ARCS
A wide-Angular Range Chopper Spectrometer at the SNS

ER45950

Progress Report
(covering work from June 16, 2003 to January 2, 2005)

for

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from

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Summary

The ARCS spectrometer project has been funded for 39 months. Procurements are now a main activity, although engineering effort remains, and installation has begun. Most of the subsystems are under control, and represent no risk to the project. These are: cryo-goniometer, detectors and electronics, Fermi chopper system, computing cluster, basic reduction software, T0 chopper and main neutron guide. The sample hutch and radiation shielding are still items of some risk. At the time of this writing, we are awaiting vendor proposals for the scattering chamber with integrated sample isolation system. This is the largest uncertainty in the ARCS project today.

The ARCS Chief Engineer, Kevin Shaw, joined the project in 2004. Project controls services are now performed by the SNS. A construction progress review was held in the August, 2004, before which the project was rebaselined, and after which the Project Execution Plan was updated. The ARCS project will be rebaselined in March 2005 after a vendor is selected for the scattering chamber with integrated isolation system. Project completion by Sept. 2006 is possible but challenging.

Technical and Programmatic Progress and Accomplishments

- We have taken delivery of nearly 900 position-sensitive ^{3}He detector tubes, and have checked that typical articles meet our requirements. An order is being placed to procure the first set of detector electronics.
- The ARCS shutter installed in the target building (see figure). This includes a short section of neutron guide inside the shutter housing.
- The single crystal cryo-goniometer with 3 axes of tilt has met its design goals of with a base temperature of 14 K at the sample. Hardware and basic software are sufficiently complete that this unit can be offered for temporary use in the user program at the Lujan Center at Los Alamos. The photograph on the next page shows part of the unit atop the Pharos instrument.

- The Fermi chopper system, with slit packages and translation table, is nearing delivery to the SNS, likely in March, 2005. A set of slit packages has been designed, and is being discussed by the chopper spectrometer community.
- A 22 processor Beowulf cluster has been built and tested for service as the ARCS data analysis computer. The basic data reduction codes have been operational for some time, and have been tested with simulated data. The present effort is on defining a NeXus file template for ARCS raw data.
- The Monte Carlo simulation package, McStas, has been ported to the DANSE framework, and integrated with a dynamics modeling code. We have simulated the phonon scattering from a sample, and run the simulated data through the data reduction code to obtain energy spectra.
- A conceptual design has been finished for the T0 chopper. It will be a vertical axis design, a which should help reduce iterference between ARCS and SEQUOIA.
- Specifications for the main neutron guide are nearly complete.
- Concepts for the sample hutch have been developed, and have been discussed from the safety standpoint. The concept is evolving into a small, heavily shielded space for sample access.
- Radiation shielding for the interior of the scattering chamber has been designed, and test articles will soon be obtained from the vendor.

- The basic neutronic design of the outer shielding has had a successful first iteration, and a second and final iteration is underway.
- The specifications for the scattering chamber with integrated sample isolation system were released in a request for proposals to vendors of large vacuum tanks. Four are interested in submitting proposals in late January.

Issues and Actions

- Bids for the scattering chamber with integrated sample isolation system are expected in 3 weeks. This is the largest single procurement of the ARCS project, and will set the schedule and contingency of the project. If the proposals are too expensive or too slow, we may need to reduce scope, perhaps eliminating the isolation system.
- Unique among inelastic spectrometers, ARCS requires a shielded hutch over the sample region, owing to radiation levels during operations. Progress is being made on this design, but this design activity will soon require more information on the scattering chamber.
- Radiation shielding continues to be a concern. Detailed design cannot be completed without further engineering on the scattering chamber, but we are pursuing another iteration of a general shielding design.

Management Progress and Issues

- Kevin M. Shaw, P.E., joined the ARCS project as Chief Engineer, and is now fully engaged in the design work and system integration.
- All personnel working on the ARCS project are now located at Oak Ridge and Caltech. The involvement of Argonne personnel was ended in the fall of 2004.
- The ARCS project was rebaselined in July, 2004, with tasks arranged in the three categories of 1) design, 2) procurement and fabrication, and 3) installation and testing that are in use for the other instruments at the SNS.
- The SNS has now assigned a set of tasks for ARCS installation in the Target Building, and is integrating them into the installation schedule.
- ARCS is now integrated into the SNS earned value system, and monthly reports can be generated about 15-20 days after the first of each month.
- The ARCS Project Execution Plan was rewritten after the August Construction Progress Review, and awaits approval by DOE.
- The ARCS project needs to be rebaselined after the bids are received from vendors of the scattering chamber. This is the last major uncertainty in the project, and an accurate plan should be possible.

Cost and Schedule Analysis

At the end of this report is a graph of the baseline cost of the work performed, the actual work performed, and the actual cost of the work scheduled. To a good approximation, the ARCS project has been tracking the project plan that was devised before the Construction Progress Review in August. The cost variance (+1%) and schedule variance (+4%) are minor, and are essentially negligible. It is important that the project be tracked over a longer period of time, but so far the progress is as expected.

Use of contingency

Costs were lower than expected, and the contingency as a percentage of the remaining budget has grown slightly during the present budget period.

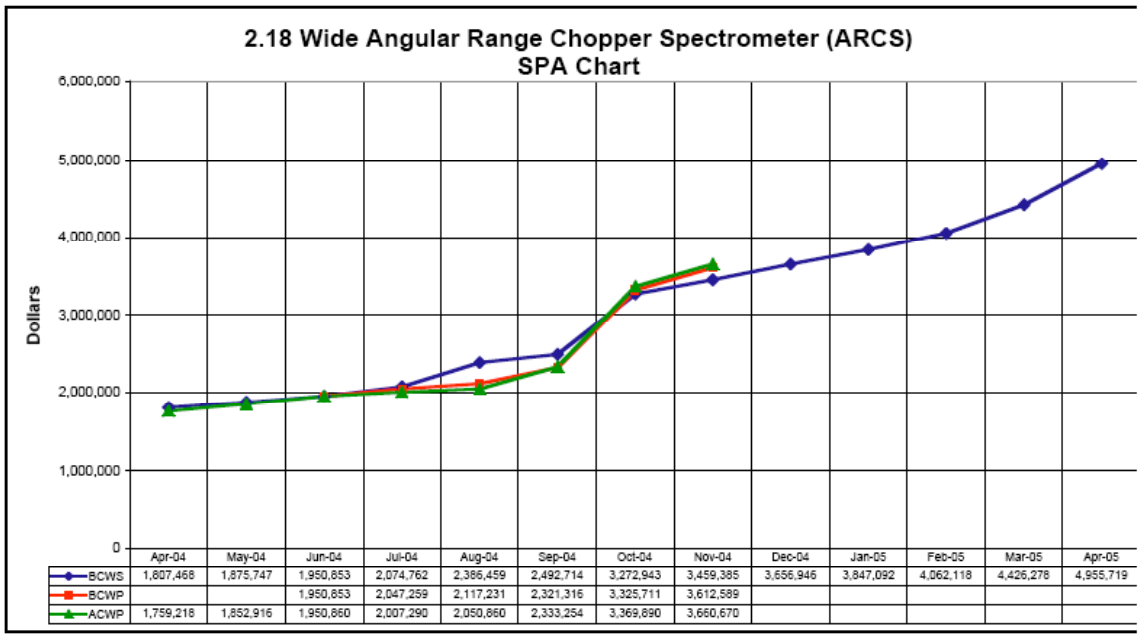
Milestone Status

The project met the milestone for detector delivery in 2004.

The next milestones are series of contracts that should be awareded in the first half of 2005.

Project Critical Path Analysis

Delivery of the scattering chamber with integrated sample isolation system will set the critical path for the ARCS project. The installation of shielding around the scattering chamber may also be in the critical path. A thorough rethinking of the project plan is appropriate after vendor proposals are received in January, 2005.



	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Apr-05
BCWS	1,807,468	1,875,747	1,950,853	2,074,762	2,386,459	2,492,714	3,272,943	3,459,385	3,656,946	3,847,092	4,062,118	4,426,278	4,955,719
BCWP			1,950,853	2,047,259	2,117,231	2,321,316	3,325,711	3,612,589					
ACWP	1,759,218	1,852,916	1,950,860	2,007,290	2,050,860	2,333,254	3,369,890	3,660,670					