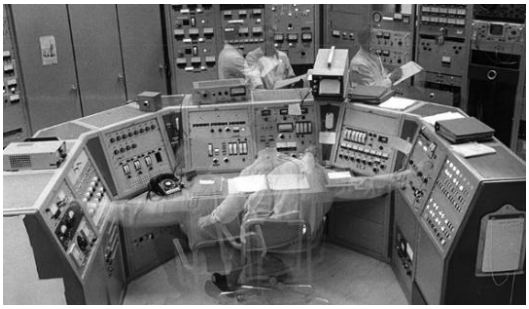
History

Over 60 Years of Accelerator-Based Nuclear Science, Serving MSU and Nation (1958-Present)

The development of Michigan State University's (MSU) prowess in nuclear physics began when MSU President John A. Hannah seized upon the idea that developing a major program in physics could be a cornerstone of his strategy for growth and diversification of the university. In 1958, Henry Blosser came to MSU to build a uniquely powerful cyclotron. Blosser assembled a remarkable team, and together they succeeded in designing, building, and funding **MSU's first cyclotron, the K50, completed in 1965** and used for nuclear physics research with proton beams.

MSU Cyclotron Laboratory (circa 1960s)



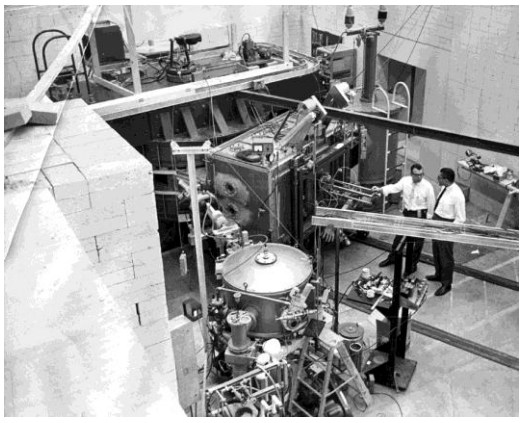
Operating the K50 (circa 1970s)

This launched a tradition not only of academic excellence in nuclear physics but of visionary anticipation and response to the quickly advancing frontiers of nuclear science. While **1965-1979 was the K50 era at MSU**, by 1973 Blosser and his team were already envisioning what would be required next.

They soon began working on acquiring funding, designing, and preparing to build a superconducting magnet, which was the cornerstone for the next generation cyclotron, the K500. **In 1977, the successful test of a superconducting magnet** confirmed the viability of the K500, marking the start of its steady progress toward completion.

Funded by the National Science Foundation (NSF), **completion of the K500 in 1982** initiated the superconducting cyclotron era, and the MSU Cyclotron Laboratory became a national user facility for research with heavy ions.

Long before the K500 was complete, the team was planning the next generation, a coupled superconducting cyclotron system which would add a K1200 post-accelerator to the K500. Their proposal was selected in **1978 by the newly created Nuclear Science Advisory Committee (NSAC) to NSF and the U.S. Department of Energy (DOE) for development as the National Superconducting Cyclotron Laboratory (NSCL)**. The steel for the K500 and K1200 magnets was produced at the Bay City Foundry in Bay City, Michigan.



National Superconducting Cyclotron Laboratory (circa 1980s)

The **K1200 was completed in 1988** and by **1990 was operating with the A1200 fragment separator** to produce beams of rare isotopes through inflight fragmentation of heavy-ion beams. Plans were already in motion that led in **2001 to the coupled cyclotron facility with the A1900 fragment separator**—the most powerful rare isotope facility.

In 2005, the **Low Energy Beam and Ion Trap (LEBIT) facility began operation** at NSCL, making ultra-precise measurements of rare isotopes and developing laser methods to study their nuclei.

In 2014, the ReAccelerator facility ReA3 at NSCL began reaccelerating rare-isotope beams, marking a major step in enabling scientists to study the building blocks of matter at low energies. Building on this success, **ReA6 achieved its first beam acceleration in 2021**, ushering in a new era of discovery with higher beam energies and expanded research opportunities.

NSCL operated as an NSF user facility for four decades. In May 2022, the final NSCL experiment was completed, nearly 40 years after the first NSCL experiment in September 1982.

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.

History of FRIB (since 2008)

Since the early 1990s, nuclear physicists had been discussing the need for a facility to produce intense beams of rare isotopes.

An NSAC taskforce presented its recommendations on how to proceed to the NSF and DOE in 1999. It closely reflected a plan for rare isotope beam production proposed by MSU.

Facility for Rare Isotope Beams groundbreaking (2014)

The NSCL leadership and scientists saw this as their next opportunity and immediately began developing detailed design plans. By year's end, they made a presentation to NSF and DOE on the benefits of siting the new facility at MSU, which included a proposal for in-flight fragmentation. After a rigorous competition, **the DOE Office of Science (DOE-SC) awarded the Facility for Rare Isotope Beams (FRIB) to MSU in 2008**.

In May 2009, construction began on FRIB. The partnership to create, build, and operate the $730 million FRIB has delivered a world-unique DOE-SC user facility that ensures the nation's continued competitiveness in nuclear science through provision of unprecedented discovery potential.

FRIB was technically completed in January 2022, on budget and ahead of the planned completion (Critical Decision 4) in June 2022. **User experiments commenced in May 2022**. FRIB hosts scientists who conduct experiments, extend the frontier of nuclear science, and help define the next frontier and the next reinvention needed to reach and transcend it.

Since 2020, the **DOE Isotope Program** has 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.**

In **2022, FRIB opened the FRIB Single Event Effects (FSEE) Facility**, which uses energetic and penetrating heavy-ion beams to measure the response of electronic components to such ions.

DOE-SC awarded a cooperative agreement to **establish and operate the High Rigidity Spectrometer (HRS) at FRIB in 2023**. HRS will have a significant benefit for FRIB's scientific program, extending the scientific reach to neutron-rich isotopes by a combined production-rate and luminosity increase of up to a factor of up to 100.

Facility for Rare Isotope Beams (2022)

K500 Chip Testing Facility (2025)

In 2023, the federal government funded MSU to establish the K500 Chip Testing Facility at FRIB, which supports the refurbishment of the world's first superconducting cyclotron—built at MSU in the 1980s—into a heavy-ion chip testing facility.

In **2024,** the MSU Board of Trustees authorized construction of a **highbay addition to the K500 Chip Testing Facility (KSEE)**.

KSEE was completed in 2025, providing additional national capability for chip testing. FRIB offers up to 6,000 hours per year.

MSU's International Standings

MSU is a member of the Association of American Universities, an organization of 71 American research universities; ranks 29th among public universities and 64th overall out of nearly 1,700 United States colleges and universities in the 2026 *U.S. News & World Report* "Best National Universities" ranking; and ranks 105th out of nearly 1,800 universities in the world in the 2026 Times Higher Education World University Rankings.