National Superconducting Cyclotron Laboratory (NSCL) is the leading rare isotope research facility in the United States, serving a user community of more than 1300 scientists from the U.S. and abroad.

Research Capabilities
NSCL is home to two superconducting cyclotrons that can accelerate all elements to an energy of up to 160 MeV/u. Beams from these cyclotrons are used to create beams of rare isotopes for research purposes. To date more than 1000 isotopes have been produced and used for experiments. A new capability to stop and reaccelerate rare isotopes is under development.

World-leading science
The National Science Foundation (NSF) currently provides more than $20 million each year to operate NSCL as a national user facility. NSCL users are represented by the 1300+ member strong FRIB user organization (fribusers.org) and are granted research time based on recommendations from a Program Advisory Committee. Scientists use isotopes produced at NSCL to better understand the universe, to probe the forces that bind neutrons and protons into nuclei, how the elements on earth were made in the cosmos, and to determine which ones could be used to benefit society. The accelerators are also used to study radiation damage in physical and biological systems, single-event upsets, and production of isotopes. NSCL is home to an accelerator science program that addresses fundamental challenges from ion sources to the generation of high fields for acceleration.

World-class education
NSCL is the largest campus-based nuclear science facility in the country. MSU students at NSCL have outstanding opportunities to pursue research at a national laboratory within a major research university.

- Over 130 students are employed at the laboratory, with access to top-level research and education.
- The U.S. News and World Report ranks MSU at the #1 graduate program in Nuclear Physics.
- MSU awards 10% of the nation’s nuclear science doctorates.
Research at NSCL

NSCL hosts research programs on a wide array of topics spanning the broad realm of nuclear and accelerator science. The laboratory can produce a large variety of nuclei, including those with extreme proton-to-neutron ratios, for experiments that illuminate the structure of and the forces within the atomic nucleus. Researchers use the results to understand astrophysical phenomena such as the mechanisms behind supernovae and the creation of elements, and the interplay of strong, weak, and electromagnetic forces to test nature’s fundamental symmetries. The laboratory has world-leading expertise in accelerator physics and engineering, pushing the boundaries of ion sources, production targets, cryogenics and linear accelerators. nscl.msu.edu/scientists/research/areas/categories

Joint Institute for Nuclear Astrophysics

JINA is an NSF funded Physics Frontier Center at the University of Notre Dame, Michigan State University, and the University of Chicago. It provides an intellectual center that enables swift communication and stimulating collaborations between nuclear physicists and astrophysicists, while at the same time providing a focal point in the rapidly-growing and diversifying field of nuclear astrophysics. www.jinaweb.org

Facility for Rare Isotope Beams (FRIB)

The Facility for Rare Isotope Beams—a $680 million Department of Energy Office of Science national user facility under development at Michigan State University—will lead the world in advancing our understanding and application of nuclear science. FRIB will use a high-power superconducting linear accelerator to produce the widest range of isotopes ever available. FRIB’s establishment leverages significant investments made in the NSCL and commitments from Michigan State University and the State of Michigan. FRIB will open the door to new, unexplored frontiers in nuclear science and many other fields of research. Design efforts and construction continue towards desired operation by 2021. frib.msu.edu

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