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ATLAS Call for Proposals

Proposal submission deadline: Friday April 8, 2022

Dear ATLAS Users,

This is a call for proposals for experiments at ATLAS, for the scheduling period beginning in the summer of 2022. The ATLAS Program Advisory Committee (PAC) meeting will be held May 9-10, 2022.

Please note that this is **a call for proposals for all experiments using stable beams, radioactive beams produced by the in-flight facility RAISOR, low-energy and reaccelerated radioactive beams from the CARIBU and nuCARIBU sources, and some long-lived radioactive beams such as ^{14}C, ^{85}Kr, and ^{223}Ra.**

During this PAC cycle, Gammasphere will be available for experiments in stand-alone mode, coupled to the FMA or the AGFA gas-filled spectrometer, or coupled to auxiliary detectors. RAISOR will be operational and the secondary beams from this facility are available with instruments in experimental areas III and IV. The new N=126 factory will also start operation. A short summary of key ATLAS instrumentation and detector stations as well as point of contact information is given below in the Background Information section.

Reminder on scheduling of Priority II experiments

Some of the experiments that received "Priority II" approval in the April 2021 PAC could not be scheduled in the period since that last PAC meeting because of the reduced ATLAS operations time due to the COVID pandemic and the heavy pressure for beam time when the facility was operational. This approval does carry over one more PAC cycle. However, such proposals that received priority II approval in the March 2020 PAC and have not yet been scheduled, have to be resubmitted for consideration by this or a future PAC if beam time is still desired.

Guidance for proposals requesting radioactive beams (RAISOR, CARIBU, nuCARIBU)

Typical beams and intensities available from RAISOR and CARIBU are presented at https://www.anl.gov/atlas/available-beams. For the in-flight beams from the RAISOR facility,

the secondary beams have been classified in the table as "available" or "expected" with the "available" beams having already been developed (or similar enough to beams that have been developed so that yield and purity can be accurately predicted) and the "expected" beams having more uncertainty. Experiments requesting "available" beams can be approved as Priority I by the PAC. Experiments requesting "expected" beams should include a two-day development period and can be approved as Priority II. The two-day development period will be run first if the beamtime is approved to confirm yield and purity. The actual experiment will only be scheduled after the beam production is successfully demonstrated. Experiments requesting RAISOR beams not listed in the table will be treated as letters of intent requesting the development of these beams. These should preferably be discussed with the RAISOR experts before submission.

For the CARIBU beams, the ^{252}Cf source currently available to produce the neutron-rich isotopes as decayed and yields lower production than what has been available in the past. Repeated efforts at securing a new ^{252}Cf source over the last few years have yielded no usable source. We will be transitioning to nuCARIBU during this PAC cycle as the ^{252}Cf source will be replaced by neutron-induced fission of ^{235}U to produce the fission fragments. This PAC cycle will therefore include a short initial period where the beams obtained from the weak ^{252}Cf source are still available, but will also include the initial operation of the nuCARIBU system where it will operate at 10% of design power while operational experience and data on activation and maintenance needs are obtained. The radioactive beam intensity yields for operation with the decayed ^{252}Cf source and the initial operation of nuCARIBU are available on the website listed above. Please note the significant gain in intensity for nuCARIBU, even at the initial reduced power, in the lighter mass range of the heavy and light peaks of the fission distribution; this however comes with a similarly significant reduction in yield in the higher mass range of both peaks. More neutron-rich isotopes, not listed in the posted table for CARIBU/nuCARIBU beams, are also available at lower intensity for low-energy experiments; Users planning experiments with these more difficult beams should contact G. Savard (savard@anl.gov) or D. Santiago-Gonzalez (dsg@anl.gov) for additional information. The reaccelerated CARIBU beams are provided through the EBIS charge-state breeder which removes the significant stable beam contamination that was generated in the previously used ECR charge-state breeder. Experiments no longer have to consider such contamination in their proposal; however, radioactive isobar contamination should still be considered in the proposals. Low-energy CARIBU beams are now delivered to the new low-background experimental area for decay spectroscopy either directly at the intensity given in the table, or through the MRTOF which makes the beam essentially pure but at the cost of a factor of 3 to 5 in intensity.

Format of Proposals and Proposal Submission

Please remember that, at the request of the PAC, some specific requirements for proposals have been implemented (see below). Please take them into account while preparing your submissions.

The proposals to the PAC must be submitted electronically. The instructions for filling out the web-based form can be found at https://www.anl.gov/atlas/proposals.

To request beam time, **two actions are required on your** part: a) complete the ATLAS proposal web-based form, and b) email your proposal to atlas-proposals@anl.gov as an attachment The attached file type should be either (I) Portable Document Format (.pdf), (II) Postscript format (.ps), or (III) Microsoft Word.

Contents of the Form: The ATLAS Proposal Form needs to be completed for a successful submission of a proposal. A link to access the web-based form can be found inside the ATLAS proposal website at https://www.anl.gov/atlas/proposals. To assist you with the preparation of your answers for the proposals form, a worksheet (pdf file) will be made available in our proposals web site. Please note that the worksheets will not be accepted as a replacement of the web-based form. On the proposal web-based form, **please list the maximum beam energy and current you require**. This essential information is needed for radiation safety calculations. Also, beam tuning will be based on these upper limits. An increase in energy above the stated maximum or a change in beam species requires prior notice. In addition, following guidance from the U.S. Department of Energy, we will start collecting demographic information of the gender and career status of the principal investigator (PI) for each submitted proposal. If needed, this information will only be presented during the PAC meeting as aggregates (i.e. no information of a single PI will be shared). Finally, by clicking the "submit" button in the web-based form, **you are certifying that all collaborators listed on your proposal are fully aware of the proposal and have agreed to participate in the experiment**.

Contents of Proposals: The proposals should be self-contained; including a **list of participants,** an **abstract**, the **basic physics goals** of the experiment, a **discussion of what exactly will be done** in the measurement, and any pertinent **references**. Sufficient technical details of the proposed measurement and count-rate estimates should be included for the PAC to be able to judge feasibility and the scope of the measurement, and impact on available ATLAS resources in terms of workforce and hardware. **The PAC requests that the proposals be kept to a reasonable length, 5 pages maximum plus figures and appendices. It is to be presented in single-column format (i.e., a full Phys Rev C length article in two-column format is not acceptable), with fonts no smaller than those in this letter (12 pt).**

In your proposal, please summarize the results of previous experiments by the group and indicate the status of the data analysis and publication. This information will be taken into account during the PAC assessments.

Please indicate also whether the proposal is part of a PhD thesis project. A question to this effect has been added to the proposal fact sheet.

Background Information

Stable Beams: The beams that are routinely available from ATLAS are presented on the ATLAS web page at https://www.anl.gov/atlas/stable-beams. In general, ATLAS produces stable beams of heavy ions ranging from ^{7}Li to ^{238}U; lighter beams such as protons and 4He

are also available. Other beams are possible, after some development, and their feasibility should be discussed with the ATLAS Operations Group before a proposal is submitted. For more information on the available stable beams, please contact the user liaison physicist Daniel Santiago-Gonzalez (dsg@anl.gov).

Maximum Beam Energy: ATLAS can accelerate heavy ions to roughly 10 MeV/nucleon. Higher energies is achievable, especially for the light nuclides (A<30), while the heaviest nuclides may only be available at energies of 10 MeV/nucleon or less. Again, for more information contact Daniel Santiago-Gonzalez (dsg@anl.gov).

Beam Isotope: The beam currents for elements listed in the table of available beams were obtained using natural material. Other isotopes are available with currents generally proportional to their abundance. Any special preparation that may be needed should be discussed with the ATLAS Operations Group prior to submission of the proposal. The practicality of a beam may be a consideration in the approval of a proposal.

Radioactive Beams: The radioactive beams produced by the in-flight technique are listed on the ATLAS web page at https://www.anl.gov/atlas/inflight-radioactive-beams. The contact persons for additional information are Calem Hoffman (crhoffman@anl.gov) or Clay Dickerson (cdickerson@anl.gov). For low-energy and reaccelerated CARIBU/nuCARIBU beams, a yield table for the beam intensities to be used for experiment planning is posted at https://www.anl.gov/atlas/caribu-beams. Please keep in mind that if use of the MRTOF for further beam purification is requested , this will reduce these intensities by a factor of 3 to 5. The contact persons for additional information are Daniel Santiago-Gonzalez (dsg@anl.gov) or Guy Savard (savard@anl.gov).

Experimental Equipment: General information on experimental equipment can be found in the ATLAS Instrumentation page (https://www.anl.gov/atlas/instrumentation). Other equipment is also available for potential Users, and there are general-purpose beam lines for additional scattering chambers or other non-standard equipment. For the current status of a specific experimental station, please contact any one of the Laboratory staff members or Daniel Santiago-Gonzalez (dsg@anl.gov).

HELIOS: The Helical Orbit Spectrometer (HELIOS) is a charged-particle spectrometer designed to study reactions with heavy ion beams. HELIOS is ideally suited to the study of single- and multi-nucleon transfer reactions in the inverse kinematics regime. Scientists interested in using the device are requested to contact the representative of the collaboration, Ben Kay (kay@anl.gov), to discuss the feasibility of a measurement.

Gammasphere and FMA: Gammasphere is one of the world's most powerful spectrometers for nuclear structure research and is especially suited to collecting gamma-ray data following

the fusion of heavy ions. The Fragment Mass Analyzer (FMA) is a recoil mass separator that separates products of nuclear reactions from unreacted beams and disperses them according to their mass-to-charge state ratio. Gammasphere and the FMA are complex instruments that may be used combined or separately in experiments. There are a number of options for their utilization. Details concerning Gammasphere can be found at the following web-site: https://www.anl.gov/phy/gammasphere or by directly contacting Mike Carpenter (carpenter@anl.gov), or Marco Siciliano (msiciliano@anl.gov); FMA details are at https://www.anl.gov/phy/fragment-mass-analyzer or by contacting Darek Seweryniak (seweryniak@anl.gov).

N=126 factory: **N=126 factory** will start operation in the summer of 2022, focusing first on isotopes in the vicinity of the N=126 line. The initial program will concentrate on mass measurements but a decay spectroscopy station will soon follow. Users interested in the radioactive beams in the N=126 region, or in the development of other beams that can be obtained with the N=126 facility, should contact Guy Savard (savard@anl.gov).

AGFA: The **AGFA** gas-filled spectrometer is a recently commissioned instrument that is installed on the APEX beamline and is available to operate in conjunction with **Gammasphere** or in stand-alone mode. AGFA details are at https://www.anl.gov/phy/argonne-gasfilled-analyzer or by contacting Darek Seweryniak (seweryniak@anl.gov).

MUSIC and the Enge Split-Pole Spectrgraph (SPS3): The MUlti-Sampling Ionization Chamber (MUSIC) is an active target system typically used to measure fusion cross sections or reactions of interest in Nuclear Astrophysics. Users interested in using the MUSIC detector or the SPS3 should contact Melina Avila (mavila@anl.gov) to discuss the feasibility of their experiment.

Access to target station while beam is present: The ATLAS Radiation Interlock System (ARIS) is designed so that for low-level radiation, where appropriate conditions are satisfied, access to the experimental areas is possible during the course of a measurement. For more information on ARIS please contact Daniel Santiago-Gonzalez (dsg@anl.gov).

Program Advisory Committee

PAC membership. The present PAC membership is: Gordon Ball (TRIUMF), Kelly Chipps (Oak Ridge National Laboratory), Roderick Clark (Lawrence Berkeley National Laboratory), Aaron Couture (Los Alamos National Laboratory), Alison Laird (University of York), Darek Seweryniak (Argonne National Laboratory), Nicholas Scielzo (Lawrence Livermore National Laboratory), Alexander Volya (Florida State University) and Kay Kolos (Lawrence Livermore National Laboratory) as Chair of the ATLAS Users Group.

Please feel free to contact Daniel Santiago-Gonzalez (dsg@anl.gov) with any questions. Web-based submissions must be received before **April 8, 2022 23:59 US Central Time**.

Confirmation of the reception of your proposal should reach you via email by April 11, 2022. We are looking forward to exciting proposals for research at ATLAS.

Sincerely,

Guy Savard
ATLAS Director