OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE U.S. DEPARTMENT OF ENERGY

The NEUTRON PULSE

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The Big Day: SNS Delivers Its First Neutrons!

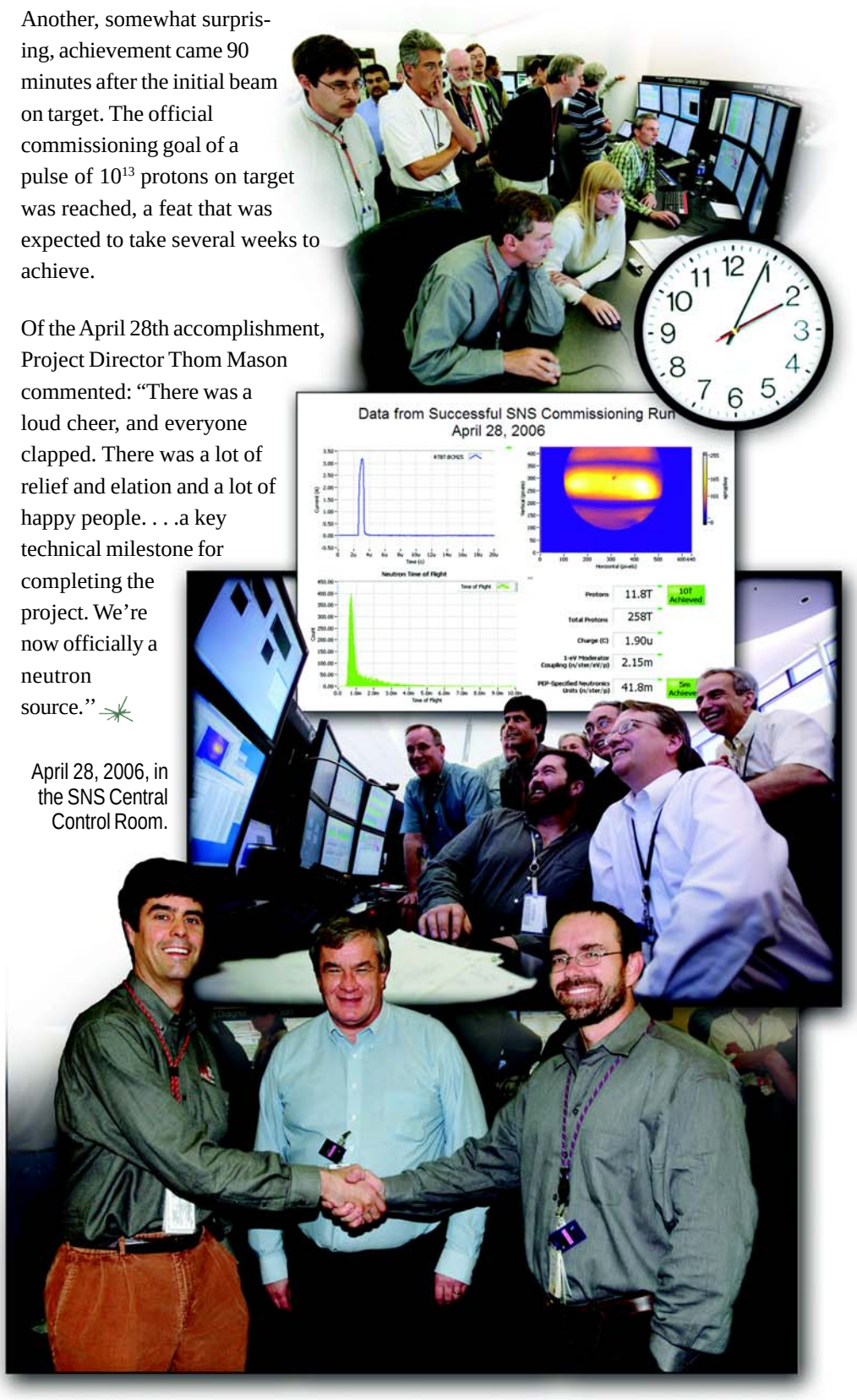
It's finally happened after seven years of construction, equipment installation, and commissioning. On April 28, 2006, SNS successfully produced its first pulse of neutrons, demonstrating that the $1.4B facility of complex, one-of-a-kind systems works. Although it will take about two years for SNS to reach its goal of 1.4 MW (with high reliability), this initial success was a major achievement that brought excitement and celebration among the SNS staff.

The past year has been one of the most challenging for project staff, with tight deadlines, significant technical challenges, and long hours. SNS Deputy Project Director Carl Strawbridge stated it best in his congratulations to the staff: "I have a lot of years working in and leading large technical institutions doing complex work, but I have never seen such a high degree of talent and willingness to apply it to the larger goal, as was the case on SNS."

After a frustrating morning of technical problems, it looked as if the planned generation of neutrons wasn't going to happen that day. Faces in the Central Control Room were anxious and showed signs of disappointment. In the end, however, all difficulties were resolved, and at 2:04 p.m., the accelerated proton beam hit the mark. A phosphor screen attached to the front of the mercury target flashed, showing clearly that the proton beam was on target. Simultaneously, instruments in the Target Building recorded the first burst of neutrons.

Another, somewhat surprising, achievement came 90 minutes after the initial beam on target. The official commissioning goal of a pulse of 10^{13} protons on target was reached, a feat that was expected to take several weeks to achieve.

Of the April 28th accomplishment, Project Director Thom Mason commented: "There was a loud cheer, and everyone clapped. There was a lot of relief and elation and a lot of happy people. . . .a key technical milestone for completing the project. We're now officially a neutron source."



April 28, 2006, in the SNS Central Control Room.

After a toast to more than ten years of hard work, a productive partnership, and a successful project, SNS celebrates.

Photos taken in the Central Laboratory and Office Building after the successful beam-on-target run. Oak Ridge National Laboratory Director Jeff Wadsworth (below left) and SNS Director Thom Mason (below right) address a gathering of the SNS staff. Said Wadsworth, "To arrive at this point on budget, on scope, and on schedule is a tribute to six national labs working together. A lot of people thought it could not be done because the labs have natural rivalries, but in this case, the labs all did what they were asked to do. I think this is an exceptional accomplishment."

Congratulations from the Scientific Community

When news went out that SNS had put beam on target, congratulations poured in from all over the world, and news of the event appeared in almost 100 publications. We at SNS would like to express our appreciation for the many years of support we've received from the scientific community and the local community in East Tennessee. We would also like to share with you some of the encouraging words we recently received.

"Congratulations. You even made CNN!" *Ned Sauthoff, DOE Princeton Plasma Physics Laboratory*

"You must be ecstatic and deservedly so. I can't tell you how much I appreciate your energy, enthusiasm, and steadiness during the past few years. You have done a remarkable job bringing SNS to the CD-4 goal. This is just a wonderful day for everyone in BES, SNS, and ORNL, and in the entire neutron sciences community, which has been waiting for more than two decades for this facility to be realized." *Pat Dehmer, DOE Office of Basic Energy Sciences, Office of Science*

"Congrats. The SNS project is the first thing I worked on at the Office of Management and Budget, so it is good to see the first phase of the facility's life coming to a close in such an auspicious fashion. Best of luck with the beginning of operations." *Mike Holland, Energy Subcommittee, Committee on Science, U.S. House of Representatives*

"This news circulated among Japan very quickly. Your effort must be greatly appreciated by the entire community of the world sciences. Congratulations to you and to all the staff members at SNS." *Shoji Nagamiya, KEK*

"The entire world neutron community is in your debt, and I look forward to the first experimental results." *Martin Blume, American Physical Society*

"I'd say that the effort on the part of the SNS team was quite impressive. It's no easy task to achieve success as quickly as you did. I'm sure all will sleep better having demonstrated the proof that all the bits and pieces can work in reality, not just on paper." *Bob Kustom, ANL/APS*

"On behalf of the INR, Moscow Directorate, and staff let us congratulate everyone at SNS with such a remarkable event as the commissioning of SNS. It's great news for all of the scientific community around the world!" *Victor Matveev and Leonid Kravchuk, Institute for Nuclear Research of the Russian Academy of Sciences*

"This is really a great step for the worldwide pulsed spallation neutron community." *Yoshi Yamazaki, J-PARC*

"We at ILL congratulate you wholeheartedly on your achievement, and we welcome you warmly to the neutron club." *Colin Carlile, on behalf of all ILL staff*

"Congratulations to you and your team for delivering beam to the target. SNS is born and soon it will grow to adulthood and make an immense impact on science." *John Peoples, FNAL*

From Local Press

"It may be possible to overstate the significance of the Spallation Neutron Source in this region's high-tech future, but it's much easier to underestimate its impact." *Metro Pulse, Knoxville, Tennessee*

"At the SNS groundbreaking in 1999, former Vice President Al Gore said 'the most important advances that will come out of this will the ones that nobody can predict.' " *Knoxville News Sentinel*

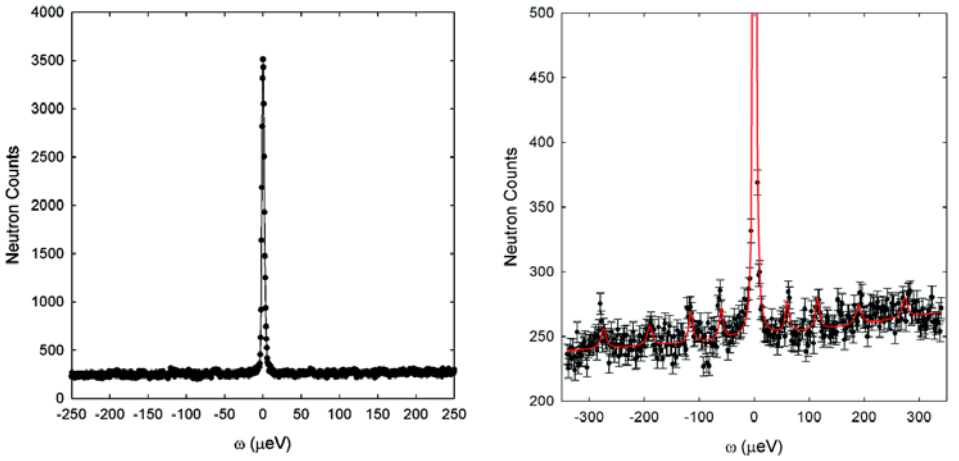
For more see www.sns.gov/ .

Additional Milestones Met During May

On May 20, two more significant events took place: the primary shutter of the Backscattering Spectrometer, the first SNS instrument, was opened and the first neutrons delivered to a research instrument were counted. These neutrons were also the first "cold neutrons" produced from the cryogenic moderator system.

A few days later, the same instrument recorded the first time-of-flight data. A 25-g sample of fluorinated mica was placed in a 3- × 3-cm^2 neutron beam with a time-averaged proton power on target of 185 W. Four detector tubes counted for 822 seconds.

On Wednesday, May 31, the instrument measured the energy-resolved scattering from a sample of 4-methyl pyridine (N-oxy g-picoline) at a sample temperature of 3 to 4 K. In addition to a strong elastic response whose width in energy was determined by the instrument resolution, the series of expected tunneling peaks was observed. These spectra were collected using 25% of the current detector/analyzer system in 3 hours at an average proton power on target of 5 kW.



Details of inelastic measurement for the Backscattering Spectrometer: on the left, the entire elastic line; on the right, an expanded y-scale and the presence of the tunneling peaks (the red curve is a constrained fit to the data using the expected locations of the peaks).

With the completion of construction project work and the Backscattering Spectrometer achievements, the SNS project was formally completed on May 31, 2006—ahead of schedule and under budget.

Future Goals

By fall 2006, SNS expects initial users to be selected for its first three instruments: the Backscattering Spectrometer mentioned previously, the Liquids Reflectometer, and the Magnetism Reflectometer. Future operational time lines at SNS include the following:

- Summer 2007: power level exceeds 100 kW.
- Fall 2007: General User Program in place for first three instruments.
- Winter 2008: 1-MW capability, with seven instruments available through the General User Program.

SNS Chronology

12/99	Groundbreaking ceremony
11/02	Front-end commissioning begins
4/03	Linac & target equipment installation begins
8/03	Ring equipment installation begins
3/04	Instrument installation begins
6/04	Project staff moves to construction site
1/05	Warm linac commissioning completed
5/05	First target module delivered
6/05	Construction hours without a lost workday reaches 4 million
9/05	Commissioning of entire linac completed
12/05	Mercury loaded into target system
1/06	Beam accumulated in ring and extracted to dump; successful testing of mercury loop
4/06	First Beam on target: Critical Decision 4 performance test accomplished
5/06	**Project formally completed**

Shull Fellowship

Applications for the 2007 Clifford Shull fellowships will be accepted from July 1 through September 30, 2006. For more information, see www.sns.gov/shullfellowship/.

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May 8, 2006, aerial view of the SNS site. Construction is complete except for a few finishing touches and landscaping.

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For the latest user updates, see the SNS users web site at www.sns.gov/users/users.htm.

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