National Superconducting Cyclotron Laboratory
Call for Proposals—PAC 35

August 30, 2010

Dear NSCL User:

The next meeting of the NSCL Program Advisory Committee (PAC 35) will be held on November 29-30, 2010.

We invite proposals for beam time to be considered at the PAC 35 meeting. We also invite, as we did for PAC 33 and PAC 34, letters of intent for experiments at NSCL's ReA3 reaccelerated beam facility (www.nscl.msu.edu/exp/sr). The ReA3 facility, presently under construction, is expected to become available for rare isotope beam experiments by the end of 2011. Submission of letters of intent at this time will help us to be aware of users' needs, identify particular beams of interest, and plan accordingly. Proposals and letters of intent for PAC 35 are due by 5 pm EST on October 19, 2010. We expect to begin running PAC 35 approved experiments around May 1, 2011.

It is planned that the next generation gamma-ray spectrometer GRETINA, now under project management at Lawrence Berkeley National Laboratory, will be coupled to the S800 spectrograph in early 2012 and made available for experiments at NSCL for a six month period in 2012. Proposals for S800-GRETINA experiments will be considered at the following PAC (PAC 36), which will meet in mid-2011.

General information on NSCL proposal process is available at www.nscl.msu.edu/exp/propexp/.

In this call for proposals, as in the last several ones, we request detailed information on your proposed use of NSCL facilities to aid the Program Advisory Committee in weighing the scientific merit of each proposal versus the cost of performing it.

The timetable for PAC 35 is:

Tuesday, October 19, 2010	Proposals due at NSCL by 5 pm EST
Monday-Tuesday, November 29-30, 2010	PAC 35 Meeting
Thursday, December 2, 2010	List of approved experiments posted; call 517-908-7337 for results
Tuesday, December 7, 2010	Mail letters with allocation of beam time

The members of PAC 35 are:

Ani Aprahamian	University of Notre Dame
David Dean	Oak Ridge National Laboratory
Paul Mantica	Michigan State University

Augusto Macchiavelli	Lawrence Berkeley National Laboratory
Robert Tribble	Texas A&M University
Piet Van Duppen	University of Leuven
Alan Wuosmaa	Western Michigan University
Sherry Yennello	Texas A&M University
Brad Sherrill	NSCL, non-voting convener

Each completed proposal submission must contain the following items:

(A) PAC 35 Proposal Form (available at the web site www.nscl.msu.edu/exp/propexp/), which has the following seven parts. All pertinent parts must be completed.

1. A PAC 35 Proposal Cover Form
2. A Description of Experiment (text limit: 4 pages, 12 pt font, 1.5 line spacing; no limit on figures or tables). Please organize the material under the following headings or their equivalent:
    i. Physics justification, including background and references;
    ii. Goals of the proposed experiment;
    iii. Experiment details
        a. what is to be measured;
        b. technical feasibility of measurement (demonstrated by simulation or by reference to prior work);
        c. count rate estimate (including assumptions);
        d. basis of time request (include time for experimental device tuning, debugging the experimental setup, calibrations, and test runs);
        e. discussion of present state of readiness of the experiment and an estimated earliest date for inclusion in the run schedule;
        f. discussion of any technical assistance (design, fabrication, installation, etc.) that may be requested from NSCL;
        g. apparatus (including sketch);
3. Status of previous experiments completed at the Coupled Cyclotron Facility (CCF), listed by experiment number, status of analysis, publications, presentations, Ph.D.s awarded, Master's degrees awarded
4. Educational impact of the proposed experiment
5. Safety information
6. Spectrograph Worksheet for experiments with the S800 Spectrograph or Sweeper Magnet
7. Beam request worksheet

(B) For rare-isotope beam requests, an electronic copy of the LISE++ files used to obtain intensity estimates with the official version of LISE++ referenced in item 4 of the "Notes for PAC35" below. The LISE files can be e-mailed to the A1900 Device Contact at the time of submission of the proposal.

You may submit your completed proposal by electronic mail (oconnor@nscl.msu.edu) or via the on-line submission page at www.nscl.msu.edu/exp/propexp/upload.

As stated above, proposals must be received at NSCL by 5 PM Eastern time on October 19, 2010.

Please note the following:

- The total beam time request for an experiment must include on-target beam time needed to test and debug equipment and to perform calibrations. Each additional beam required for testing and performing calibrations must be listed explicitly. Requests for interruptions in beam time (for example a gap between a test run and the main run or an interruption in the main run to change the experimental configuration) must also be indicated.
- The spokesperson affirms on the Proposal Form that all collaborators listed on the proposal have read the proposal and have agreed to participate in the experiment.
- You (a) must be a member of the NSCL user group and (b) must enter a password when uploading your proposal via the on-line submission page. To be a user, you can register at www.nscl.msu.edu/exp/users/userlist. The password for proposal submission is "Proposal" (case-sensitive).
- If, after uploading a proposal, you decide to submit a revised version, we request that you do not upload the revised version but instead send it as an electronic attachment to raman@nscl.msu.edu. That way, there will be no discontinuity in the automatic numbering of the proposals.
- Previous PACs have emphasized that particular care should be taken to submit well-written proposals, with the proposed scientific goals clearly presented.
- To enable the PAC to evaluate the scientific merit of proposals while weighing the cost impact on NSCL operations, we ask that each proposal include, in addition to the on-target time request, a separate estimate of the beam delivery time and experimental device tuning time (using guidelines given below).
- In evaluating proposals, the PAC takes into consideration the strength of the experimental team in addition to the physics of the proposal and its technical feasibility. Therefore, NSCL needs to be apprised of any significant changes in personnel as they occur.
- Approved proposals are announced by title on the NSCL website. Proposers may wish to carefully consider the title for competitive experiments.
- Prior to scheduling of experiments, the spokesperson will need to
    (1) Complete a *Scheduling and Safety Questionnaire.*
    (2) Participate in person or by telephone in a possible conference with NSCL staff to establish the level of NSCL support and to review the final setup.
    (3) Participate as required in a full safety review of the experiment.

- After the scheduling of an approved experiment, the spokesperson needs to
  (4) Communicate with the A1900 contact person to develop the detailed secondary beam sequence plan and A1900 configuration.

If you have any questions or problems, please contact Raman Anantaraman, (517) 908-7337, via email to raman@nscl.msu.edu.

Each proposal will be reviewed by the entire PAC and will be assigned to two PAC members (one primary and one backup) for detailed consideration. The PAC members' names will be sent to you within one week after the proposal due date. You are encouraged to contact the primary PAC member charged with the detailed review of your proposal to address questions he/she may have and/or provide clarifications, afterthoughts, etc. The proposals will also undergo a technical review and a safety review and the results will be communicated to spokespersons and the PAC, as described in items #10 and #11 of the "Notes for PAC 35" given below.

NOTES FOR PAC 35

1. Letters of Intent for Experiments with Stopped and Reaccelerated Beams from ReA3: The letters of intent should in general include:

- a description of the proposed program and the scientific motivation;
- a description of the necessary research equipment;
- some examples of beams and reactions (if applicable) that might be used for the study;
- the approximate beam time per year that is expected to be needed and the estimated duration of the program.

Details of the reaccelerator and beam properties are available on the NSCL website. Proposers should use the look-up table available at www.nscl.msu.edu/exp/sr for the estimated yield for reaccelerated beams, with the understanding that, given the absence of operational experience, the estimated yields might be uncertain by an order of magnitude. Proposers should contact Kei Minamisono if they wish to use the Beam Cooling and Laser Spectroscopy (BECOLA) endstation, Jeff Blackmon for the Si-barrel ANASEN, and Daniel Bazin for the active target time projection chamber (AT-TPC). For other devices, please use the contacts provided below. Contact Raman Anantaraman if you need additional information for preparing your letter of intent.

2. Duration of PAC Approvals: The length of validity for proposals is 24 months from the start of the running period, with the possibility of extension of up to a year if justified.

3. Beams: The list of primary beams being offered is shown at www.nscl.msu.edu/exp/propexp/beamlist. This list was developed in consultation with NSCL Operations Staff and with input from the Users' Executive Committee. The quoted intensity estimates are based on experience from operation of the CCF. If an experiment requires a primary beam or maximum beam intensity other than what is included on the list of offered beams, the user is encouraged to contact the NSCL Operations Department for advice regarding

the preferred course of action. Following this advice, the user may follow one of two courses: (a) submit a proposal in the usual fashion, with the recognition that it may be approved on a "reserved" basis, with release of beam time contingent on the successful development of the beam; (b) submit a Letter of Intent, to get feedback from the PAC on the PAC's assessment of the physics interest in the proposed measurement. The latter course is especially appropriate if a very difficult beam is required.

Rare-isotope beam development is the responsibility of NSCL for experiments based downstream of the A1900 and of the user for experiments based in the A1900.

4. Estimates of Rare-Isotope Beam Rates: Experimenters are required to estimate the expected intensity for each rare-isotope beam requested in the proposal. These estimates should be made with the program LISE++, version 9.1.17 (linked from www.nscl.msu.edu/exp/propexp/yields, with the option file "A1900_2010.lopt" and configuration file "A1900_2010.lcn") or be based on previously run settings. For calculation of yields from ^{238}U fission, start LISE++; from the "File" menu, select "Open"; look in the "Examples" folder; select and open the example file "AF_238U_Be_NSCL.lpp" and use this as the starting point. For simulations with the RF fragment separator, use the NSCL configuration file "A1900_RFFS_2010.lcn". Note that the A1900 group website groups.nscl.msu.edu/a1900/ provides useful information for planning experiments with rare isotopes (for example, instructions on using LISE++ for simulating rare-isotope settings in the A1900). Users who would like help with performing LISE++ simulations can contact the A1900 Device Contact. Once rate estimates are made, and before the proposal is submitted, users are encouraged to contact the A1900 Device Contact for consultation regarding setting optimization and the identification of possible problems. Users must submit or upload an electronic copy of any LISE++ calculation files used for rare-isotope beam intensity estimates together with their proposals to help resolve any questions that may arise during the technical review of the proposals.

The beam line transport efficiency for rare isotope beams between the A1900 focal plane and end stations located in the experimental vaults depends on the optical properties of the beam and can vary from 100% to less than 50%. Please contact the A1900 Device Contact for consultation regarding your specific application.

5. Beam Delivery Time Calculation: To enable the PAC to evaluate the scientific merit of proposals while weighing total facility use time, each proposal will include an estimate of beam delivery time as part of the overall time request. The beam delivery time estimate is made as follows:

(a) Preparation time for each occurrence of a coupled cyclotron primary beam tune used in an experiment is 12 hours. (Note that a primary beam isotope delivered at two different energies by retuning the coupled cyclotrons counts as two different primary beams and will require a beam delivery time allotment of 2x12= 24 hours; a primary beam delivered with a lower quality and at a lower energy by degrading the beam from the coupled

cyclotrons does not cost the extra 12 hours of beam delivery time.) If the primary beam is used at a location beyond the A1900, a time allotment of 3 hours per rigidity setting is needed to cover the time for beam delivery to the experiment. A single time allotment of 3 hours can be used to cover delivery of more than one beam beyond the A1900 if the rigidities of the delivered beams lie within a range of 10% (±5%).

(b) The time estimate for rare-isotope beam experiments based downstream of the A1900 will also include preparation time for each rare-isotope setting according to the table below:

	Tuning time (hours)		
Rate (pps/pnA)	$Z_{fragment} \leq 12$	$12 < Z_{fragment} \leq 36$	$36 < Z_{fragment}$
Rate ≥ 10	2	6	6
1 ≤ Rate < 10	4	10	12
0.0001 < Rate < 1	6	20	24
Rate ≤ 0.0001	Consult A1900 Device Contact		

The expected rate can be obtained from a LISE estimate or from a previous measurement of the rate at the A1900 focal plane. (A rare isotope delivered from the same primary beam but with two different rigidities or purities would require two developments and thus would count as two rare-isotope settings.) A time allotment of 3 hours per rare-isotope setting is also needed to cover the time of beam delivery to the experiment. A single time allotment of 3 hours can be used to cover delivery of more than one rare-isotope setting beyond the A1900 if the rigidities of the settings lie within a range of 10% (±5%).

For example, an S800 experiment requiring primary beams of ^{40}Ar and ^{48}Ca each at an energy of 140 MeV/nucleon would need to allocate (2x12) = 24 hours for primary beam development. If the experiment also requires two secondary beam settings, one with an expected rate of 300 pps/pnA and Z=14 and the other with an expected rate of 5 pps/pnA and Z=12, the additional time for development and tuning to the S800 target will be (6+3)+(4+3) = 16 hours. If the experiment furthermore requires the delivery of degraded primary beam at two rigidities for testing or calibration, the additional tuning time will be 3+3 = 6 hours. Thus, the total tuning time is 24+16+6 = 46 hours. (If the rigidities of both degraded primary beams and both rare-isotope settings lie within a range of 10%, the tuning time would be reduced by 9 hours to a total of 37 hours.) The tuning time request in this example is in addition to the beam on target time needed to carry out the experiment.

6. NSCL-Supported Experimental Devices: NSCL-supported experimental devices include: the A1900 Fragment Separator, the S800 Spectrograph, the Segmented Germanium Array, the Sweeper Magnet, the RF Fragment Separator, and the 53-inch chamber. NSCL strives to make it possible for experiments utilizing facility-supported devices to be conducted without

collaboration with MSU researchers by providing technical assistance within existing resources. Each of these devices has a Service Level Description which outlines (a) the standard configuration options available for the device, (b) NSCL support level users can expect for the device, and (c) user responsibilities for working with the device. Facility support is available for these devices when they are operated in their standard configurations. The Service Level Descriptions are available on the technical information web pages linked from www.nscl.msu.edu/exp/propexp/devices. For further information on a device, please contact the appropriate person from the list posted at www.nscl.msu.edu/exp/propexp/contactpersons. Users are encouraged to collaborate with members of the A1900 group for experiments requiring the development of a very difficult rare-isotope beam (i.e., in cases where the beam development and identification represent the bulk of the experimental effort).

Beam-related device tuning for NSCL-supported devices will be carried out by NSCL staff. The table below gives guidelines for estimating the device-tuning component of the overall beam time request. In general, device tuning is needed only once per experiment but there are exceptions, e.g. a change of optics for the S800 will require a retune. When in doubt, please consult the appropriate device contact person.

S800	Standard experiment: 4 hrs; High-resolution experiment: 12 hrs.
SeGA	2 hrs.
Sweeper Magnet	8 hrs.
53-inch chamber	0 hrs.
RFFS	4 hrs for first rare isotope; 2 hrs for each additional rare isotope.

Experiments based in the A1900 should request 4 hours of experimental device tuning time. (Experiments based downstream of the A1900 do not need this time.)

7. Other Experimental Devices: Other experimental devices listed at www.nscl.msu.edu/exp/propexp/devices are available for use in NSCL experiments. Since these devices also require substantial experience to operate them safely and properly, collaboration with MSU researchers is necessary for users unfamiliar with running these devices. Users wishing to do experiments with the Modular Neutron Array (MoNA) should contact the MoNA Consortium Executive Director, presently Deseree Meyer, or MoNA's NSCL Contact, Thomas Baumann. For other devices, the contact persons are as follows:
Beta Counting System (BCS), Sean Liddick;
High Resolution Array (HiRA), William Lynch;
CsI(Na) scintillator array (CAESAR), Alexandra Gade;
Low Energy Neutron Detector Array (LENDA), Remco Zegers;
Digital Data Acquisition System (DDAS), Sean Liddick.

Please establish contact one month before the proposal submission deadline to work out collaboration details.

Details about experimental devices are available at www.nscl.msu.edu/exp/propexp/devices. For further information on a device, please contact the appropriate person from the list posted at www.nscl.msu.edu/exp/propexp/contactpersons.

Estimating the device tuning time for non-NSCL-supported devices is the responsibility of the experimenters; NSCL contact persons for these devices may be consulted for input. Proposals should explicitly list the amount of beam time needed for tuning these devices.

8. Non-standard Configurations for Experimental Devices: Descriptions of the standard experimental equipment configurations, for devices that are supported by NSCL staff (A1900, S800, SeGA, Sweeper Magnet, RF Fragment Separator, 53-inch chamber), are given in the Service Level Descriptions available on technical information web pages linked from www.nscl.msu.edu/exp/propexp/devices. If your experiment requires a non-standard configuration, please discuss in your proposal the amount and sources of effort required to change configurations. Proposals for experiments that require changes to the standard A1900 hardware/detector configuration must also include a request for the time necessary to modify and restore the A1900 setup since NSCL will be unable to deliver beam to other experiments while the changes are taking place; contact the A1900 Device Contact for help with an estimate of the time required for the A1900 changes you wish to make.

9. Beam Lines and Optics: The typical minimum beam spot diameter at the experiment location is a few millimeters for primary beams and about 1 cm for secondary beams. The size can be reduced further with slits, at the expense of rate. In general, NSCL beam lines can transport beams with rigidities in the range of 1.0 to 5.0 Tm for almost all optical solutions. Higher rigidities up to 6.0 Tm are possible for some endstations, but require a review of the optics. If your experiment requires high rigidities or special optics (e.g. low-divergence optics), please include a description of your needs in the proposal. Proposals requiring new optics to be developed either within or downstream from the A1900 must include a request for the beam time necessary for testing and debugging the new optics. For more instructions or for an estimate of the time required for the optics development, please consult the A1900 Device Contact.

10. Technical Review: Prior to the PAC meeting, NSCL technical experts will review each proposal to assess its technical feasibility from the points of view of device usage and beam delivery. During this review, the beam preparation time estimate will be checked and, if necessary, refined. Any issues identified in the technical review will be communicated to the spokesperson of the proposal and to the PAC.

11. Safety Review: It is an important goal of NSCL that users perform their experiments safely. Some safety information is requested in the proposal. MSU and NSCL safety experts will review all proposals upon receipt for safety issues. The Committees' findings will be communicated to

the spokespersons of the proposals and to the PAC. If the experiment is approved, NSCL requires the experimental group to appoint a safety representative who will participate in a more detailed safety review prior to scheduling the experiment. The duties of the safety representative are available at www.nscl.msu.edu/exp/safety/users.

12. Liaison with NSCL: All requests for assistance required by the experimenters should be directed to Raman Anantaraman. The level of support provided for an experiment by NSCL will be based on available resources to address the requests in the proposal and on a detailed questionnaire submitted by the spokesperson at least six months prior to the experiment being scheduled. Decisions regarding assistance reside with the NSCL Director or his/her designee, and the delegation of tasks to appropriate NSCL technical personnel will be completed by Raman Anantaraman. It is assumed that experimenters will provide any special equipment needed for their experiments.

C. Konrad Gelbke
Director