Bragg Peaks > for neutron users
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OPAL news

Since the last Bragg Peaks in October 2008, OPAL and its cold-neutron source have continued to run well, with an availability of 80% in the last cycle (compared with ~60% for the previous cycles). We continue to have some minor teething problems, for instance failures of neutron-flux detectors in the reactor itself, loss of offsite power (due to electrical storms) and opening of primary shutters.

The main reactor issue now affecting our users is that we have a somewhat inflexible protocol for moving fuel within the reactor core, that these fuel movements drive the reactor schedule in the event of unforeseen shutdowns, and in consequence we have difficulty sticking to a predetermined calendar schedule. We are currently working with our regulator ARPANSA to obtain approval for a modified fuel-management strategy, which will then allow us to stick to a fixed reactor schedule.

The current reactor cycle (number 12) started on 26 January 2009 with the next shutdown scheduled for 22 February 2009. This shutdown will be three weeks in order to look into the previously reported reflector-vessel defects. After the restart in mid-March the preliminary reactor operation schedule goes up to cycle 16 with the following reactor start-up and shutdown dates: 12 March – 6 April, 11 April – 13 May, 23 May – 17 June, and 22 June – 24 July 2009.

Around the instruments

Operating licences for PLATYPUS and QUOKKA were granted on 27 November 2008; below are the happy instrument scientists.

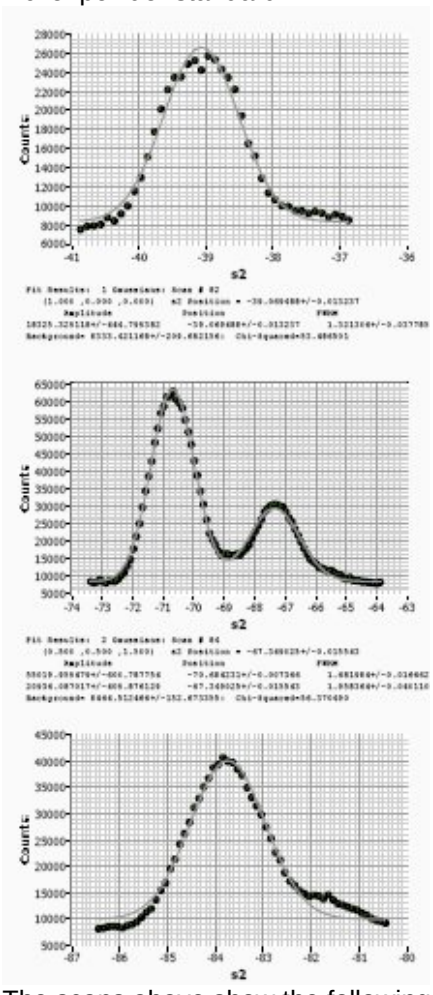
In addition, a total of five refereed papers have now been published, or are in press, involving authors from the Australian National University, the Australian Defence Force Academy, the Universities of Sydney, Wollongong and Aveiro (Portugal) and ANSTO.

Of the 57 powder diffraction experiments approved in 2007, 21 remain to be scheduled in due course subject to availability of samples and sample-environment equipment, but we have started running experiments from the September call. More details on this call can be found on page 4.

We anticipate calling for proposals on all seven instruments, and for the National Deuteration Facility, in March 2009.

Taipan *(thermal three-axis spectrometer)*

On 13 January, TAIPAN scattered its first neutrons from a sample into the main detector. This was a simple calibration scan using a nickel-powder standard.



The scans above show the following reflections:

hkl	*Observed position*	*Fit position*
1 0 0	-39.07 ± 0.01	-39.081
1/2 1/2 3/2	-67.35 ± 0.01	-67.271
1 1 1	-70.68 ± 0.01	-70.688
2 0 0	-83.74 ± 0.02	-83.790

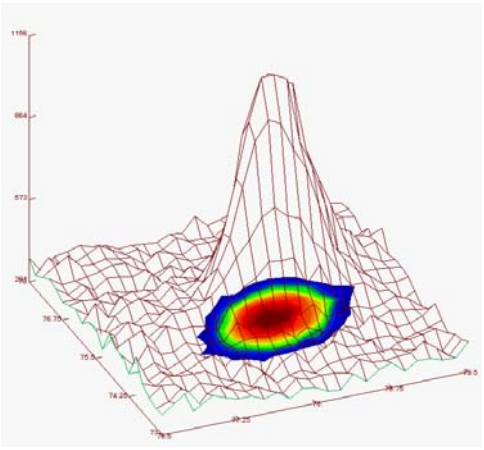
The safety paperwork has now been submitted for internal ANSTO review, and we anticipate the submission to ARPANSA for Taipan's operating licence in February 2009.

Wombat *(high-intensity powder diffractometer)*

Our first overseas users were welcomed on Wombat:

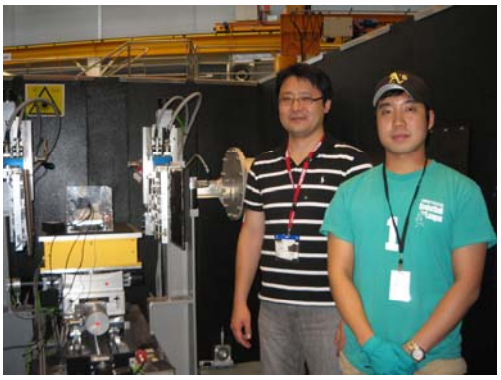
Jacob Jones and Abhijit Pramanick, from the University of Florida, carried out *in situ* real-time experiments on PZT (lead zirconate titanate ferroelectric), which was subjected to a cycling electric field, switching at rates of 1Hz to 1kHz. The data were acquired stroboscopically, with up to 64 time bins measured for each period. The changes in diffraction peak with field are very subtle and Wombat's high flux is indispensable in measuring them.

The smallest sample so far measured on Wombat was a 150 nm thick $FePt_3$ multilayer sample (by Frank Klose and Thomas Saerbeck, Bragg Institute). This corresponds to 220 micrograms of material. The image below shows the 200 reflection of $FePt_3$.



Platypus *(reflectometer)*

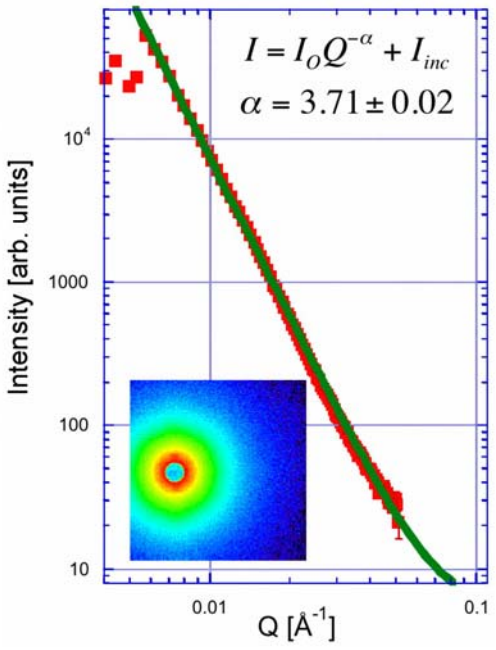
Over the past couple of months we have run numerous commissioning samples and experiments with "friendly users" on Platypus. In general, we have been fine-tuning our instrumental control and data reduction systems.



Our most recent set of "friends" to visit (photo above with Kwanwoo Shin, left, and Daehyun Hong from Sogang University, Korea) conducted our first serious free-liquid reflectometry experiment: examination of peptide binding to highly charged phospholipid monolayers. Data were taken from DPPS lipid monolayers on D_2O using a NIMA Minitrough under various states of molecular compression.

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

Characterisation measurements are continuing on the instrument and a call-for-proposals is anticipated shortly.



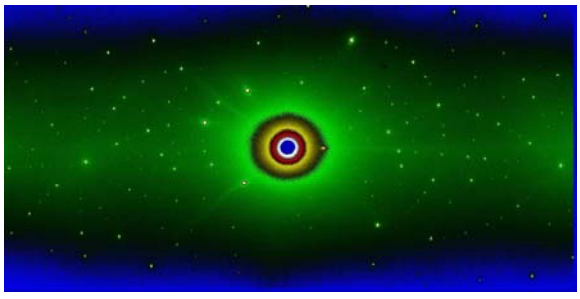
The graph above shows SANS from the mineral opal illustrating power-law behaviour. The inset shows the original 2D data set from which the reduced SANS was derived and illustrates how Quokka's detector can be offset to increase the Q range covered by a single measurement. The maximum flux at the sample position has been estimated to be 3 x 10^7 n $cm^{-2}s^{-1}$.

Kowari *(strain scanner)*

Kowari has proven to be fast and reliable for users: a number of residual stress measurements (by Michael Law, ANSTO-IME) have been made on a variety of samples, the most challenging being a very thick steel pipe intersection (see sample below) with complex geometry which is still in the beam. This specimen requires careful manipulation to measure four stress directions at 15 points; each measurement has long counting times due to attenuation through the material.

Koala *(Laue diffractometer)*

One of the diffraction patterns recently measured on Koala is given below.



This is part of a project by Stephen Best (left) and Peter Wichta (right), University Melbourne, studying the ordering and dynamic properties of $ZnCN_2$ single crystals (photo below on Koala with instrument scientists).

X-ray instruments

The suite of X-ray complementary instruments at the Bragg Institute has a new member: a second new ***Small Angle X-ray Scattering (SAXS) instrument*** was acquired providing temperature-controlled sample environment, simultaneous SAXS/WAXS, both 1D and 2D SAXS detectors, as well as GISAXS stage for thin-film measurements. The new instrument (photo below) has been successfully installed and commissioned and is now fully operational.

Helium-3 for polarisation

On 23 January, we signed a contract with the Institut Laue Langevin (ILL) in Grenoble, France, for the provision of a state-of-the-art polarised ^{3}He system, using the metastable-exchange optical pumping method. Cells using this technology to polarise and analyse neutron beams will eventually be implemented on a number of our instruments, including PELICAN, WOMBAT, PLATYPUS, SIKA and QUOKKA. As part of the project, ANSTO personnel will be seconded to the ILL, during the construction of the system.

Congratulations go particularly to Frank Klose for pushing this through, over the last year following the workshop in December 2007.

Pelican *(time-of-flight spectrometer)*

The engineering design of the Pelican instrument has been finished. Major items, like detectors, detector electronics, vacuum chambers, Fermi choppers, polariser, radial collimator and slits have been ordered, and the Be-filter has been delivered.

Announcements

Results of last proposal round

On 10-11 December 2008 our Program Advisory Committee met to assess the proposals submitted for the call closing in October 2008.
A total of 141 proposals were submitted requesting 788 beam days (including 40 days requested on the X-ray reflectometer), spread over the 5 instruments as follows:

Instrument	*Days requested*	*Days allocated*
Echidna	116	83
Koala	88	60
Kowari	180	60
Platypus	201	60
Wombat	163	99

At the end of December, all principal investigators were informed about decisions of beam-time allocations. Successful applications from researchers from AINSE member institutions were automatically forwarded to *AINSE for consideration of travel/accommodation support*.
Please do not hesitate to contact us if you have any questions concerning your beam time.

Some statistics on proposals

105 proposals received beam time: 27 on Echidna, 15 on Koala, 14 on Kowari, 14 on Platypus and 35 on Wombat covering scientific areas from bimolecular sciences to strongly correlated electron systems. The beam-time distribution is as follows:

	Beam-time days requested	Beam-time days allocated
Australia	597	285
Brazil	3.3	2.3
China	2.5	1
Europe*	30.7	25.5
New Zealand	36.5	13
Other Asia*	18	4.5
South Africa	10	6
Taiwan	35	22
USA	6	3
Total	*748*	*363*

*Europe includes Belgium, Denmark, Germany and UK. Other Asia includes India, Japan, Korea and Malaysia.

The attribution is based on the location of the laboratory of the proposer and not their individual nationality. The majority of the non-Australian beam-time requests are in collaboration with researchers from Australian laboratories. Beam time per proposal was split in these cases and therefore we have not only integers.

Successful NOBUGS conference

From 3-5 November 2008, over 80 scientists and computer scientists, from around the world converged on Cronulla for the 7th NOBUGS (New Opportunities for Better User Group Software) conference. It was a truly international event with 11% of the participants coming from Asia, 30% from Europe, 20% from the USA and 39% from Australia.
NOBUGS is a series of conferences intended to foster collaboration for developers of fast and user-friendly software for data acquisition, data reduction and data analysis in scientific instrumentation, especially as employed at large-scale user facilities, like neutron sources and synchrotrons. All in all the quality of the presentations and material presented was very good. NOBUGS 2008 was unique in that way that the conference was briefly interrupted to watch the Melbourne Cup.

Faces

Departure

One of our postdocs, Andrew Whitten, leaves for the University of Queensland. He has just been awarded a prestigious NHMRC Australian Biomedical Fellowship on "How SNARE proteins regulate glucose transport" at the University of Queensland. This will allow him to continue his career, using small-angle scattering of both neutrons and X-rays, and we look forward to seeing Andrew coming back to the Institute as a user.

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