



The Source

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SPECIAL

First X Rays Light the Way for APS

The APS has taken an important step toward fulfilling its stated mission of "producing insertion-device- and bending-magnet-based synchrotron radiation for use in forefront research in science and technology at this national user facility."

At 1:55 on the morning of March 25, the APS storage ring radio frequency (rf) cavities began supplying energy to an electron beam with an energy of 4.5 billion electron volts. Rf capture in the storage ring, the first major step in commissioning the facility, had been accomplished (see sidebar). The beam was maintained for 15 minutes while electrons orbited the 1104-m storage ring some 250 million times, a total distance of ~275 million km.

Then, at 7:13 a.m. on March 26, x-ray radiation from the Sector 1 bending magnet traversed the length of the Beamline 1-BM front end. The beam exited through the ratchet wall collimator, and left its mark on a sheet of radiation-sensitive material taped to the beryllium window at beamline's end inside the Synchrotron Radiation Instrumentation Collaborative Access Team's first optics enclosure.

First light.

"We can all be proud of the reputation the APS is gaining within the worldwide scientific community," said APS Associate Laboratory Director David Moncton.

The APS beam acceleration and storage system is a highly complex conglomeration of millions (even zillions) of sophisticated pieces of technology. When commissioning began, many of those components had yet to function in concert. According to Accelerator Systems Division (ASD) Director John Galayda, "Start of commissioning is really the final hardware checkout, to find out if the machine does to the particle beam what was intended. Often, many new things are found out about the hardware during this process."

"We decided to begin studies by sending beam into the storage ring for a fraction of a single turn during the first two weeks," said Galayda, "rather than immediately attempting to send beam around the entire circumference of the ring. Because our beam diagnostics were ready, we were able to quickly learn a great deal

about the equipment, such as whether the power supplies were responding correctly to controls commands, and make adjustments accordingly."

A 13-member APS operations crew mans the main control room around the clock, in three shifts. However, ASD has opted for two 8-hour shifts of actual commissioning. (A commissioning team comprising the three ring managers and other accelerator physicists is also present during these shifts.) The third (daytime) shift is dedicated to continued checkout and improvement of accelerator hardware. So, while 5 days elapsed from the first full orbit of beam in the storage ring to betatron capture, that 5 days was, in reality, a total of 5 shifts, or a mere 40 hours of accelerator studies.

The excitement engendered by the first flash of x rays was almost beyond any words for Experimental Facilities Division (XFD) personnel. "What else do you expect from a team that has worked together for so many years in anticipation of this day?" asked Gopal Shenoy, Director of XFD. "The team is now ready for even more excitement as they bring each of the undulator beams on line, and as new results are announced by APS users running experimental programs." ○

☛ Betatron capture when the particle beam in the storage ring is controlled in both the vertical and horizontal dimensions simultaneously. Captured beam will orbit the ring without striking the injection magnet through which beam entered the storage ring from the booster. The storage ring bump magnet must be cycled on/off very rapidly at the right time and at the right amplitude during the first five ring turns (which, at 4.5 GeV, take 18.4 microseconds) until the injection magnet switches off. After 40 turns (another 147.2 microseconds) with betatron capture, the rf system must begin replacing energy lost to synchrotron radiation. This is called ...

☛ Rf capture when the storage ring beam is confined longitudinally in the direction of its travel, while the rf transmitters and accelerating cavities maintain the stored beam at the desired energy for the prescribed length of time.

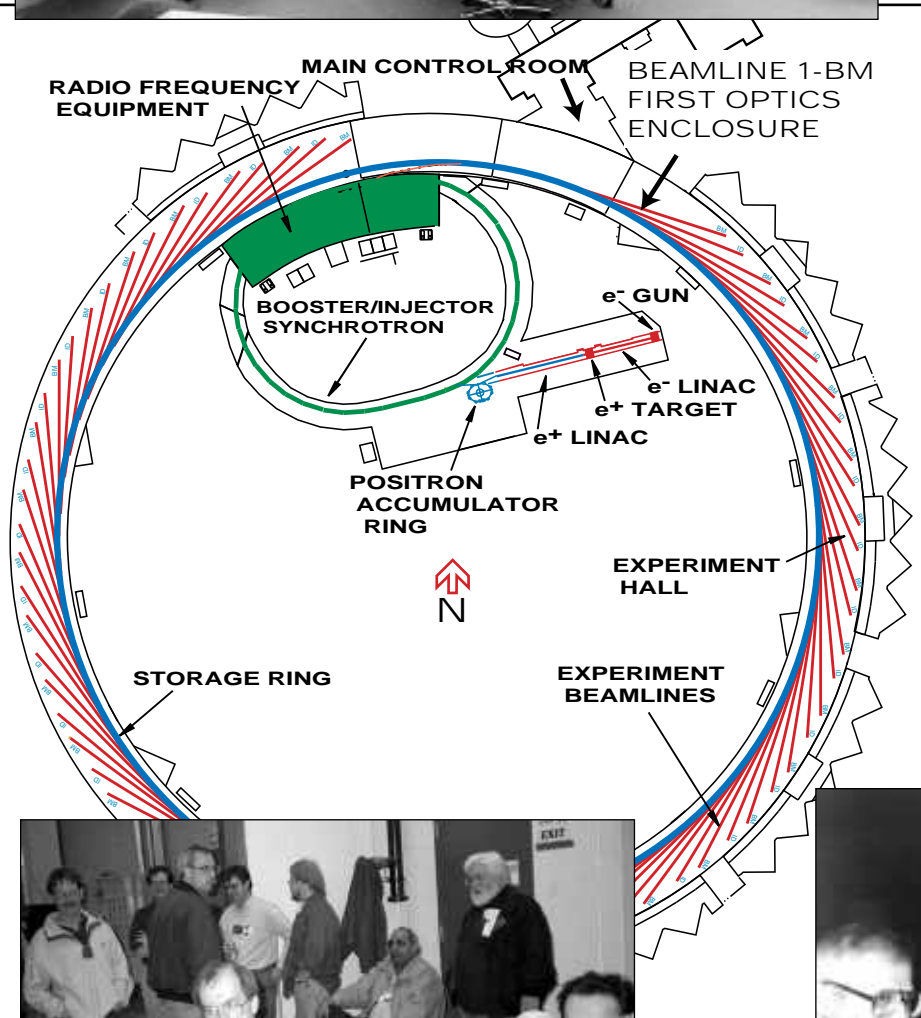


← The newly completed APS Main Control Room (MCR). This photo was taken during the afternoon shift on March 23. (ANL photograph 19366K #12A)

All other photos on this page courtesy of Dennis Mills (XFD-OP).



↑ PA R Ring Manager Michael Borland and Synchrotron Ring Manager Steve Milton (both ASD-PHY) in the MCR shortly after rf capture of the 4.5-GeV electron beam on March 25.



↑ Waiting for the light. Some of the multitude who spent the better part of the weekend at the APS. Locations alternated between the main control room or, as shown above, the experiment hall, where a temporary observation post had been established next to the deposition facility in anticipation of first light.

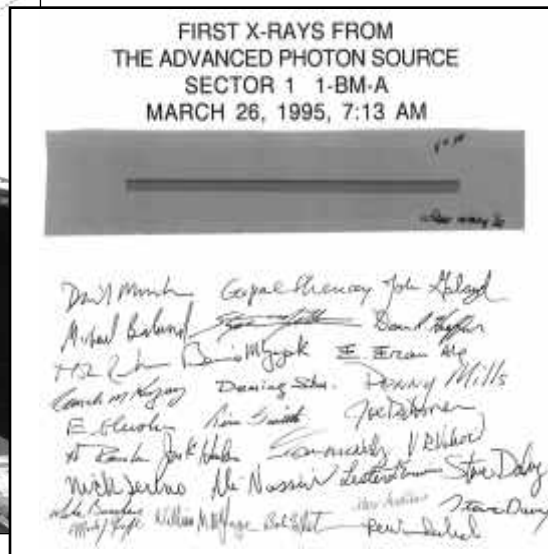
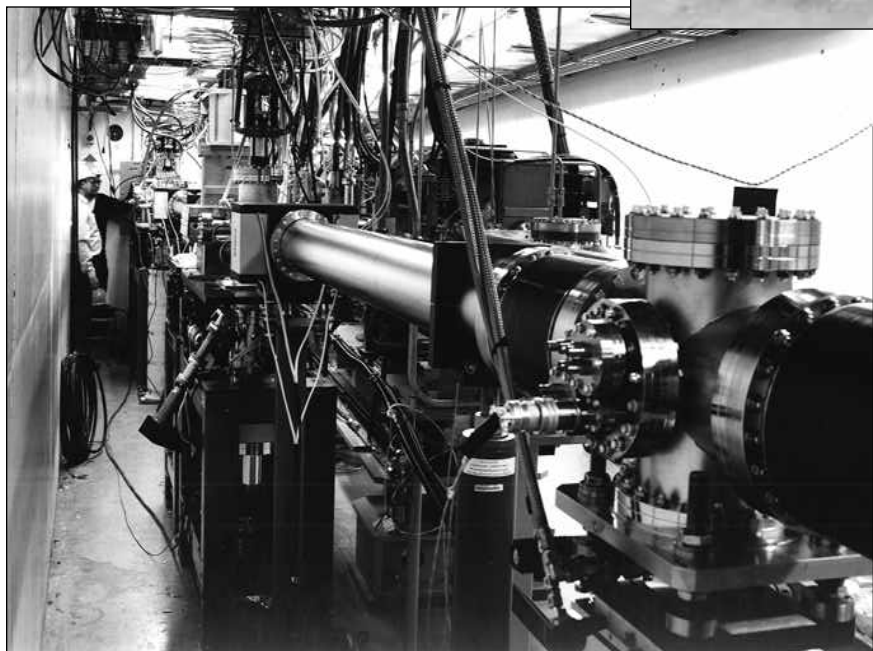


↑ XFD Director Gopal Shenoy (left), Storage Ring Manager Glen Decker (ASD-PHY), ASD Director John Galayda, and APS ALD David Moncton capped off a weekend in the MCR with a toast to the first APS stored beam and x-ray beam.

→ The sign reads: **APS - FIRST FULLY INTEGRATED FRONT END - JANUARY 6, 1995.** Most, but not all, of the XFD Engineering & Construction Group were photographed together in the experiment hall to celebrate completion of the first APS beamline front end, for sector 1-BM. (ANL photograph 18921K #1)



↓ A partial view of the Sector 1-BM front end (FE), complete from bending magnet to ratchet wall collimator. The first APS x-ray beam traveled the length of this FE and was recorded in the first optics enclosure on the experiment hall floor, just outside the ratchet wall. (ANL photograph 18985K #12)



↑ All present for the occasion signed underneath the piece of radiation-sensitive material on which the first APS light left its mark.



← ANL Director Alan Schriesheim (at the microphone) visited an all-Project celebration in the experiment hall to personally convey his congratulations for a job well done. (ANL photograph 19438K #25A)



Department of Energy
Washington, DC 20585

April 5, 1995

Dr. Alan Schriesheim
Director
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

Dear Al:

Congratulations to you and to the entire team on the production of the first beam of hard x-rays at the Advanced Photon Source (APS). This is a significant milestone for the APS as well as for the research community which will use these x-rays.

In this era of large science such achievements are not the result of the work of one person or one small group, they are the culmination of the efforts of hundreds of talented people over many years. I commend you personally on your leadership and your management of the laboratory. In addition, I specifically want to recognize Dr. David Moncton for his management of the APS. Please convey my congratulations to him and to the many others whose contributions were essential to this accomplishment.

Achievements such as this validate the need for continuing research in this area and represent the payoff for the investment that our society has made in basic research.

Best wishes for continued success.

Sincerely,

Martha A. Krebs
Director
Office of Energy Research

From: William Oosterhuis - DOE-BES
Congratulations!



STANFORD SYNCHROTRON RADIATION LABORATORY

PO Box 4948, MS 89
Stanford, California 94308-0910
(415) 825-4980
FAX: (415) 825-4190

From: Jochen Schneider, HASYLAB/DESY -
Congratulations on the first x-rays produced at APS. At HASYLAB, we are very happy about your success and we wish you and the Laboratory all the best for the further commissioning of the APS!

Dear David:

The progress in commissioning the APS is most impressive.

Congratulations to you and the entire APS staff from all at SSRL in storing a beam so quickly. Reaching this important milestone so rapidly is an excellent omen. We send you our best wishes for continued rapid progress in reaching (and probably exceeding) design goals.

Yours sincerely,

Arthur Hegerstock
SLAC Associate Director for SSRL

From: Yves Petroff, ESRF -
Congratulations to all your staff! We will bring the champagne over for the meeting in May.

From: Ruprecht Haensel, ESRF - I was extremely happy to read that APS made its first turns. I know exactly how happy you and all your collaborators are and I wish you all the best for the next period of exciting tests of your machine.

KEK NATIONAL LABORATORY FOR HIGH ENERGY PHYSICS
1-1 OHG, TSUKUBA-SHI, IBARAKI-KEN, 305, JAPAN



From: Heinz Weyer, SLS -
Congratulations from the SLS team.

BERKELEY LABORATORY
Advanced Light Source
P.O. Box 232, MS 80-101, ERL 4810

M E M O R A N D U M

From: Ken Finkelstein, CHSS - MazelTov!

TO: the entire APS Team
FROM: Brian Kincaid and the ALS

CONGRATULATIONS!

GREAT WORK!

(Now try to relax and have some fun!)

Dear David and Gopiel
You must feel like parents
of a new baby. We look forward
to a vigorous adulthood.
Warmest congratulations

USA FAX: +1-708-252-3222
From: Motohiro Kihara
Director, Photon Factory
FAX: +81-298-64-2801
TEL: +81-298-64-5631
E-MAIL: KIHARAM@KEKVAX
No. of pages (including this sheet):

Dear Dr. Moncton,

Congratulations for the successful commissioning of the APS storage ring! I think this is a victory of your leadership and the team work of your staffs. I look forward to hearing news soon on scientific products from the APS.

Sincerely yours,

Motohiro Kihara
Professor, Director
Photon Factory

From: Denis McWhan, NSLS - On behalf of the NSLS staff, let me congratulate you and the APS staff on your success with rf capture and x-ray beam extraction from the APS. Within budget and ahead of schedule, your success demonstrates again the excellent planning and management of the APS project.

From: Jay Marx, ALS - Great news!!!
Congratulations - best wishes and hopes for continued success.



Handwritten signatures and notes at the bottom of the page, including names like Steve Sutton, Mark Rivers, and others.