ATLAS

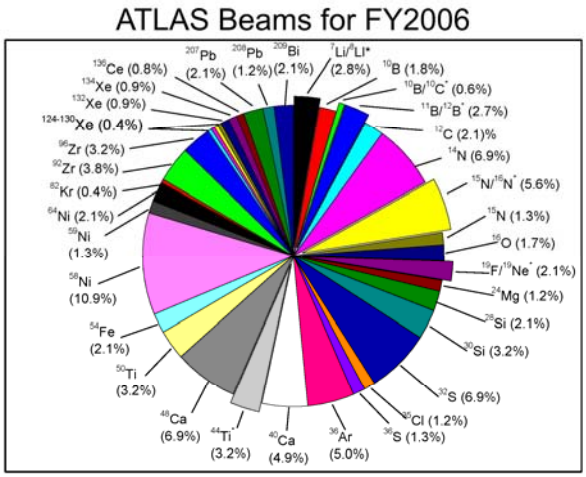
Argonne Tandem Linear Accelerator System

The prime national facility for nuclear structure research

The ATLAS facility is a leading facility for nuclear structure research in the United States. It provides a wide range of beams for nuclear reaction and structure research to a large community of users from the US and abroad. The full range of all stable ions can be produced in ECR ion sources, accelerated in the world's first superconducting linear accelerator for ions to energies of 7-17 MeV per nucleon and delivered to one of several target stations. About 20% of the beam-time is used to generate secondary radioactive beams. These beams are used mostly to study nuclear reactions of astrophysical interest and for nuclear structure investigations.

User community

ATLAS provides beams and experimental instruments for a large community of nuclear scientists. In 2006, there were 436 active users, including 75 graduate students. Typically, research at ATLAS results in 10 Ph.D. theses and 60 publications in peer reviewed scientific journals every year. Beam time is allocated based on the recommendations of a Program Advisory Committee which meets twice a year.



Distribution of ATLAS beams in FY2006

Research programs

The ATLAS research programs focus on the key questions that are central to our understanding of baryonic matter and on the description of the astrophysical processes that generate energy and produce elements in the stars. These areas of research have been endorsed in several major reviews of the science. Specific issued being addressed are 1) the quantum structure of nuclei, 2) nuclear shapes, 3) exotic decay modes, 4) masses of exotic nuclei, 5) fundamental interactions, 6) nuclear reactions of astrophysical importance, 7) properties of the heaviest nuclei and 8) accelerator mass spectrometry.

GAMMASPHERE is one of the forefront instruments available for experiments at ATLAS. It consists of 110 Compton-suppressed Ge detectors used to detect gamma rays emitted from compound nuclei formed by fusion of accelerated heavy ions and target nuclei.

Future developments

Since its inception in 1985, the ATLAS facility has continually been upgraded in order to be at the forefront of nuclear research. At present, the Californium Rare Ion Breeder Upgrade, CARIBU, is being built. This facility will provide for the acceleration of neutron-rich fission fragments from a one Curie ^{252}Cf source to study neutron-rich nuclei, particularly those of relevance for the astrophysical rapid neutron capture process responsible for the production of a large fraction of the heavy elements in the Universe. A novel superconducting solenoid spectrometer, HELIOS, which is ideal for the study of the structure of these neutron-rich species, is under construction and an energy upgrade of ATLAS is also under way. In order to fully explore neutron-rich nuclei, a current frontier in nuclear physics research, a major new facility for beams of radioactive ions is in the planning stages.

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