

Document issued in preparation for the ATLAS User Workshop 2006

A. Context:

Following the 2003 Operations Review of ATLAS by the Department of Energy, a Strategic Plan for ATLAS was drafted by the Executive Committee of the ATLAS Users group and the management of the Physics Division. This plan was adopted by the Users community at the ATLAS User workshop of July 2004, and submitted to the DOE soon thereafter. The plan can be found on the ATLAS website at: (http://www.phy.anl.gov/atlas/User_Meeting/ATLAS_Strategic_Plan.pdf). It was then presented and discussed at the 2005 ATLAS Science and Technology (S&T) review organized by DOE. As a result of this review, the agency requested that the plan be augmented “*to articulate priorities, scientific justification for new initiatives, and the correlation of scientific campaigns with scientific goals, in the context of long-term plans*”. One of the main objectives of the workshop is to provide an opportunity for the Users community to address this request.

The ATLAS Strategic Plan identifies four major areas of research. These are:

- (a) Understanding the stability and structure of nuclei as many-body systems built of protons and neutrons bound by the strong force,
- (b) Exploring the origin of the chemical elements and their role in shaping the reactions that occur in the cataclysmic events of the cosmos,
- (c) Understanding the dynamics governing interactions between nuclei at energies in the vicinity of the Coulomb barrier, and
- (d) Testing with high accuracy the fundamental symmetries of nature by taking advantage of nuclei with specific properties.

Four major topics of research were identified to reach these goals. There are:

- (1) The development of beams of short-lived isotopes and their subsequent use for measurements of astrophysics interest and for nuclear structure and reaction studies,
- (2) The production and characterization of nuclear structure away from the valley of stability including nuclei at the very limits of stability, i.e.; nuclei at and beyond the proton drip-line, on the neutron-rich side of the valley of stability, and in the region with $Z > 100$,
- (3) The study of the nature of nuclear excitations as a function of mass, proton or neutron excess, spin and temperature: characteristics such as nuclear shapes, the interplay between degrees of freedom, and changes in shell structure,
- (4) The use of traps for high precision mass measurements for astrophysics and for searches of physics beyond the standard description of the weak interaction.

It was also noted that smaller scale, complementary efforts are an integral part of the ATLAS Strategic Plan as they exploit the exceptional and often unique capabilities of the facility: for example, the irradiation of samples for materials research, the development of

accelerator mass spectrometry techniques for applications in environmental studies, oceanography, astrophysics, fundamental interactions, and any other area of basic science where they apply, and accelerator research experiments.

A number of important elements required to make the plan successful were subsequently identified in the Strategic Plan. They include accelerator operation hours and effective support for experimental installation and operation, as well as the development of new initiatives aimed at increasing accelerator capabilities and at developing new experimental equipment. Particularly notable in this context are: (a) the CARIBU (The CALifornium Rare Isotope Beam Upgrade) project for which a description can be found on the ATLAS web page at: <http://www.phy.anl.gov/atlas/caribu.html>, and (b) the proposed Superconducting Solenoid for the study of transfer reactions in inverse kinematics which can also be found on the ATLAS web page at: <http://www.phy.anl.gov/atlas/solenoid.html>.

B. Organization of the Workshop:

The workshop will start with a number of presentations about the status of ATLAS and of the existing experimental equipment, including Gammasphere, as well as about the new initiatives, i.e., CARIBU and the proposed Superconducting Solenoid. Updates will also be given on the new ATLAS data acquisition system and on the new Gammasphere data acquisition system.

The presentations will be followed by a working session where the Users will be invited to join in discussion groups arranged along the major areas of research outlined in the Strategic Plan (see above). For these in-depth discussions, every User is asked to come prepared to provide answers to a number of important questions given in paragraph C below. Users can expect to be contacted by the discussion leaders prior to the meeting. The results of the discussions will be subsequently summarized by the discussion leaders and the opportunity will be provided for additional comments by the workshop participants before final conclusions are drawn. The discussion leaders will also be asked to provide a written report of the discussions in their group. These reports will then form the basis for the document summarizing the response of the ATLAS User community to the DOE request for an augmentation of the ATLAS Strategic Plan. This document will be prepared jointly by the Executive Committee of the ATLAS User Group and the management of the Physics Division. It will be reviewed by the DOE Office of Nuclear Physics at the June ATLAS Science and Technology Review.

C. Questions for Discussion at the Workshop:

- What are the most important physics questions that **you** plan to study at ATLAS over the next five years?
- How do these questions relate to the ATLAS Strategic Plan?

- How do these questions relate to the national priorities as expressed in
 - (1) the 2002 NSAC Long Range Plan (http://dnp.nsl.msui.edu/2002_lrp.pdf) and,
 - (2) the DOE-OMB performance measures (http://www.sc.doe.gov/production/henp/np/nsac/docs/nsac_report_performance_measures.pdf)?
- What developments in accelerator capabilities and instrumentation do you envision as being needed to optimize your research program at the facility? Consider options included in the current strategic plan and new possibilities.
- Did you identify other important issues that the Executive Committee of the ATLAS User Group and the ATLAS management should make a priority for the facility?