with the linear accelerator. Only a few systems remain for beam testing, which will begin in 2019. As commissioning continues, each stage will enable improvements to measurement and detection capabilities as beam intensity is increased.

FRIB completes repeatability testing for magnet installation



Using a remote-handling crane, a magnet is lowered into place during repeatability testing.

FRIB staff have successfully completed the repeatability testing for maintenance of the laboratory's magnets. Over 240 magnets of various types are used to focus and steer the beam as it is transported through the accelerator.

The magnets require careful handling and precise alignment, but they can't be handled in person once the linear accelerator is operational. To address this, FRIB has built a remote-handling system to access the magnets easily.

The repeatability testing proves that the magnets can be removed from and replaced back to the same spot each time. The magnet alignment ensures FRIB will be able to deliver rare isotopes. The system built for removal consists of a kinematic coupler to hold the magnet stationary. A crane uses guides to direct the magnet in and out of the fragment separator vacuum vessel. The system is able to place the magnets within 75 to 100 microns (ten times thinner than the width of a driver's license) of their location.

FRIB and NSCL provide 4,000 tours during public open house

FRIB and NSCL provided 4,000 tours to members of the public during the open house on 18 August. Photo credit: Thomas Baumann, NSCL

FRIB and NSCL provided 4,000 tours to members of the public during the open house on 18 August.

The event included activities, demonstrations, presentations, and tours that allowed attendees to learn more about a world-leading science facility in operation (NSCL) and one in the making (FRIB).

The six-hour open house, made possible by 150 volunteers, offered an array of experiences for all ages. Tours were held in the currently operational experimental areas in NSCL that will be used in FRIB experiments, and visitors could tour the FRIB linear accelerator currently under construction.

Several hands-on activities and demonstrations showed the fields of FRIB and NSCL research, including a 3D model of the FRIB facility under construction, the "Isotopolis" video game, coloring pages and activity sheets related to nuclear astrophysics, safety equipment to wear, magnetic marbles to practice "smashing nuclei," and much more. Additionally, scientists were on-hand to talk about their work on the frontiers of rare-isotope research, and several educational videos were shown in the "FRIB Theater."

In the lecture hall, speakers gave presentations that gave a behind-the-scenes look at the FRIB Laboratory, the science being explored, and career opportunities for young people.

For photos of the event, visit the photo gallery on the FRIB website.

Additionally, the open house received attention from a number of media outlets:

• WKAR: Public tours at FRIB Saturday
• East Lansing Info: Facility for Rare Isotope Beams opens doors to the public this Saturday
• I929fm.com: FRIB tours at MSU set for Saturday
• Lansing State Journal: MSU's FRIB holds open house
• WILS 1320: Interview with Artemis Spyrou

The six-hour open house, made possible by 150 volunteers, offered an array of experiences. Several hands-on activities and demonstrations showed the fields of FRIB and NSCL research. Here, NSCL Student Research Assistant Gabriel Moreau is shown interacting with a visitor in the demonstration area. Photo credit: Thomas Baumann, NSCL

2018 Low Energy Community Meeting held 10-11 August

by Heather Crawford, Lawrence Berkeley National Laboratory

• We strongly endorse the vision expressed in the draft ATLAS Strategic Plan for the future of the ATLAS facility and the proposed development of accelerator- and equipment-related initiatives that will enhance the scientific reach and efficient utilization of the ATLAS facility. These initiatives include the upgrade of ATLAS to provide multi-user capabilities which should be

The 2018 Low Energy Community Meeting was held 10-11 August at FRIB/NSCL, following the Nuclear Structure 2018 conference. More than 260 members of the low-energy nuclear physics community (pictured above) attended the meeting.

The 2018 Low Energy Community Meeting (LECM) was held 10-11 August at FRIB/NSCL, following the Nuclear Structure 2018 conference. More than 260 members of the low-energy nuclear physics community made their way to East Lansing to interact and discuss future plans, initiatives, and facilities over the course of one-and-a-half days, plenary sessions, and thirteen working-group sessions. Satellite workshops were held on "Science with a 400 MeV/u FRIB Upgrade" and "ATLAS Long Range Planning Meeting," while the FRIB Theory Alliance held its annual meeting during two of the LECM working-group sessions. All told, the 2018 LECM was a highly productive meeting for the community, with important discussions resulting in a set of resolutions accepted unanimously. All plenary talks and the resolutions are posted on the LECM website, as well as summaries from each working group.

2018 LECM resolutions:

• FRIB remains our top priority. The community is impressed by the progress in construction and eagerly anticipates the completion of FRIB and the forefront science this facility will enable.

supported at a sufficient staffing level for its efficient operation.

• The ARUNA facilities are a central part of the low-energy science program and their continued operation is crucial. The community strongly supports the funding of these facilities and the associated research.

• The FRIB Theory Alliance is an essential component of our field. The bridge faculty and theory fellowship positions at universities and national laboratories help to grow capability in this important aspect of our community. We strongly endorse continued support of the FRIB-TA, its programs, and investment in computational theory and related astrophysics.

• The community endorses the prompt initiation and timely completion of the High Rigidity Spectrometer (HRS) construction project, an essential instrument for fast-beam experiments at FRIB.

• We strongly support pursuit of the 400 MeV/u energy upgrade of FRIB. It will open new scientific opportunities and is timely given the recent neutron-star merger observation.

User community invited to submit input regarding FRIB upgrade to 400 MeV/u

by Brad Sherrill and Alexandra Gade, FRIB

At its July meeting, the FRIB Science Advisory Committee stated that "a very strong and exciting scientific justification has emerged recently for a timely energy upgrade of FRIB." The recent neutron-star merger observation provides a compelling and timely rationale for the upgrade to reach at least 400 MeV/u production energy at FRIB for all beams.

In August, the scientific potential of this upgrade was discussed in a workshop at the Low Energy Community Meeting. Talks from the workshop that outline the scientific case are available online. Approximately 100 people participated in the workshop. There was broad and strong support for moving forward and attendees unanimously supported the statements: “We strongly support pursuit of the 400 MeV/u energy upgrade of FRIB. It will open new scientific opportunities and is timely given the recent neutron-star merger observation.”

The community is now preparing a whitepaper that will summarize the exciting scientific opportunities of the upgrade. All interested parties are invited to be involved further and contribute science themes or specific examples of high-impact science or both. For that, any input should be submitted via email to Brad Sherrill or Alexandra Gade by 30 November. The goal is to have a first draft ready by the end of the year.

A new SRF cavity design has been developed such that by addition of 11 more cryomodules in the open space available in the FRIB accelerator tunnel it will be possible to reach the desired energy.

National Science Foundation conducts NSCL site visit

by Brad Sherrill, FRIB

The NSCL Cooperative Agreement between MSU and the National Science Foundation requires that there be a yearly site visit to evaluate progress.

This year’s visit occurred on 7-8 August, during the Nuclear Structure 2018 Conference. The overlap of the visit and the conference allowed a number of NSCL users to meet with the site-visit committee. The committee also heard presentations on the NSCL scientific program and operations. This year’s visit had a special focus of education, outreach, and diversity activities. NSCL has a new code of conduct and a diversity plan to increase participation of under-represented groups in the NSCL technical staff.

The committee was very positive regarding all these activities and the report overall gave NSCL high marks.

Included in the comments, the committee complimented the outstanding science with ReA3. The panel pointed out the future science opportunities with reaccelerated beams and stated: "The panel encourages NSCL to begin discussions with the user community about the potential science impact and consider a ReA-only running period.”

Nuclear Structure 2018 conference held 5-10 August

by Sean Liddick, FRIB

More than 200 scientists from around the world participated in the Nuclear Structure 2018 conference, held 5-10 August at FRIB.

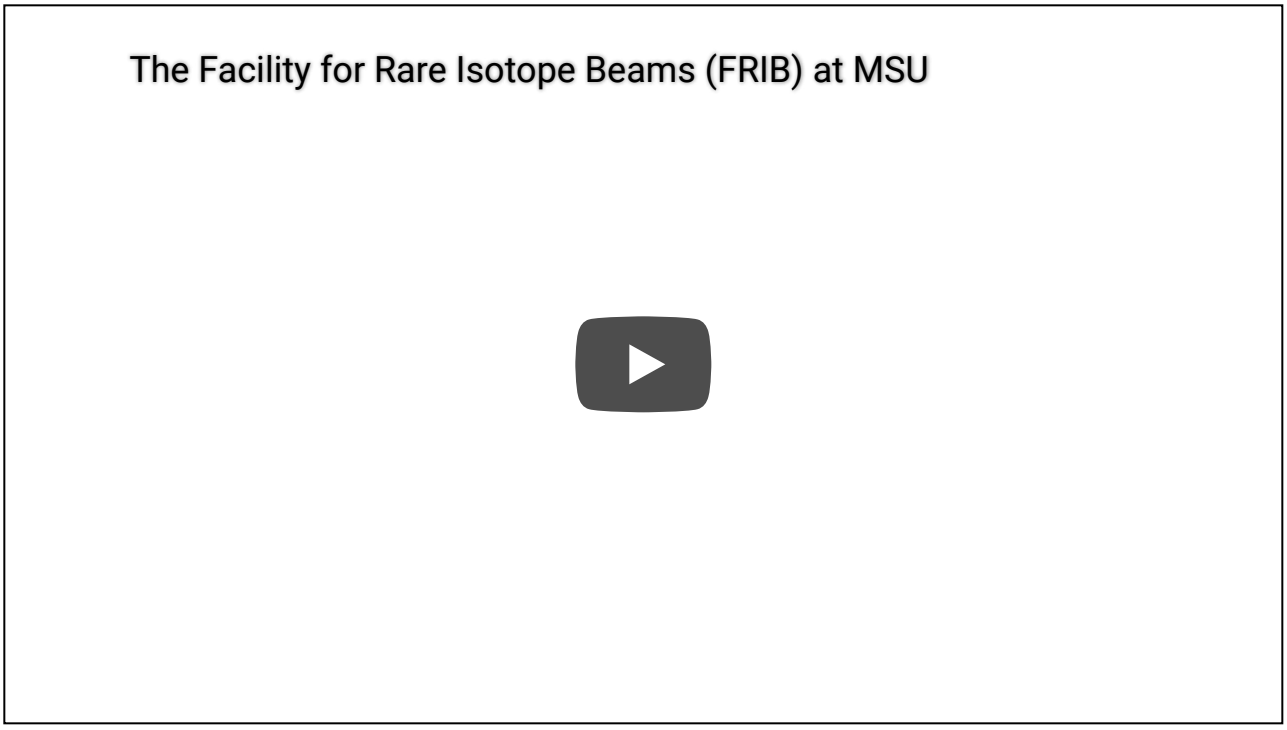
More than 200 scientists from around the world participated in the Nuclear Structure 2018 conference, held 5-10 August at FRIB. The meeting was the seventeenth in a sequence of biennial meetings organized by North American national laboratories. These conferences are devoted to recent experimental and theoretical developments in the research on nuclei near the limits of isospin, spin, and excitation energy.

Previous meetings in this series have been held in East Lansing (2008), Berkeley (2010), Argonne (2012), Vancouver (2014), and Knoxville (2016).

The main meeting program consisted of plenary sessions starting on Monday and continuing until Friday morning. A total of seventy-nine oral presentations were delivered over the course of the week, with 60 percent of the talks drawn from the 191 submitted abstracts. The program commenced with a plenary session on the big open science questions in the field of nuclear structure and the impact of nuclear structure on other aspects of nuclear science. A conference poster session was held on 7 August, with over 60 posters presented. The posters were judged, and poster awards were given out to Brenden Longfellow (first prize), Sean Burcher (second prize), and Brittany Abromeit (third prize). The conference concluded with a session discussing the techniques and tools that are being used to address the science vision. The conference was followed on 10-11 August by the Low Energy Community Meeting.

The local organizing committee would like to thank the international organizing committee, speakers, poster presenters, chairs, and attendees for their presentations and scientific discussions. The committee would also like to thank the sponsors and exhibitors for their support. The next Nuclear Structure meeting will be hosted by Lawrence Berkeley National Laboratory in 2020. The chair of Nuclear Structure 2020 is Heather Crawford.

FRIB video, animation available as resources



A new video (above) highlights FRIB from its conception to its future, and features an animation showing how rare isotopes are created.

The Facility for Rare Isotope Beams has a number of resources available for FRIB users, including a new video (shown above) that gives a high-level overview of FRIB, from its conception to its future.

There are two versions of this FRIB informational video available online. For downloadable files, please contact FRIB Communications.

• The Facility for Rare Isotope Beams (FRIB) at MSU: This is a short video created by MSU that explains FRIB to a general audience. It is available on YouTube.
• FRIB animation: This is the animated segment of the above video. It is available on YouTube.

Additional resources for users are available on the FRIB website, including the FRIB logo and current FRIB graphics.

Multi-institutional CENTAUR develops next-generation leaders in low-energy nuclear and stewardship science

by Lauren Heilborn and Sherry Yennello, Texas A&M University

The Center for Excellence in Nuclear Training And University-based Research (CENTAUR) is a new multi-institutional effort supported by a Stewardship Science Academic Alliances (SSAA) grant from the Department of Energy's National Nuclear Security Administration (DOE/NNSA). The center's university partners are Texas A&M University, Florida State University, Washington University in St. Louis, the University of Washington, Louisiana State University, and the University of Notre Dame. Scientists from Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Pacific Northwest National Laboratory are also involved, resulting in new collaborations and exciting opportunities for students and post-doctoral researchers.

CENTAUR participants pursue basic research relevant to the NNSA mission in low-energy nuclear science through collaborative experimental, theoretical, and technical programs using accelerators at Texas A&M's Cyclotron Institute and Florida State University's John D. Fox Superconducting Linear Accelerator Laboratory as well as facilities at the

other participating institutions. Students receive broad training in low-energy nuclear science with an emphasis on stockpile stewardship relevant topics to develop the next generation of leaders in low-energy nuclear and stewardship science. Many CENTAUR members will be FRIB users; all are working on FRIB-related science goals.

To learn more about CENTAUR, from current research programs to currently available graduate student and postdoctoral positions, visit the website.

FRIB-Theory Alliance bridge faculty and fellow searches

by Jorge Piekarewicz, Florida State University

The FRIB Theory Alliance (FRIB-TA) continues its commitment to the growth of the field by creating permanent theory positions across the country as well as attracting young talent through the national FRIB Theory Fellow Program.

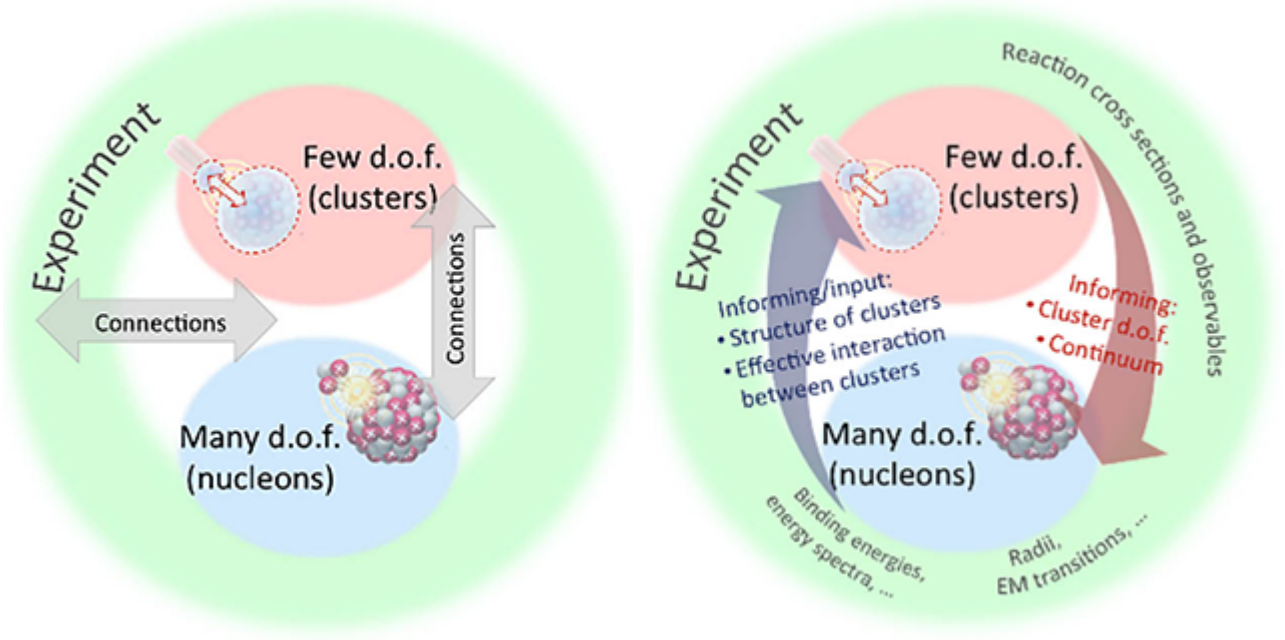
Following the successful hire of the first two bridge faculty — Saori Pastore and Maria Piarulli at Washington University in St. Louis — a call was made to universities and national laboratories interested in partnering with the FRIB-TA. Strong proposals were received from five institutions and, after careful deliberation, North Carolina State University was selected as the host institution for the second FRIB Theory Bridge Faculty position.

Significant progress has also been made in the FRIB Theory Fellows program. After a call was made to institutions interested in partnering with FRIB-TA, four institutions responded to the call: Argonne National Laboratory, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, and Ohio University. A job posting has been sent out, and FRIB-TA trusts that many outstanding candidates will apply for the position. The application deadline was 12 October.

Visit the FRIB-TA website for more information.

FRIB Theory Alliance topical program 2018 held 11-22 June

by Calvin Johnson, San Diego State University, and Kristina Launey, Louisiana State University



An FRIB Theory Alliance topical program 2018 ("From bound states to the continuum: Connecting bound state calculations with scattering and reaction theory") was held at FRIB from 11-22 June.

An FRIB Theory Alliance (FRIB-TA) topical program ("From bound states to the continuum: Connecting bound state calculations with scattering and reaction theory") was held at FRIB from 11-22 June 2018. Organized by Calvin Johnson (San Diego State University), Kristina Launey (Louisiana State University), Pierre Descouvmont (Université libre de Bruxelles), Dean Lee (MSU), Marek Płoszajczak (GANIL), Sofia Quaglioni (Lawrence Livermore National Laboratory), and Jimmy Rotureau (MSU), there were 35 participants, divided among 13 few-body techniques and 22 many-body techniques.

The program had talks in the morning and early afternoon, with time for discussions and break-out sessions, as well as a useful discussions with an experimentalist (NSCL Associate Director for Experimental Research Remco Zegers).

The goals of the workshop were to:

• establish connections among different areas, as well as theory to experiment,
• further develop theory needed to address FRIB science, and
• get individual researchers and research groups involved.

In the talks and discussions, attendees recognized current challenges, e.g.:

• use of localized basis in many bound-state calculations;
• addressing non-resonant continuum, collectivity and clustering;
• the need for reliable effective inter- cluster interactions; and
• the importance of accurate reproduction of thresholds and asymptotic behavior of nuclear wave functions.

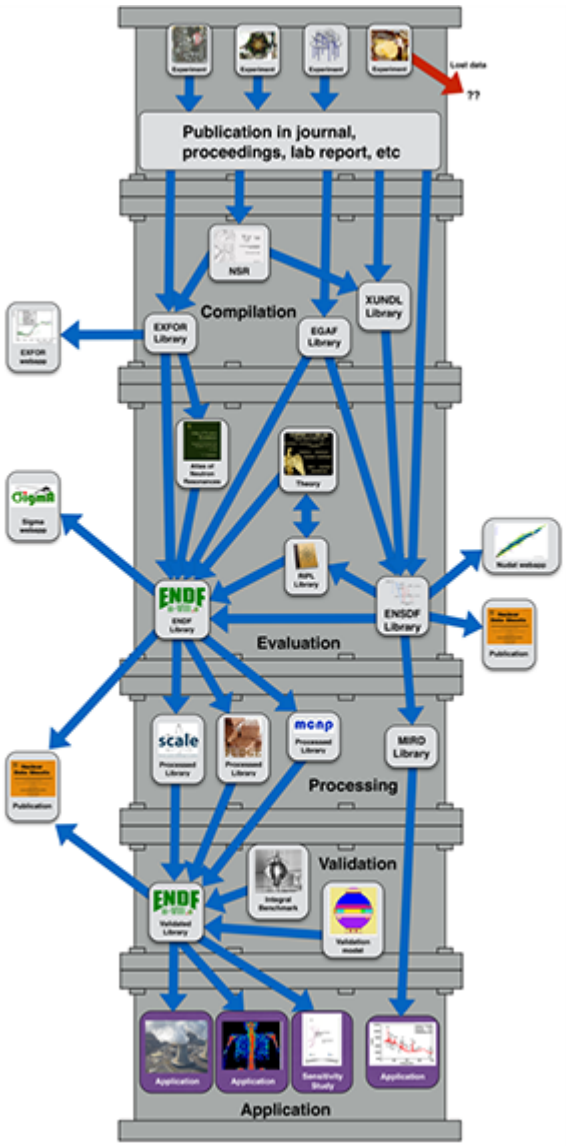
The group also:

• determined detailed connections between few- body and many-body methods;
• emphasized observables are measured in experiments, avoiding comparison to deduced quantities; and
• initiated a paper summarizing the talks and discussions (to be published in J. Phys. G in 2019).

The talks can be found online.

FRIB era brings new challenges for community and United States Nuclear Data Program

by Elizabeth McCutchan, David Brown, and Alejandro Sonzogni, Brookhaven National Laboratory



The United States Nuclear Data Program conducts a rigorous appraisal of data as it passes through a nuclear data pipeline (pictured above). Click on the image to see a full-sized version.

The goal of the United States Nuclear Data Program (USNDP) is to provide the most reliable nuclear data available to scientists and engineers working in academic research, national security, isotope and energy production, and in a wealth of other applications.

This task is accomplished by a rigorous appraisal of data as it passes through a nuclear data pipeline. The distillation of knowledge generally begins with the publication of data in the form of journal publications, laboratory reports, and conference proceedings.

The end product of this process is collected in our flagship databases: the Evaluated Nuclear Structure Data File (ENSDF) and the Evaluated Nuclear Data File (ENDF). Many quality assurance checks are run on the recommended data. Finally, data are disseminated to the users both through our very popular web-based applications (www.nndc.bnl.gov) and also through our traditional printed material. The USNDP is actively working to improve each of the steps in this nuclear data pipeline. In March 2018, a pilot project between USNDP and Physical Review C was initiated which facilitates a discussion between researchers and the data evaluation community prior to refereeing of an article. Upon submission of an experimental nuclear structure or decay data manuscript, authors now have the option to have their data sent to the USNDP for data consistency checking. With our suite of evaluation programs, and our intimate knowledge of all the data in the literature, the USNDP can help identify any inconsistencies, check the calculation of derived quantities, verify the citation of literature values, and provide suggestions for data presentation. This process is designed solely to improve the quality of the data published in the literature and should not be considered as an extra refereeing step.

The FRIB era will bring new challenges for the community and for the USNDP. We will need to be flexible in our approach going forward as there will be new data and changes that must be rapidly implemented into the data bases. We are asking for assistance from the entire FRIB community to help in re-defining our ENSDF evaluation priorities. Input from the FRIB community on which nuclei are of the highest importance in designing FRIB experiments and/or testing new theories is very important to us and we encourage users to make use of our Request an Evaluation form available on the NNDC website. Additionally we want an open dialog between the FRIB user community and the USNDP about the dissemination of nuclear data. For example, the recent addition of plotting capabilities in our NuDat application and improved pdf versions of ENSDF evaluations were both driven entirely based on feedback and suggestions from users.

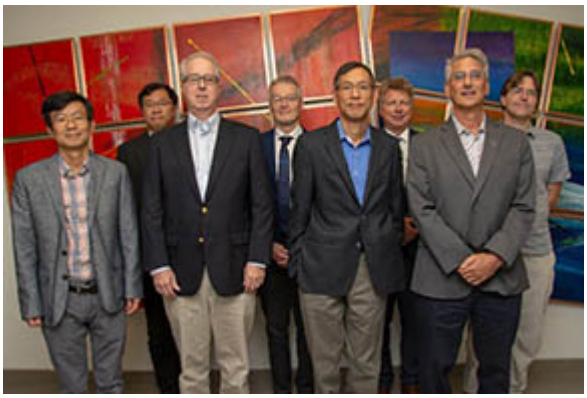
The key factual information is formatted, filtered and entered into the appropriate data bases: initially and rapidly into Nuclear Structure References (NSR) where nuclear physics articles are indexed according to title, authors and keywords, and then into the EXFOR (nuclear reactions) or XUNDL (nuclear structure) data bases, which tabulate and critically combine the results from each individual paper. The data are then evaluated by combining all information into final "recommended values" and their associated uncertainties.

Earlier this year saw the release of the new ENDF/B-VIII.0 library, the United States' primary source of nuclear reaction data which is used in simulations of nuclear systems and which underpins Monte Carlo simulation codes like MCNP and GEANT. Major advances include updated evaluated data for light nuclei, structural materials, actinides, fission energy release, prompt fission neutron and gamma-ray spectra, thermal neutron scattering data, new Neutron Data Standards, updated decay data for reactor antineutrinos and charged-particle reactions. The evaluations benefit from recent experimental data obtained both in the U.S. and Europe, and improvements in theory and simulation, notably input from members of the USNDP who develop the EMPIRE, CoH and FRESCO reaction codes. The library is detailed in a series of articles in the March 2018 issue of Nuclear Data Sheets.

REVIEW ROUNDUP

ASAC review completed 2-4 October

by Jie Wei, FRIB



The ASAC Review Committee: (back row, from left) Yuke Tian, Bob Laxdal, Soren Prestemon, Kay Kasemir; (front row, from left) Sang-ho Kim, Stuart Henderson, Yatming Roberto Than, John Galambos. Not photographed: Thomas Roser.

The Accelerator Systems Advisory Committee (ASAC) held its eighteenth meeting 2-4 October.

ASAC focused on the progress of FRIB's Accelerator Systems Division (ASD) in the last six months. Progress included:

- effort toward delivery of the baseline,
- technical design verification,
- technical procurement progress,
- installation and commissioning planning,
- and operational planning.

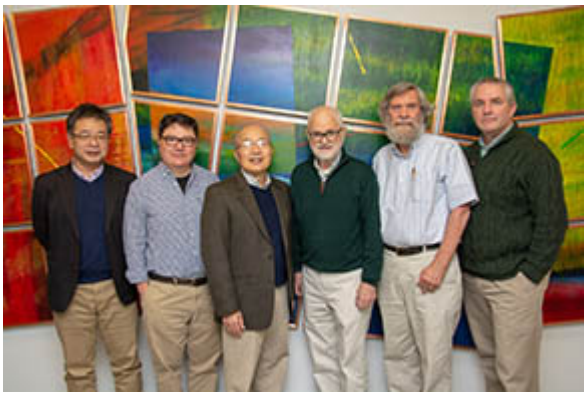
The committee answered all charge questions affirmatively, and recognized several achieved goals, including:

- keeping a completion rate of more than one cryomodule per month,
- liquid-helium production by the FRIB cryoplant,
- continuous circulation of liquid lithium and establishment of lithium film in the charge stripper,
- and demonstration of the machine-protection system.

The committee also supported the advancement of liquid-lithium beam commissioning.

ESAC review completed 16-18 October

by Georg Bollen, FRIB



The ESAC review committee from left to right: Hiroki Okuno, Patrick Hurh, I-Yang Lee, Jerry Nolen, Dave Harding, and Jim Kerby. Not pictured: John Post.

The Experimental Systems Advisory Committee (ESAC) held a review of FRIB experimental systems 16-18 October.

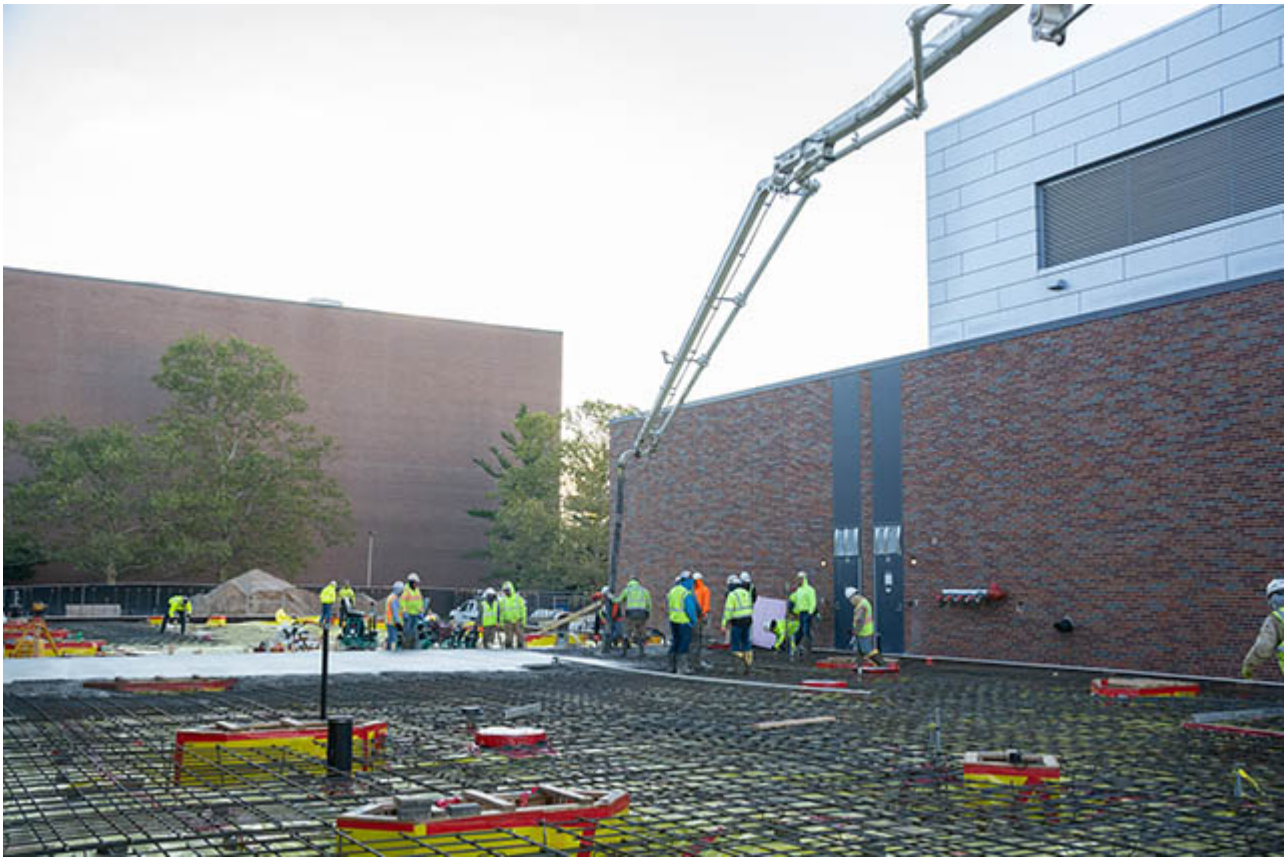
The focus of the review was to assess whether experimental systems scope is being managed to deliver the baseline with a high likelihood of success, and whether technical design verification, technical, and environmental issues are being addressed appropriately.

In addition, the progress in the planning for the A1900 and transfer hall reconfiguration was reviewed. All charge questions were answered in the affirmative.

ESAC found that with the changes in technical management and the availability of an integrated schedule through the end, appropriate progress is being made. ESAC provided a number of recommendations and advice, including making effective use of the schedule now available and fully developing acceptance criteria and test plans for the remaining scope.

Construction continues on two FRIB building additions

by Jessica Kolp, FRIB



Construction continues on the MSU-funded Cryogenic Assembly Building (CAB) at FRIB. The first CAB concrete slab was placed in October.

Construction continues on two new MSU-funded additions to the laboratory that will expand FRIB's discovery potential and enable isotope harvesting.

The 31,000-square-foot High Rigidity Spectrometer (HRS) and Isotope Harvesting Vault will house research equipment for isotope harvesting and provide experimental space for the FRIB science program. Existing utilities have been rerouted around the HRS construction site, including the temporary support system for the cryogenic lines which will remain in place. The existing building and utilities have been demolished. The deep foundations are underway and progressing on schedule. The addition is scheduled to be completed in October 2019.

The 14,000-square-foot Cryogenic Assembly Building (CAB) adjacent to the existing Superconducting Radio Frequency Highbay will enable cryomodule maintenance and cryogenic engineering research. FRIB's current cryomodule assembly space will become research space for the reaccelerated beam program when FRIB cryomodule production completes in 2019. Underground electrical and mechanical work is complete. The first CAB concrete slab was placed in October along the west side of the site. Steel installation will begin in early November. CAB is scheduled to be completed in August 2019.

Contributors this issue

- Rich Bennett
- David Brown
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- Lauren Heilborn
- Calvin Johnson
- Takuji Kanemura
- Jessica Kolp
- Kristina Launey
- Sean Liddick
- Steve Lidia
- Elizabeth McCutchan
- Jorge Piekarewicz
- Brad Sherrill
- Alejandro Sonzogni
- Jie Wei
- Sherry Yennello

LOOKING AHEAD

6-8 November DOE Office of Project Assessment Review of FRIB

The FRIB Laboratory Update for Users is published by the FRIB Laboratory and distributed via email.
Please email questions, comments, and contributions to communications@frib.msu.edu.

Facility for Rare Isotope Beams | Michigan State University | 640 South Shaw Lane | East Lansing, MI 48824 | (517) 355-9672 | frib.msu.edu

Michigan State University is establishing FRIB as a scientific user facility for the Office of Nuclear Physics in the U.S. Department of Energy Office of Science.