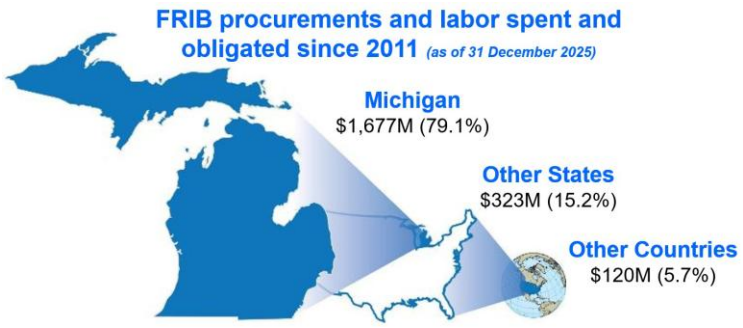
Addressing State, National Priorities

Michigan State University (MSU) operates the Facility for Rare Isotope Beams (FRIB) as a user facility for the U.S. Department of Energy Office of Science (DOE-SC), with financial support from and furthering the mission of the DOE-SC Office of Nuclear Physics. FRIB is the only accelerator-based DOE-SC user facility on a university campus. User facility operation is supported by the DOE-SC Office of Nuclear Physics as one of 28 DOE-SC user facilities.

Economic Impact in Michigan

FRIB is a DOE-SC user facility for nuclear science with benefits to medicine, materials science, national security, and industry. FRIB has spent and obligated over $2 billion in procurements and labor since January 2011, with $1,667 million (more than three-quarters) in Michigan, and 94 percent in the United States. FRIB uses a best-value procurement approach as required by federal regulations. Michigan has proven to be a great resource, and a strong regional skilled workforce supported civil construction.



FRIB Adds Value to Nation

Isotope Harvesting Benefits Society

Rare isotope harvesting provides additional discovery opportunity. During routine operation for its nuclear physics mission—without interfering with FRIB's primary users—extra, unused isotopes can be "harvested." Rare isotopes have a role in multiple fields of study, such as medicine, biochemistry, materials science, horticulture, and astrophysics. Isotope harvesting at FRIB is recommended by the Nuclear Science Advisory Committee Isotopes Subcommittee, a federally chartered advisory committee to DOE. The DOE Isotope Program provided funding for FRIB's isotope harvesting project, to establish the capability and now supports operations and research. The project was completed in December 2024.

Enabling World-Leading Discoveries

FRIB transforms the nuclear science landscape by providing intense beams of rare isotopes (short-lived nuclei not normally found on Earth).

FRIB enables scientists to make discoveries advancing our knowledge of the physics of atomic nuclei, nuclear astrophysics, fundamental interactions, and practical applications of rare isotopes benefiting society in fields such as medicine, materials science, national security, and industry.

FRIB is oversubscribed and can only accommodate a third of all requested beam time due to the large interest. Published results are available at frib.msu.edu/publications.

Approximately 1,800 scientific users are engaged in FRIB science and instrumentation. They organized themselves in an independent FRIB Users Organization (fribusers.org).

Nuclear Science Leadership

Discoveries at FRIB will transform our understanding of nature. FRIB addresses science's most important questions related to the stability, composition, reactions, and applications of atomic nuclei.

FRIB provides researchers with more than 1,000 new rare isotopes never before produced on Earth.

This enables researchers to answer key scientific questions, ranging from the origins of stars and the universe to how to diagnose and cure diseases, optimize nuclear reactors, and destroy nuclear waste. FRIB has the potential to enable major discoveries.

Learn more at frib.msu.edu

Michigan State University (MSU) operates the Facility for Rare Isotope Beams (FRIB) as a user facility for the U.S. Department of Energy Office of Science (DOE-SC), with financial support from and furthering the mission of the DOE-SC Office of Nuclear Physics.

FRIB Expertise Applied to Address National Need for Chip Testing

FRIB supports U.S. industry by addressing the national shortage of microelectronics testing. Its heavy-ion facilities—FRIB Single Event Effects Facility (FSEE) and K500 Chip Testing Facility (KSEE)—test chips used in spaceflight, wireless tech, and autonomous vehicles. These facilities provide high-energy heavy-ion beams that allow testers to estimate, within minutes, the likelihood of malfunctions or failures caused by decades of cosmic ray exposure on electronic components. With existing facilities oversubscribed, FSEE offers up to 2,000 user hours per year, and KSEE offers up to 6,000 user hours per year. The federal government funded MSU to establish KSEE by repurposing the world's first superconducting cyclotron, built at MSU in the 1980s. Student opportunities through the MSU Space Electronics Initiative, launched by FRIB and the MSU College of Engineering, position MSU as a national leader in chip design and testing and help develop the U.S. workforce in these fields.

FRIB Research and Student Training Support National Security

Students gain valuable career perspective through hands-on experience at FRIB, where they engage in cutting-edge research supported by the DOE-SC and the National Nuclear Security Administration. Through programs like the Nuclear Science and Security Consortium and the Stewardship Science Academic Alliance, students explore pathways in nuclear science that directly contribute to national security and prepare them for future success in the Nuclear Security Enterprise.

FRIB isotope harvesting supports national security efforts. FRIB can harvest many of the rare isotopes that are produced when nuclear weapons are detonated. By studying their properties, FRIB can provide essential data for post-detonation nuclear forensics. FRIB data can also be used to inform science-based stockpile stewardship. FRIB's isotope harvesting laboratory is one of the few places in the world where students can get hands on training with many of the techniques and tools that are essential for nuclear forensics.

Innovation and Economic Engine

FRIB supports multi-disciplinary collaboration, affords opportunities to generate new intellectual property, and stimulate external investment. FRIB enables scientists to perform research and further development in industry and in the national interest. Past discoveries in nuclear science have enabled important advances in medical technology, like MRI and PET machines, smoke detection in homes, and cell-phone technology. FRIB provides leadership in applying accelerator technology to the sciences and developing technology required to operate the most powerful superconducting, heavy-ion accelerator. Strategic capabilities include low-beta superconducting radiofrequency particle acceleration and large-scale high-efficiency helium liquefaction. FRIB will also provide economic benefits as a research destination and improve quality of life for Michigan residents through discoveries with medical and industrial applications. FRIB will attract important private-sector economic development, as has happened around other national labs. MSU works closely with local economic developers to ensure awareness of FRIB and its potential.

Providing Workforce Development

FRIB is the only accelerator-based DOE-SC user facility on a university campus for students studying accelerator science, cryogenic engineering, and radiochemistry, all areas identified in federal advisory panel reports as in short supply for the nation, and critical to U.S. economic competitiveness, energy security, nuclear security, and nonproliferation efforts.

FRIB, the Department of Physics in the MSU College of Natural Science, and the MSU College of Engineering offer graduate education programs in accelerator science and engineering to contribute to the workforce in areas of national need. Training the next generation of U.S. science and technical talent at a world-unique campus-based DOE-SC user facility is a unique experience and a top priority at FRIB. FRIB is a magnet for top students in nuclear science.

MSU's nuclear physics graduate program is a top-ranked program nationally, according to U.S. News & World Report. MSU awards 15 percent of nuclear physics doctorate degrees*.

FRIB is a top facility for students studying nuclear science, accelerator physics, cryogenic engineering, and radiochemistry, all areas identified in federal advisory panel reports as in short supply for the nation, and critical to U.S. economic competitiveness, energy security, nuclear security, and nonproliferation efforts.

FRIB collaborates with the MSU College of Natural Science and the MSU College of Engineering to attract the best and brightest students into accelerator science and engineering.

** Based on National Science Foundation National Center for Science and Engineering Statistics (NCSES) Survey of Earned Doctorates between 2018 and 2023*

For More Information

Contact FRIB Senior Communications Manager Karen King

- communications@frib.msu.edu
- (517) 908-7262

MICHIGAN STATE UNIVERSITY

U.S. DEPARTMENT of ENERGY | Office of Science

FRIB