Bragg Peaks > for neutron users
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OPAL news

We expect to resume operations once there is regulatory approval from ARPANSA. The fuel-plate displacements found during a routine shutdown in July 2007 resulted in a design change, i.e. the incorporation of a stopper to prevent fuel-plate movement. The revised design has been thoroughly tested and evaluated, including tests that exceeded conditions that would be experienced in the reactor. ANSTO has undertaken detailed risk assessments and technical analyses, in collaboration with the reactor designer INVAP and drawing upon the advice of independent international experts. Documentation on the modifications was submitted to our regulator ARPANSA in December 2007. If ARPANSA approval is received, operation of OPAL will recommence using fuel manufactured to the new design.

This shutdown has also enabled ANSTO to successfully complete a set of unrelated repairs to the reflector vessel, which contains heavy water. The very small leaks of light water into the heavy water in the vessel would gradually have affected the efficiency of neutron production over several years if not resolved.

Around the instruments

Echidna *(high-resolution powder diffractometer) and* ***Wombat*** *(high-intensity powder diffractometer)*

A new gas-dosing equipment was tested on Echidna.

Sam Duyker (Univ. Sydney) and Vanessa Peterson (Bragg Institute) assemble the equipment for testing.

The system is delivering an accurate dose of gas or gas mixtures to samples for neutron-scattering experiments, using a design based on similar equipment at NIST in the USA. In its first use, this equipment will be used to investigate new hydrogen-storage materials, as part of ANSTO's research project "Neutrons for the Hydrogen Economy". This equipment will be initially used at sample temperatures in the range 1.5 – 700 K on the two powder instruments, Echidna and Wombat, and plans are already in place to run the equipment on several other instruments, notably Taipan and Pelican.

Kowari *(strain scanner)*

Commissioning on Kowari is going ahead well with all of the hardware recently installed. Besides the commissioning work and although OPAL was shut down, participants of the Neutron School on Diffraction had the opportunity to understand how a strain scanner works. Although not necessarily experienced in strain scanning or materials science it was an opportunity to appreciate tasks such as sample mounting and aligning and "operating/controlling" the instrument. Obviously, those who "worked" on Kowari had a good time….

Mounting and aligning the sample may be fun,

but driving the instrument seems to be even more enjoyable.

Koala *(quasi-Laue diffractometer)*

The Koala diffractometer has arrived back at ANSTO following its repair and upgrade in France. It is now being installed and will

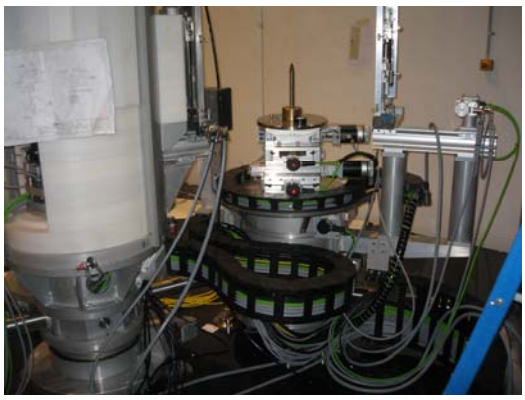
be ready for commissioning by the end of January.

Friedl Bartsch inspects the image-plate reader after it is removed from its packing crate.

***Quokka** (small-angle neutron scattering, SANS)*

The data-acquisition group has now completed their modifications of Quokka's Ordela 21000N detector to provide higher-speed data transfer; this will be placed in the Quokka detector-vessel shortly. Calibration tests have been completed on essentially all of the instruments motorised components. Meanwhile, in the last two months Quokka's spare Ordela 21000N detector and high-wavelength resolution Astrium neutron velocity-selector have arrived.

***Taipan** (thermal three-axis spectrometer)*

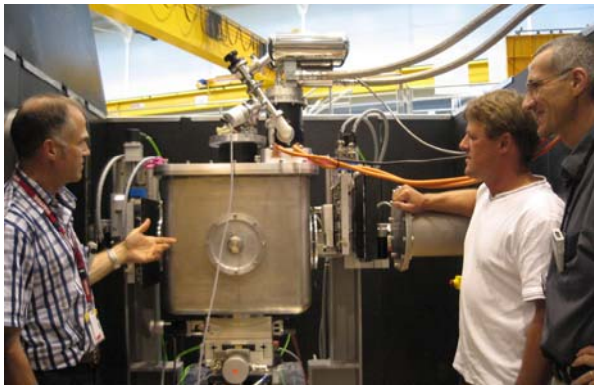


Currently, Taipan is being wired: motors and encoders in monochromator drum, sample and analyser stages (see photo). Even as the wiring proceeds, motion control is being installed and tested on those axes which have been completed. The elements of safety interlock system are installed. We are about to install the input-optics assembly, consisting of the virtual source, a secondary shutter, a sapphire filter and primary collimators. Implementation of instrument-control software will follow.

Sample environment

Commissioning of our 5 Tesla high-temperature superconducting magnet for neutron reflectometry and small-angle scattering has been completed.

A novel cryogen-free 5 Tesla magnet made of high-temperature BSCCO (bismuth strontium calcium copper oxide) material arrived at ANSTO and was commissioned in December 2007. It was built by the New Zealand company HTS-110.



Donald Pooke (left) and Simon Gibson, from HTS-110, explain aspects of the magnet testing to Frank Klose (far right) from the Bragg Institute.

A sample is mounted in the magnet in a cryofurnace, allowing the sample temperature to be varied from 5 - 700K. The neutron beam can be axial (in line) with the magnetic field or transverse to it. The magnet can be tilted up to 10 degrees and rotated ±16° in the axial direction and ±12° in the transverse direction. The neutron windows (not in place in the photo above) are made of single crystal sapphire.

Announcements

Commissioning of instruments

Once OPAL restarts, we will essentially resume commissioning where we left off in July 2007. Each instrument requires its own regulatory sign-off from ARPANSA, in addition to the reactor license described earlier, and we are very close to getting that for the two powder diffractometers. Once this is received, and there is a published schedule for OPAL operations,

we can schedule the user experiments approved in last year's proposal round.

New computing cluster

We have recently taken delivery of a high-performance computing cluster that will be used for simulation and modelling. This is not only for internal use, but also to help neutron users who want to use numerical methods to get the most from their data but lack the expertise and/or resources to get started.
The machine has a total of 32 cores and 96 GBytes of memory and is currently being set up to run *ab initio* and DFT codes. Users wishing to know more about these facilities should contact Don Kearley (gordon.kearley@ansto.gov.au).

ANSTO – AINSE Neutron School on Materials, 21-26 July 2008

This school will provide training for newcomers to neutron scattering focussing on important classes of structural and functional materials, e.g. concrete and geopolymers, magnetic materials, soft matter and biomaterials, and metals. We will not only have lectures but also practical sessions with hands-on experiments and data analysis. All neutron techniques (available at ANSTO) will be covered in the school, i.e. powder diffraction, single-crystal diffraction, strain scanning, small-angle scattering, reflectometry, and inelastic scattering using three-axis spectrometers.
This school is aimed at PhD students and post docs – novice users, and will be limited to 30 people. Participants will be selected based on an abstract outlining an aspect of their scientific project to be presented as a poster at the school. Deadline for applications will be April 2008. For further details see http://www.ansto.gov.au/bragg/science/conferences_and_workshops/neutron_school_08.html.

Defining specifications for a USANS neutron-scattering instrument

On 15-16 November 2007, the Institute hosted a workshop on 'Pushing Small-Angle Neutron Scattering at OPAL to Smaller Q'.
The thirty-nine participants, coming from universities, research institutes and industry, discussed large-scale structures with real space-sizes ranging from 0.1 to 50 microns, such as polymers, precipitates, grain structures, viruses and bacteria. The length scales of such materials exceed the measurement capabilities of conventional small-angle neutron scattering by one or two orders of magnitude and therefore require a new experimental approach.

A major point of this workshop was to make a start on defining specifications for a USANS neutron-scattering instrument at OPAL. Invited talks were given on the two techniques, crystal ultra small-angle neutron scattering and spin-echo small-angle neutron scattering, with emphasis on their scientific merits. The workshop discussed science covering a wide range of subjects, including colloids, coals, complex fluids, porous materials, nanocomposites, cements, steels and various areas in biology.
A detailed report can be found under http://www.ansto.gov.au/__data/assets/pdf_file/0014/24521/ANSTO_Low-Q_Workshop_Report.pdf.

Discussing polarisation options

Our workshop on Polarised Neutron Scattering welcomed over 30 participants on 28-29 November 2007 at the Institute. There is a compelling case for polarised neutrons and polarisation analysis for inelastic neutron-scattering and neutron diffraction. Polarisation analysis of high-intensity specular and diffuse scattering for reflectometry and small-angle neutron scattering is also supported.

1. The majority of our needs can be met with polarised ^{3}He gas technology, as implemented at the ILL or NIST. The particular choice between metastable exchange and spin-exchange optical pumping will depend on an assessment of relative cost, scheduling times and risk, by ANSTO.
2. There is

also support for a focussing Heusler-alloy monochromator on Taipan.

3. While commercially available polarising supermirrors will continue to find a role at OPAL, it is not recommended that ANSTO invests in its own supermirror production.

However, ANSTO should make an effort to install ^{3}He polarisers/analysers on five of our instruments rapidly, subject to providing staffing and making a technology choice between the two optical pumping methods. In parallel, a Heusler-alloy polarising monochromator should be procured for Taipan. A detailed report can be found under http://www.ansto.gov.au/__data/assets/pdf_file/0015/25341/Workshop_Report_Jan_7_2008-_final_version.pdf

First neutron school at Opal was a success

The "ANSTO/AINSE Neutron School on Diffraction in collaboration with IAEA, 29 November 2007 - 3 December 2007" hosted 30 PhD students and postdocs, selected from 55 applications. The school was truly international: although most of the participants came from Australian universities several came from Japan and Taiwan, but more than half of the participants originated from other countries: China, Finland, India, Indonesia, Italy, New Zealand, Russia, Ukraine, USA, Vietnam.

The first half of the school consisted of lecture sessions and posters in which the participants presented their own projects and where they considered neutron scattering could be advantageous. Although we had no neutrons to show the real performance of the instruments, the participants found the hands-on experience with 'previously collected data' very beneficial: "it was an excellent experience; I got to learn a lot". Each group presented the results of their analyses on the last day of the school.

Neutron Science Symposium

The 6th Annual Neutron Science Symposium AANSS2007, was held at Lucas Heights, 4-6 December 2007, hosted jointly by the Australian Institute of Nuclear Science and Engineering (AINSE) and the Australian Neutron Beam Users Group (ANBUG). Some 70 delegates, including 20 graduate students attended, including 3 international speakers (from Taiwan, Japan, and USA). The scientific programme featured 36 oral and 20 poster presentations of a consistently high standard, covering the entire range of neutron scattering science (from protein dynamics to magnetic phase separation) and techniques (from reflectometry to inelastic scattering).

An important part of the symposium was the ANBUG Annual General Meeting, chaired in 2007 by its president Craig Buckley. The general assembly provides its 332 members with an update on the status of the new OPAL research reactor and its instruments and gives the opportunity for direct feedback on their needs and priorities as users to the Bragg Institute.

Faces

The Bragg User Office Team (from left to right): Cherylie Thorn, Margaret Edmondson, Laura Nichols, Lauren Mackaway, Donna Freeman and Herma Büttner.

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