

FRIB PROJECT

UPDATE FOR USERS

AUGUST 2014

Civil Construction Steams Ahead; Linear Accelerator Tunnel Takes Shape with Giant Concrete Placement

Story contributed by Brad Bull, Conventional Facilities and Infrastructure Division Director

Civil construction is rolling along on the project site, with various significant milestones achieved in the past several months.

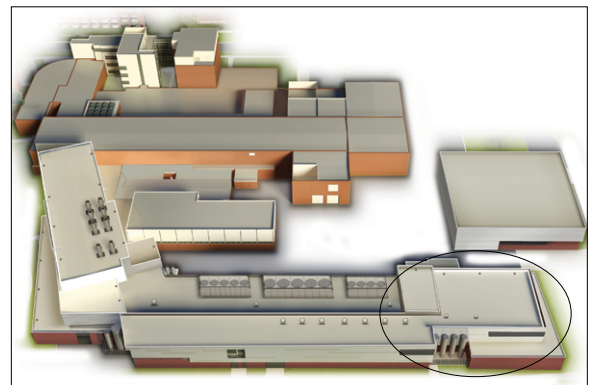
In mid-July, the first structural concrete was placed for the floor of the linear accelerator tunnel. A team of 24 workers placed 1,400 cubic yards of concrete, starting around 3 a.m. and finishing around 8 p.m. One-hundred-forty truckloads of concrete were required to complete the task. It was the first of four large concrete placements required to complete the tunnel floor, which is 1,500 feet long and 70 feet wide.



Derrick L. Turner/Michigan State University Communications and Brand Strategy

The concrete placement marked the most “solid” progress on FRIB since site excavation began on March 3. With the goal of reducing project risk by turning over the conventional facilities earlier than planned in the project baseline, the Conventional Facilities and Infrastructure Division re-sequenced its construction schedule to start excavation simultaneously on both ends of the site.

Following the excavation start, more than 1,000 participants gathered at the ceremonial groundbreaking on March 17 to mark an important step in bringing FRIB closer to reality. Among the participants were members of the FRIB Users Organizations, DOE Deputy Undersecretary for Science and Energy Michael Knotek and DOE-SC Associate Director Tim Hallman representing the DOE-SC Nuclear Physics program, members of the Michigan Congressional delegation, representatives from the State of Michigan and leaders from Michigan State University led by MSU President Lou Anna K. Simon.



Top: Workers place concrete for the floor of the linac tunnel. Above: As a point of reference, the circled region in the rendering of the completed FRIB shows where the concrete was placed.

Follow along with FRIB progress by checking the construction camera at frib.msu.edu.

SRF Highbay Completed and Ready for Science

Story contributed by Brad Bull, Conventional Facilities and Infrastructure Division Director

The MSU-funded SRF (superconducting radio frequency) Highbay is complete and was turned over for use on May 1. The FRIB civil construction project team delivered the highbay while awaiting the start of construction for the FRIB Project, enabling a dress rehearsal of sorts for FRIB construction. The highbay project exercised the project team, refined interfaces, and modeled the integration of technical equipment into civil construction, all of which will benefit construction of FRIB.

The \$15.5-million, 27,000-square-foot high bay houses a cleanroom for coldmass assembly, space for incoming accelerating structures (cavity) quality assurance and inspection, a cavity hydrogen de-gassing furnace, cavity-processing and cold-mass assembly facilities, power-coupler conditioning, vertical-cavity test area, cryomodule test facility, test facility control room, and cryogenic systems. This will yield an integrated and consolidated base for superconducting cavity and cold-mass production as well as cavity and cryomodule test efficiency.

As of August 1, project team members have moved in and have started installing processing equipment. The clean room is operational, including chemical-etching equipment, and the degassing furnace has been moved over from the south highbay. Additionally, the ultra-pure water systems and chemical scrubber are installed and operational while the installation of water for the cryogenic plant, compressed air and stainless steel cryo-piping is underway.



The DOE-SC Office of Project Assessment team at the June review.

FRIB Ready for Technical Construction (CD-3b)

Story contributed by Thomas Glasmacher, FRIB Project Manager

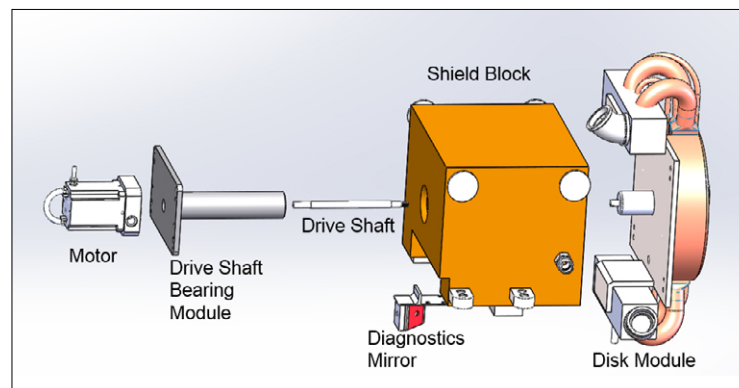
In June, the DOE Office of Science, Office of Project Assessment concluded its review of the FRIB Project and recommends to the DOE Office of Science, Office of Nuclear Physics that FRIB is ready for technical construction (CD-3b). The review committee was organized into eight subcommittees and FRIB staff gave 45 presentations.

Packing it Right: Optimizing Design to Dispose of Radioactive Waste

Story contributed by Georg Bollen, Experimental Systems Division Director

The FRIB high-power targets used to fragment the primary beam into rare isotopes are designed to have a lifetime of about two weeks if operated using the 400-kW full power heavy-ion beam provided by the driver linac. These targets are sets of rapidly rotating graphite disks surrounded by a water-cooled copper heat shield. The power lost in the target, up to about 100 kW, is transferred by thermal radiation. Once the target disk module has exceeded its lifetime it is highly activated and needs to be disposed of.

The baselined conceptual design for disposal was to put the complete target modules into a large, heavily shielded radioactive waste cask for transport to a disposal site. Up to three complete target modules would have fit into



The target-disk module will reduce operations costs. Nine of the target disk modules can fit in a commercial-waste transportation cask.

such a waste cask. The expected waste-handling costs per cask are in excess of a quarter million dollars, leading to considerable total cost of ownership in future FRIB operation.

To reduce operations costs, the target design has been optimized during final design. The optimized

design will make it possible to remove only a compact target-disk module from the iron shield protecting the drive motor, which is expected to have a longer lifetime than the target itself. The figure above shows the modularized target. Nine target disk modules can be stacked in a commercial-waste transportation cask.

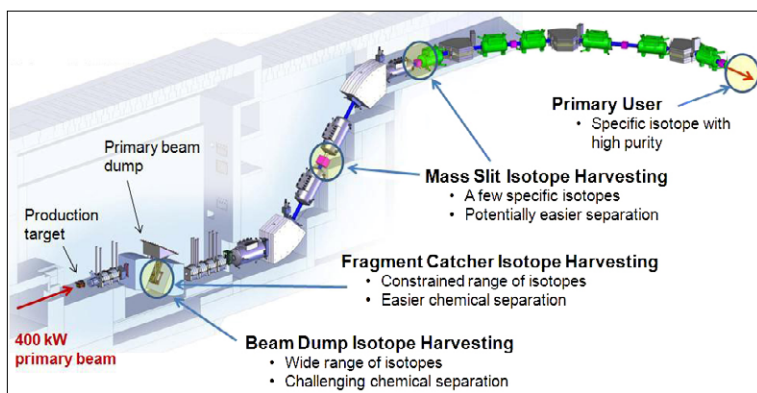
FRIB Design Offers Isotope-Harvesting Opportunities

Story contributed by Georg Bollen, Experimental Systems Division Director

FRIB will simultaneously produce a very large number of different rare isotopes that are available from the production target. FRIB's three-stage fragment separator will select the rare isotope of interest to deliver only one or a few isotopes through the beam line system to the primary user. Those isotopes not transmitted through the separator will be stopped in mass slits or fragment catchers. Furthermore, the portion of the heavy-ion primary beam that does not react in the target will be stopped in a water-filled beam dump, where more isotopes will be produced.

The FRIB design provides future opportunities to harvest these isotopes. The design provisions include space for harvesting equipment in the target facility, the possibility to tap into the cooling-water loop for the primary beam dump and the first set of water-filled fragment catchers, and space for ion catchers. These can intercept off-axis rare isotopes at slit positions in the fragment separator and produce a low-energy rare isotope beam in commensal mode of FRIB operation. Also included in the design is the possibility to later collect gaseous rare isotopes that are produced in the charge-state selectors after the lithium stripper in the FRIB linac. An off-gas line from the charge-state selector to the hot off-gas treatment room in the target building is foreseen.

With FRIB's design, the portion of the heavy-ion primary beam that does not react in the target will be able to be harvested in the beam-dump area.



FRIB Project Welcomes New Chief Scientist

Story contributed by Brad Sherrill, FRIB Laboratory Chief Scientist

The FRIB Project heartily welcomes FRIB Chief Scientist Witek Nazarewicz as he is set to begin his appointment on August 16. Witek has been a central figure in developing the scientific vision for rare isotope science and has served on many international advisory committees, including the most recent National Research Council Decadal Study in Nuclear Science. He is excited about the challenge and looks forward to leading the establishment of a vibrant FRIB Theory Center and helping the FRIB users realize the full scientific potential of FRIB. His role will be to articulate the scientific opportunities with FRIB, advise the laboratory director and project director on issues related to science, and to represent FRIB capabilities to the broader scientific community. He will work closely with Brad Sherrill, who as associate director for users, will work with the user community and assist users in mounting their programs.

Town Meetings Set for Low Energy Nuclear Physics and Nuclear Astrophysics

Story contributed by Brad Sherrill, FRIB Laboratory Chief Scientist

The Joint Nuclear Physics Town Meetings for Low Energy Nuclear Physics and Nuclear Astrophysics will be held at the Mitchell Institute at Texas A&M University August 21-23. These town meetings are important parts of the U.S. Long Range Planning process in nuclear science and afford members of the nuclear science community input in the process.

Completion of FRIB and the suite of equipment that is needed to realize FRIB's scientific promise, along with recognition of future upgrade possibilities, will be important considerations in the Long Range Plan and will be discussed at the town meetings. To this end, FRIB Project Manager Thomas Glasmacher will present FRIB status and Michael Smith, the chair of the FRIB Users Organization, will present major FRIB equipment initiatives. All users are invited to participate and provide input in 15 working group sessions.

For more FRIB news and events, visit frib.msu.edu.