Probing Atomic Nuclei for Quark Effects

CHALLENGE

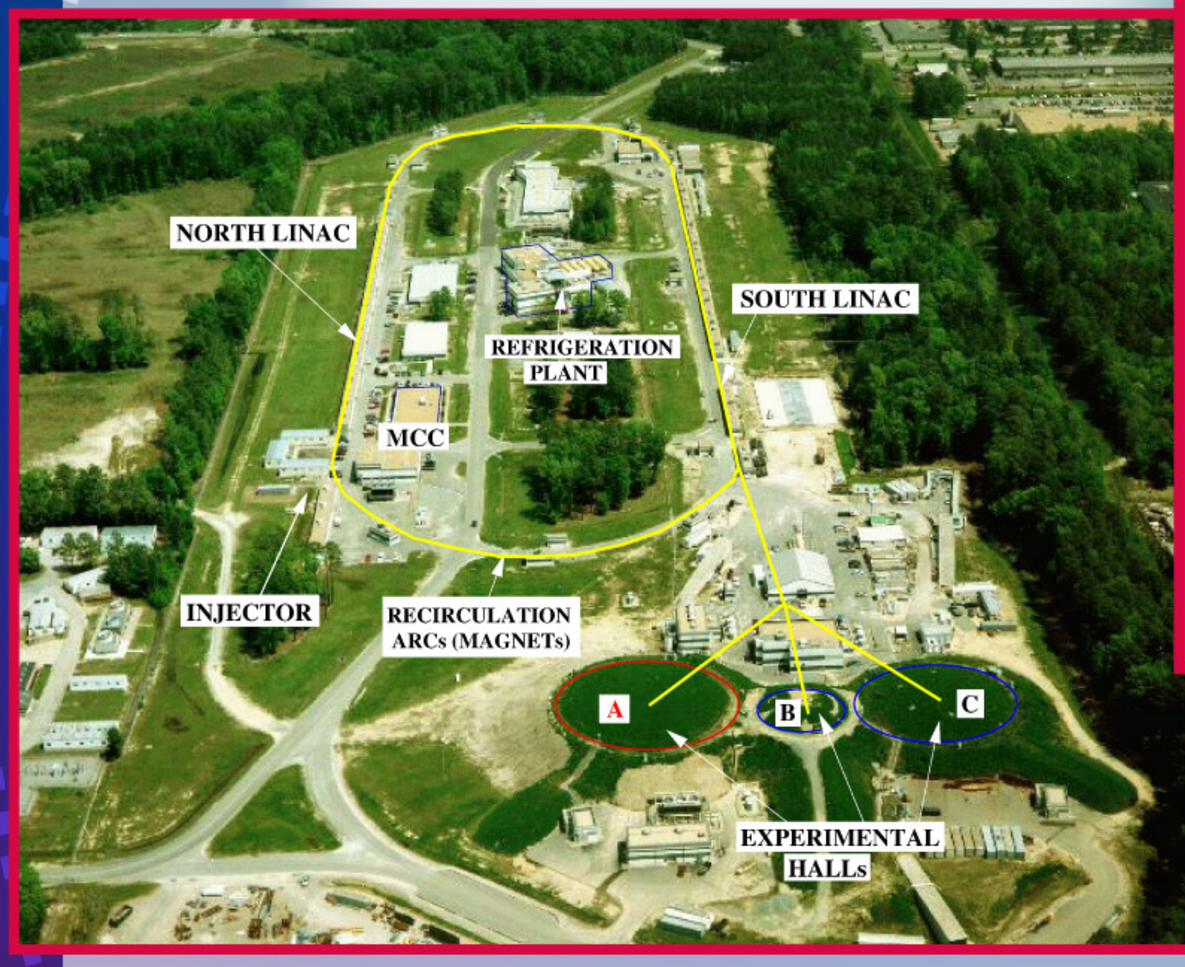
Nuclear physicists are studying how quarks affect proton and neutron interactions inside atomic nuclei. Protons and neutrons contain quarks — one research goal is to learn when quark effects become noticeable in nuclear reactions.

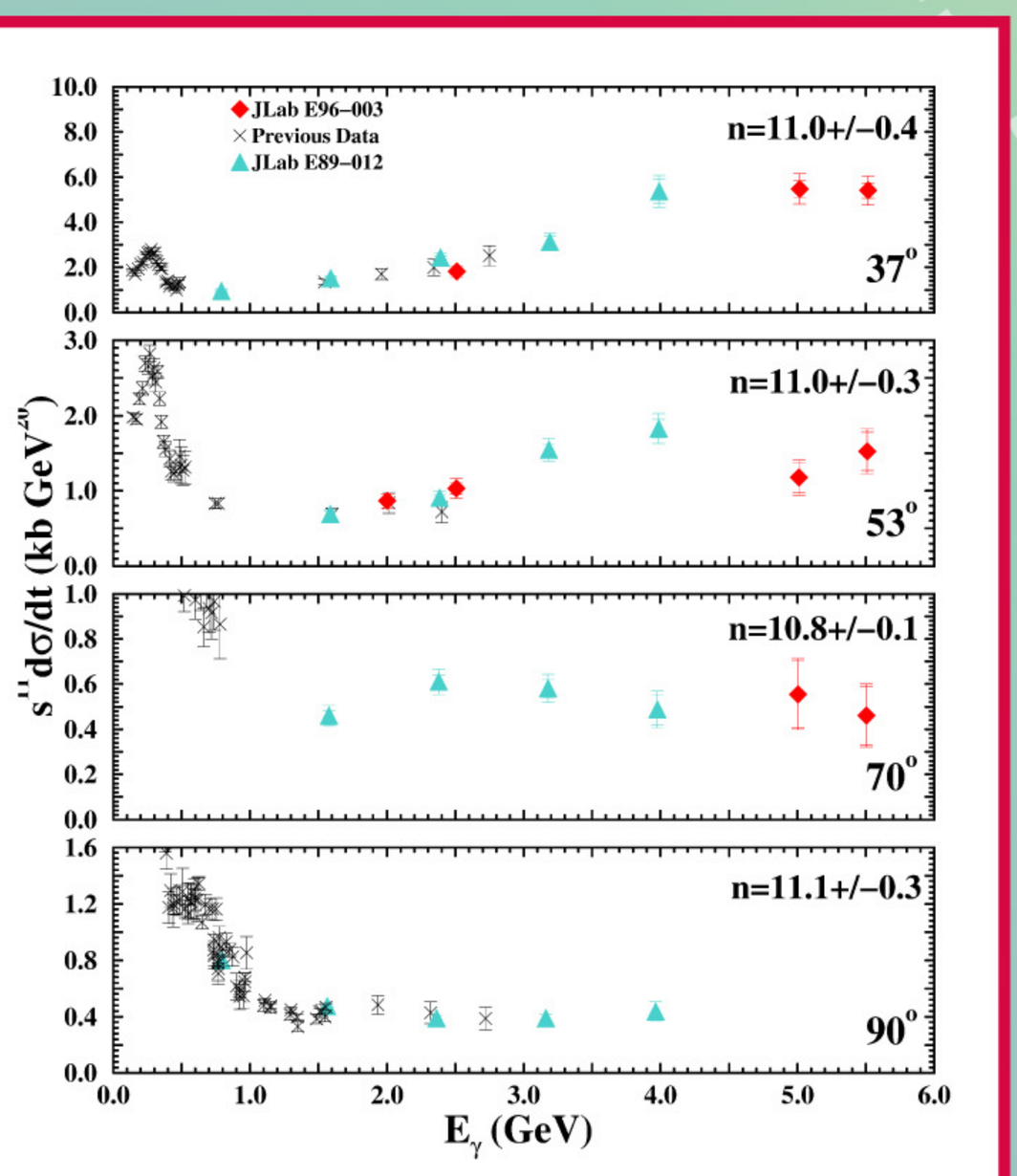
ARGONNE'S ROLE

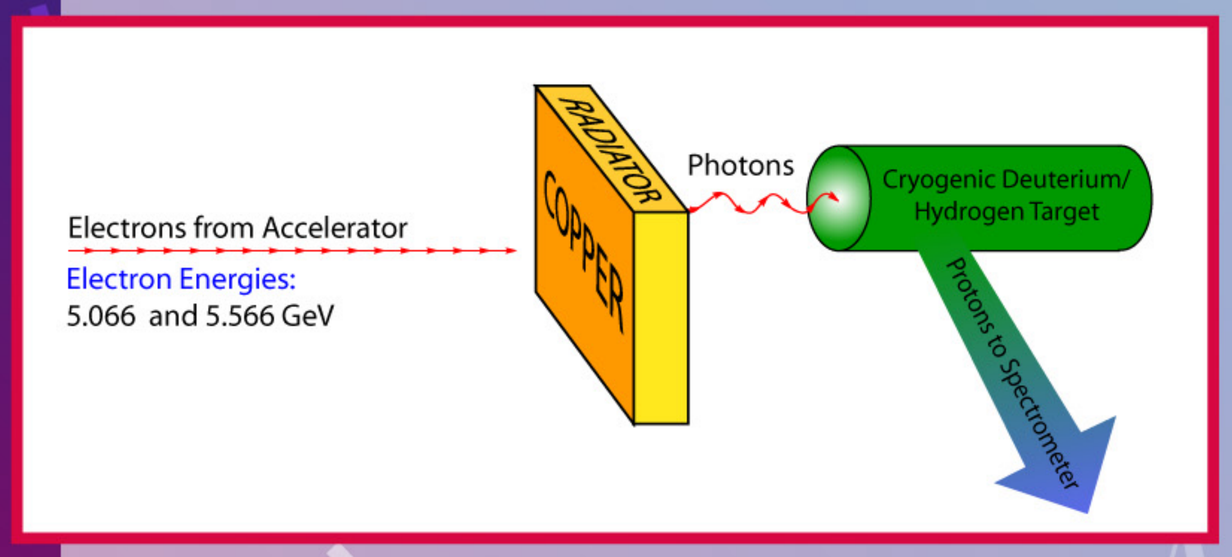
Argonne scientists are looking for quarks influences in the way protons and neutrons inside deuterium nuclei scatter when the nuclei are broken up after colliding with high-energy photons.

APPROACH

In experiments at the Thomas Jefferson National Accelerator Facility, Argonne scientists fired high-energy photons at a deuterium target to study the trajectories of scattered protons.







ACCOMPLISHMENTS

The researchers were the first to see evidence of a threshold for the onset of quark effects. The evidence came in the form of graphs that "flattened out" — meaning that the quantities they were graphing stayed the same regardless of photon energy. The finding challenged many theoretical predictions about when quark effects will become important in nuclear reactions.

Collaborators
American University
Florida International University
Florida State University
George Washington University
Hampton University
Massachusetts Institute of Technology
Mississippi State University
New Mexico State University
North Carolina AT&T State University
Ohio University
Rutgers University
University of Colorado
University of Illinois
University of Maryland
University of Massachusetts
University of Michigan
University of Virginia

Argonne National Laboratory is operated by The University of Chicago for the U.S. Department of Energy