

JEFFERSON LAB

Exploring the Nature of Matter



Thomas Jefferson National Accelerator Facility (Jefferson Lab) is a U.S. Department of Energy Office of Science national laboratory. Its primary mission is to enable basic research for building a comprehensive understanding of the atom's nucleus by scientists and students worldwide. In addition, the laboratory capitalizes on its unique technologies and expertise to perform advanced computing and applied research with industry and university partners.

SCIENTIFIC MISSION AND IMPACTS

The protons and neutrons within the atomic nucleus are assembled from

more than 1,500 scientists from more than 230 institutions and 30 countries flock to Jefferson Lab to conduct their research with CEBAF's unique and state-of-the-art facilities. From 1995 to 2012, nearly 200 experiments were completed at the laboratory. In fact, one-third of U.S. Ph.D.s in Nuclear Physics are based on research carried out at Jefferson Lab, with more than 531 Ph.D.s granted and 195 more in progress, helping to ensure continued U.S. leadership in this critical field. Scientists from more than 90 institutions across 34 states call

Jefferson Lab enables basic research into the heart of matter.

more fundamental subatomic particles called quarks and gluons. Jefferson Lab is home to one of the most powerful microscopes in the world for studying these subatomic building blocks: the Continuous Electron Beam Accelerator Facility (CEBAF). More

Jefferson Lab their scientific home to carry out their research and educate their students with the goal of improving our understanding of the building blocks of matter, and identifying the forces that transform it.



Quarks bound together by the strong force inside a nucleon.

ENTERING A NEW ERA OF SCIENCE

As the first large-scale application of superconducting radiofrequency technology, CEBAF opened up new avenues for exploration of the atom's nucleus near the end of the 20th century. It soon became clear that even more scientific advances would be made possible by an upgrade to higher energies. The recently completed \$338M 12 GeV Upgrade project has tripled the energy of the electron beams that enable research

with CEBAF, from its initial 4 billion electron-volts (GeV) to 12 GeV. The construction and now operation of the 12 GeV Upgrade is the highest priority of the U.S. Nuclear Physics Community, as evidenced in the Nuclear Science Advisory Committee's (NSAC) most recent Long Range Plan. Jefferson Lab is now poised to pursue its mission with even greater precision and reach, opening critical new directions for cutting-edge research in nuclear physics.

AN ASSET TO OUR COMMUNITY

Jefferson Lab also provides teacher and student programs designed to increase the number of teachers with a substantial background in math and

Jefferson Lab opens critical new directions for cutting-edge research in nuclear physics.

science and strengthen student motivation and preparation, particularly among minorities and females. These programs are widely recognized for benefiting at-risk students and populations underrepresented in the science, technology, engineering and math fields. More than 13,000 students and 1,200 teachers participate in STEM programs each year at Jefferson Lab.



Jefferson Lab capitalizes on its unique technologies and expertise to perform advanced computing and applied research with industry and university partners.

TECHNOLOGIES BENEFITING OUR NATION

In the pursuit of its science program, Jefferson Lab has developed a remarkable suite of technologies with value and impact that reach far beyond fundamental research. Jefferson Lab's accelerator expertise

has been central to the construction of major DOE scientific user facilities nationwide, and its advanced accelerator technology has applications for isotope production, the life sciences and materials science. Jefferson Lab scientists and engineers have been awarded more than 150 patents, primarily in the areas of accelerator technology, medical imaging, cryogenics and nanomaterials.

HIGHLIGHTS:

- Nearly 200 experiments have been completed at Jefferson Lab
- One-third of all nuclear science Ph.D.s awarded in the U.S. are based on Jefferson Lab research
- Jefferson Lab research has generated more than 150 patents
- Jefferson Lab STEM programs reach more than 13,000 students and 1,200 teachers each year

THOMAS JEFFERSON
NATIONAL ACCELERATOR FACILITY

12000 Jefferson Avenue, Suite 15,
Newport News, Virginia 23606
(757) 269-7100
jlabinfo@jlab.org • www.jlab.org

Jefferson Lab is managed and operated by Jefferson Science Associates, LLC, a joint venture between Southeastern Universities Research Association, Inc., and PAE.

