Fourth International Workshop on Sample Environment at Neutron Scattering Facilities

Argonne NATIONAL LABORATORY

Argonne, IL USA
September 6-8, 2006

Cover Logo

The Argonne Logo

The Argonne logo is our most important visual asset and the cornerstone of our visual identity. It is a clear representation of our positioning and acts as a symbol of our reputation.

This logo incorporates the brand name "Argonne" with the descriptor "National Laboratory" and the "delta" symbol. The "delta," the symbol of change, reinforces the meaning behind our brand positioning: "where scientists come together to open up new possibilities for the future."

Disclaimer

The opinions expressed during this workshop and in any subsequent documents are solely those of the individual participants and do not reflect those of the Intense Pulsed Neutron Source, Argonne National Laboratory, or the US Department of Energy.

Any mistakes, misspellings, or omissions are the sole fault of the workshop organizers and none other.

Acknowledgements

The organizers of this workshop would like to express their thanks to Maria Heinig, Bev Marzec, Merle Faber, and Cathy Riblon, IPNS/ANL, for their help in administering this workshop.

We would also like to recognize the financial assistance of Rick Hapanowicz, Oxford Instruments, Inc, in providing morning amenities.

Table of Contents

Fourth International Workshop on
Sample Environment at Neutron Scattering Facilities
Argonne, IL USA
September 6-8, 2006

Workshop Logistics

Locations

- Oral Presentations will be held in Building 360, Room L-119. Follow the sign as you enter the main lobby.
- Poster Presentations will be in L-145 at 3:00 to 4:00 pm on Wednesday and Thursday. Presenters should set up their posters during the lunch time prior to their session.
- Vendor Exhibitors will be in L-145.
- Internet access is available in the IPNS user room, A-216. Several PC/MAC are available for workshop participants as well as our current users. Laptop connections are available to connect your laptop directly to a high-speed network connection. There is also WIFI in the main workshop venue, L-119.
- Washrooms are located along the A-Wing corridor on each floor.

Breakfast

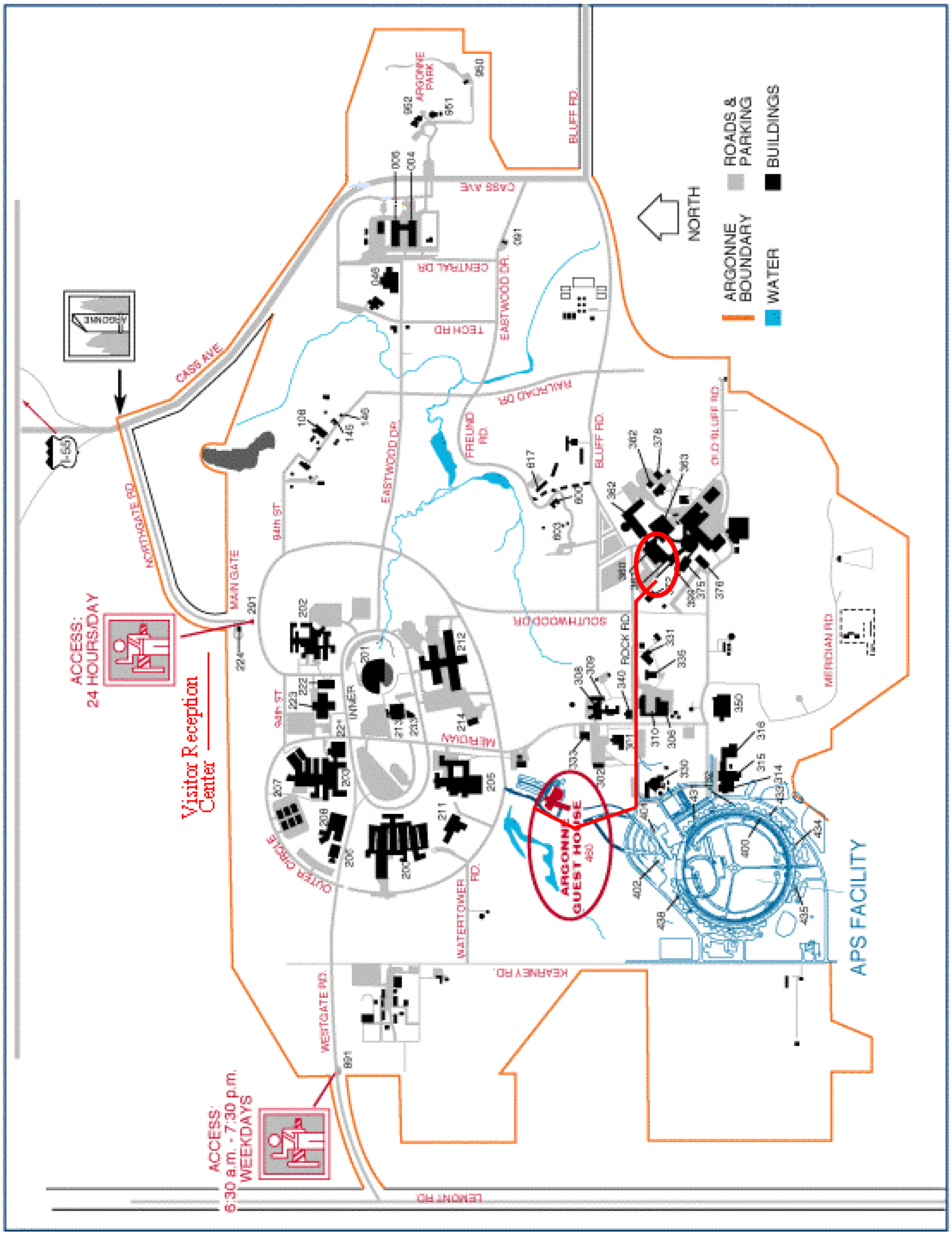
There will be a continental breakfast provided, courtesy of Oxford Instruments, starting at 8:00am on Wednesday and 8:30am on Thursday and Friday.

Lunch

Lunches will be at the Argonne Cafeteria, Building 213 – Dining Room B, a short 15 min walk from building 360. Workshop participants are responsible for their meal costs.

Dinner

There will be no workshop dinner. An exhaustive list of local restaurants can be view via the web at http://www.aps.anl.gov/About/Visiting/Restaurants/index.html. Guidance can also be obtained at the Argonne Guest House main desk.



IPNS is just a short walk from the Argonne Guest House.

Raymond G. Teller, Ph.D.
Division Director

Intense Pulsed Neutron Source
Argonne National Laboratory
9700 South Cass Avenue, Bldg. 360
Argonne, IL 60439-4814

1-630-252-4999 phone
1-630-252-4163 fax
rteller@anl.gov

September 6, 2006

On behalf of the Intense Pulsed Neutron Source (IPNS) and Argonne National Laboratory (ANL), I welcome you to the *4th International Workshop on Sample Environment at Neutron Scattering Facilities*. Sample environment continues to play an important role in neutron scattering at IPNS and other sources around the world and there is every indication that this trend will continue into the future. As next generation sources come on line and neutron scattering is applied to new areas, sample environments at greater extremes and combinations will enable scientists to address the key scientific questions of the 21st century. This workshop series plays an important role in this process by bringing together the key players in this important area.

IPNS is proud to host the 4th workshop and we hope your visit to ANL is useful and productive.

Ray Teller

Division Director
Intense Pulsed Neutron Source
Argonne National Laboratory

Tuesday, September 5, 2006 **Argonne Guest House**

05:00pm to 07:00pm	Registration in Guest House Lobby
07:30pm to 10:00pm	Workshop Organization Meeting Guest House Room to be determined Open to all participants

Wednesday, September 6, 2006	**Building 360, L119**
08:00am to 08:30am	Registration and Gathering Time
08:30am to 09:00am	Welcome & Introductions – Ray Teller and Ken Volin
Session I Chair:	**Michael Meissner**
09:00am to 09:20am	*Ever Improving Sample Environment at the IPNS* Ken Volin, IPNS/ANL, Argonne, IL USA.
09:20am to 09:40am	*Overview of the "Modernization of Sample Environment" Project* Eddy Lelièvre-Berna, N. Belkhier, E. Bourgeat-Lami, S. Demas, J.–P. Gonzales, J.–L. Laborier, O. Losserand, P. Martin, L. Mélési, P. Mendes, J.–L. Ragazzoni, and X. Tonon, ILL, Grenoble, FRA
09:40am to 10:00am	*Alignment Techniques for Installing Neutron Scattering Instruments using Modern Laser Interferometry* Scott Moore, J. L. Robertson, G. B. Taylor, CNS/ORNL, Oak Ridge, TN, USA, E. R. Blackburn, M. W. Humphreys, ORNL, Oak Ridge, TN, USA, and C. E. Stalsworth, Y-12/ORNL, Oak Ridge, TN, USA
10:00am to 10:30am	Break and Discussions – Building 360, L145
Session II Chair:	**Zoe Bowden**
10:30am to 10:50am	*Sample Environment on High Resolution Fourier Diffractometer on IBR-2 Reactor* Valeriy Simkin, FLNP/JINR, Dubna, RUS
10:50am to 11:10am	*Spreadsheet Calculations for Sample Environment Problems* Lou Santodonato, SNS/ORNL, Oakridge, TN USA
11:10am to 11:30pm	*Cryofurnace Made Simple* Bruce Hill and J. W. Wenzel, SNS/ORNL, Oakridge, TN USA
11:30am to 11:50am	*7th Framework Programme - Sample Environment Joint Research Activity* Moderators: Eddy Lelièvre-Berna and Michael Meissner
11:50pm to 02:00pm	Lunch and Discussions – Argonne Cafeteria Building 213, Dining Room B

Session III Chair:	**Scott Olsen**
02:00pm to 02:20pm	*Novel Cryogen Level Monitors* Xavier Tonon , Olivier Losserand, N. Belkhier, J.-P. Gonzales, P. Mendes, J.-L. Ragazzoni, X. Tonon, and E. Lelièvre-Berna, ILL, Grenoble, FRA
02:20pm to 02:40pm	*The Quest for Rapid Cooling and Setpoint Equilibration* Lakeisha Walker, SNS/ORNL, Oakridge, TN USA
02:40pm to 03:00pm	*Sample Environment Innovation at the GPPD Instrument* Evan Maxey, IPNS/ANL, Argonne, IL USA
03:00pm to 04:00pm	Poster Session I – Building 360, L145 • *Update on Thermometry at ILL* Xavier Tonon, J. Gonthier, N. Belkhier, J.-P. Gonzales, O. Losserand, P. Mendes,J.-L. Raggazoni, and E. Lelièvre-Berna, Institut Laue Langevin, Grenoble, FRA. • *Controls Engineering for a Compact Crystal Positioning System* Prishantha Dunstan, C. Hoffmann, R. Viola, E. Miller, P. Carman, L. Santodonato and G. Granroth, SNS, Oak Ridge National Laboratory, Oak Ridge, TN, USA • *Hydrogen Under Pressure at ISIS* Andy Church and C. Goodway, ISIS/RAL, Oxfordshire, UK • *Gas Pressure Cells Designed and Built at the IPNS for Neutron Scattering Experiments* Bob Kleb and Rich Vitt, IPNS/ANL, Argonne, IL USA • *Direct Pressure Measurement using Ruby Fluorescence* Beth Evans and J. W. Dreyer, ISIS/RAL, Oxfordshire, UK

Session IV Chair:	**Ken Volin**
04:00pm to 05:00pm	Tour of the IPNS Sample Environment
05:00pm	End of Workshop Day

Thursday, September 7, 2006 **Building 360, L119**

08:30am to 09:00am	Gathering Time
Session V Chair:	**Jurgen Peters**
09:00am to 09:20am	*Packaging Top-Loading Closed-Cycle Refrigerators for Beamline Research* Dan Dender, NCNR/NIST, Gaithersburg, MD USA
09:20am to 09:40am	*EPICS Control of Sample Environment* Rodney R. Porter, IPNS/ANL, Argonne, IL USA
09:40am to 10:00am	*SEA – a Modular Sample Environment Control System* Markus Zolliker and M. Koennecke, Laboratory for Developments and Methods, SINQ/PSI, Villigen, SUI
10:00am to 10:30am	Break and Discussions – Building 360, L145
Session VI Chair:	**Marcus Zolliker**
10:30am to 10:50am	*Refrigerator Cryostats at BENSC* Michael Meissner and S. Gerischer, BENSC/HMI, Berlin, GER
10:50am to 11:10am	*Latest Developments in Closed Cycle Cryostats at Forschungsneutronenquelle Heinz Maier-Leibnitz (FRM II)* Heinrich Kolb and J. Peters, Forschungsneutronenquelle Heinz Maier-Leibnitz , GER
11:10am to 11:30pm	*Exploitation of Pulse Tubes at ISIS* Beth Evans and O. Kirichek, ISIS/RAL, Oxfordshire, GBR
11:30am to 11:50am	*Open Discussion on Information Interchange via the Web* Moderators:Ken Volin
11:50pm to 02:00pm	Lunch and Discussions - Argonne Cafeteria Building 213, Dining Room B

Session VII Chair:	**Eddy Lelievre-Berna**
02:00pm to 02:20pm	*Combined Levitation and Neutron Diffraction to Investigate Liquids at ExtremeTemperatures* R. Weber, J.E. Rix, Containerless Research, Inc., Evanston, IL, 60202, USA, C.J. Benmore, J.E. Siewenie, IPNS/ANL, Argonne, IL, USA, and L.J. Santodonato, SNS/ORNL, Oak Ridge, TN, USA
02:20pm to 02:40pm	*Design and Implementation of a Cryogenic Loading Capability on the Spectrometer for Materials Research at Temperature and Stress (SMARTS)* Tim Woodruff, V. Krishnan, R. Vaidyanathan, Advanced Materials Processing and Analysis Center; Mechanical, Materials and Aerospace Engineering, University of Central Florida, Orlando, FL USA, and B. Clausen, T. Sisneros, D. Brown, M. Bourke, LANSCE/MST, Los Alamos National Laboratory, Los Alamos, NM USA
02:40pm to 03:00pm	*Automatic Sample Changer for Cryogenic Sample Environments* Jim Rix and R. Weber, Containerless Research, Inc, Evanston, IL USA, L. J. Santodonato, B. Hill, J. Hodges, M. Rennich, SNS/ORNL, Oak Ridge, TN, USA, and K.J. Volin, IPNS/ANL, Argonne, IL, USA
03:00pm to 04:00pm	Poster Session II – Building 360, L145 • *Super Solid Helium* Richard Down and D. Bruce, ISIS/RAL, Oxfordshire, UK. • *Sample Environment Testing and Diagnostics using LabVIEW* Rich Como and K. J. Volin, IPNS/ANL, Argonne, IL USA. • *New Power-Bays for ILL-type Furnaces* Steffen Demas, P. Martin, N. Belkhier, E. Lelièvre-Berna, ILL, Grenoble, FR • *Advanced Magnets for Pulsed Neutron Scattering at ISIS* Dave Bunce and R. Down, ISIS/RAL, Oxfordshire, UK. • *New Pressure Cells at ISIS* Andy Church and C. Goodway, ISIS/RAL, Oxfordshire, UK

Session VIII Chair: Scott Moore

04:00pm to 04:20pm	*Radial Collimators, Reducing SE Background on the SEPD* Joe Fieramosca, R. Kiyanagi, and R. Kleb, IPNS/ANL, Argonne, IL USA
04:20pm to 04:40pm	*Pulsed Magnetic Field Experiments for Neutron and X-Ray* Hiroyuki Nojiri, K. Ohoyama, and Y. H. Matsuda, Institute for Materials Research, Tohoku University, Sendai, JPN
04:40pm to 05:00pm	*New High Field Magnet for Neutron Scattering at Hahn-Meitner Institute* Peter Smeibidl, BENSC/HMI, Berlin, GER
05:00pm	End of Workshop Day
06:00pm to 8:00pm	No-Host Reception at the Argonne Exchange Club, Building 617 Snacks and Cash Bar

Friday, September 8, 2006	**Building 360, L119**
08:30am to 09:00am	Gathering Time
Session IX Chair:	**Dan Dender**
09:00am to 09:20am	*Sample Environments at the OPAL Neutron Beam Facility* Scott Olsen, J.Schulz, S.Kennedy, R.Robinson, R.Piltz, G.Davidson, M.Perry, G.Horton, Bragg Institute, Australian Nuclear Science and Technology Organisation, Sydney, AUS
09:20am to 09:40am	*0.3K– 900K Gas-Loading Apparatus Capability at the NIST Center for Neutron Research* Juscelino Leão, D. Dender, and C. M. Brown, NCNR/NIST, Gaithersburg, MD USA
09:40am to 10:00am	*Sample Environments for Controlled Gas Deposition up to 10 kbar* Klaus Kiefer, D. Wallacher and M. Meissner, BENSC/HMI, Berlin, GER.
10:00am to 10:30am	Break and Discussions – Building 360, L145
Session X Chair:	**Lou Santodonato**
10:30am to 10:50am	*Rheo-SANS at NIST Center for Neutron Research* Bryan Greenwald, NCNR/NIST, Gaithersburg, MD USA
10:50am to 11:10am	*The New Motion Control Systems for TS2* Dennis Cowdery, ISIS/RAL, Oxfordshire, GBR
11:10am to 12:00pm	Workshop Summary – Ken Volin and Michael Meissner Announcement of location of next workshop!
12:00pm	Conclusion of Workshop

ABSTRACTS

Ever Improving Sample Environment at the Intense Pulsed Neutron Source (IPNS)

Ken Volin
IPNS/ANL, Argonne, IL USA

Neutron diffraction is a powerful tool for structural studies of samples in special sample environments because of the high penetrating power of neutrons compared to x-rays. The Intense Pulsed Neutron Source (IPNS) at Argonne National Laboratory offers its users a variety of sample environments for pulsed neutron scattering and diffraction experiments. At the present time 90% of all experiments performed at the IPNS involve some type of ancillary equipment to control the sample environment. These include relatively commonplace closed cycle refrigerators, cryostats, furnaces, magnets, and pressure cells. In the past two years we have made continuing improvements and upgrades in several areas. Major milestones achieved will be presented and what the future holds for our scientific staff and user community.

Type of presentation: Oral

Overview of the "Modernization of Sample Environment" Project

E. Lelièvre-Berna, N. Belkhier, E. Bourgeat-Lami, S. Demas, J.-P. Gonzales,
J.-L. Laborier, O. Losserand, P. Martin, L. Mélési, P. Mendes, J.-L. Ragazzoni, X. Tonon
Institut Laue Langevin, Grenoble, France

About a year ago, ILL has launched the "Modernization of Sample Environment" project. Our aim is to upgrade/renew the suite of sample environment equipment made available to +40 instruments. A few new people have recently joined the team and a Millennium Programme budget has been allocated for that project.

Among the many tasks to perform, we have planned to change the thermometry by replacing Carbon thermometers with Cernox ones, equip the ILL with cryogen-free cryostats, purchase new cryomagnets, build new dilution fridges, very-high temperature furnaces, mid-range pressure cells (30-50 kbar), a safer and very accurate gas handling system for gas pressure cells and a new power-bay for existing ILL-type furnaces.

On the instruments side, it is planned to install an electronic cabinet that will contain the controllers regularly used: temperature controller, cold valve controller, cryogen level monitor, power supplies, multimeter, etc. The cabinet will be connected to the main control workstation using CORBA. A computer installed in the cabinet will ensure this link, record the values collected by the numerous controllers and program them from a common database. Instrument scientists will essentially use the main control workstation on which they will find the physical parameters necessary to carry out experiments. Instrument technicians will use the cabinet for preparing or testing equipment.

Type of presentation: Oral

Alignment Techniques for Installing Neutron Scattering Instruments using Modern Laser Interferometry

Scott A. Moore, J. L. Robertson, G. B. Taylor (Oak Ridge National Laboratory, Center for Neutron Scattering), E. R. Blackburn, M. W. Humphreys (Oak Ridge National Laboratory) C. E. Stalsworth (BWXT Y-12 National Security Complex at Oak Ridge)

We describe the technical concepts incorporating the latest Laser Interferometry technology as applied to the installation and alignment of modern neutron scattering instruments. We are able to mechanically install our new neutron scattering instruments to a previously unattainable degree of accuracy when given engineering data locating the instrument in its theoretical operational location. Using this technology we develop a three dimensional coordinate system in the general area of the instrument and install the permanent positioning equipment (i.e. high precision rails or mounting plates) prior to delivery of the instrument. Upon delivery, the instrument is pre-aligned when installed. This methodology was previously not feasible due to combinations in limits in theodolite technology and time to perform the lengthy geometric calculations between measurements. We have had successful installations incorporating these techniques with accuracies of less than 0.08 mm in each of the x, y, and z axis of our neutron scattering instruments as compared to +/- 0.30 mm using previous alignment techniques. We will discuss the schedule and economic benefits from these techniques as well as our mechanical installations and alignments.

Type of presentation: Oral

Sample Environment on High Resolution Fourier Diffractometer on IBR-2 Reactor

Valeriy G. Simkin
Joint Institute for Nuclear Research, FLNP, Dubna, Russia

SE for various physical conditions on samples are presented: equipment for low and high temperatures, high pressures, magnetic and electric fields, stress and strain measurements, goniometers and sample holders.

Type of presentation: Oral

Spreadsheet Calculations for Sample Environment Problems

L.J. Santodonato
Spallation Neutron Source
Oak Ridge National Laboratory, Oak Ridge, TN

Spreadsheet applications are extremely versatile and powerful. They can be used for simple tasks, such as plotting data, but also for advanced tasks such as the numerical solution of differential equations describing heat flow. Both the simple and the advanced applications are valuable tools for sample environment development. Spreadsheet-based calculations relevant to sample environment design, upgrade, and operation will be discussed. Example applications will be presented, including the calculation of a temperature gradient due radiative heat transfer, and the simulation of a simple controlled-temperature environment.

Type of presentation: Oral

Cryofurnace Made Simple

B. A. Hill and J. W Wenzel
Spallation Neutron Source
Oak Ridge National Laboratory, Oak Ridge, TN

By integrating various off-the-shelf components and software, a simple remote operation of an otherwise complex system has been assembled. The heart of the system is a standard, manually operated cryofurnace manufactured by JANIS Research Inc. with a temperature range of 2 to 600 K. As delivered, it requires frequent operator intervention which could lead to longer experiment times. The original manual controls included a "cold valve", sample tube pressure isolation valve, and separate heater connections for high and low temperature operating modes. Now, a single software application monitors and regulates all of these controls with an easy to use operator panel.

Type of presentation: Oral

7th Framework Programme - Sample Environment Joint Research Activity

Eddy Lelièvre-Berna
ILL, Grenoble, FRA
And
Michael Meissner
BENSC/HMI, Berlin, GER

At the last SE-Workshop at ISIS, it was agreed that we should submit a proposal for setting up a Joint Research Activity (JRA) financed by the European Commission. A few months ago, M. Meißner and E. Lelièvre-Berna have proposed a list of tasks to the Sample Environment Team leaders of the European facilities. Today, several facilities support the idea to set up a Sample Environment JRA. We propose to discuss the tasks that should be presented at the next NMI3 meeting on October 11th.

Type of presentation: Oral

Novel Cryogen Level Monitors

X. Tonon, O. Losserand, N. Belkhier, J.-P. Gonzales, P. Mendes,
J.-L. Ragazzoni, E. Lelièvre-Berna
Institut Laue Langevin, Grenoble, France

A long time ago, the ILL has developed its own cryogen probes and cryogen level monitors (CLM) in collaboration with the Duhamel company. The liquid helium (LHe) probes are made of a superconducting wire that is resistive above the liquid level. As regards the liquid nitrogen (LN_2), many principles have been tested and today we measure the capacity of coaxial tubes with local oscillators. The CLM have been used very successfully for many years and a few years ago, it has been decided to upgrade them with state-of-the-art electronics or to purchase commercial systems.

From our experience and with the help of the Duhamel company, we have designed, constructed and tested a compact unit that can be remotely controlled for reading the levels of LHe dewars. On each dewar, there is a compact CLM that is powered with a battery and identified in a RF network. With a computer, we can read the levels of all dewars wherever they are in the institute, which simplifies a lot the LHe distribution.

Concerning the cryostats, we have tested Oxford Instruments and Cryomagnetics units. In all cases, they do not provide all the useful functionalities required at a neutron facility. We have therefore decided to design a new CLM that is able to handle many types of probes (ILL, Cryomagnetics, Oxford Instruments, etc.). We present the specifications of the CLM we plan to build alone or in collaboration with a company or a neutron facility.

Type of presentation: Oral

Fourth International Workshop on
Sample Environment at Neutron Scattering Facilities
Argonne, IL USA
September 6-8, 2006

The Quest for Rapid Cooling and Setpoint Equilibration

Lakeisha M. H. Walker
Spallation Neutron Source
Oak Ridge National Laboratory, Oak Ridge, TN

Most conventional neutron sample environments are too slow to meet the needs of a new generation of high flux instruments. Fast sample cooling and setpoint equilibration are particularly needed. The present talk compares a few different strategies and designs associated with fast temperature response. Test results will also be presented, including those from the SNS "Fast Blast" sample stick, and the "Fast Exchange Refrigerator for Neutron Science".

Type of presentation: Oral

Sample Environment Innovation for the GPPD at the IPNS

Evan Maxey
Intense Pulsed Neutron Source
Argonne National Laboratory
Argonne, IL USA

The General Purpose Powder Diffractometer at IPNS is actually a *multi*-purpose instrument. One of the highlights of the GPPD program is implementation of specialized equipment that meets users' needs for in situ sample environments. The challenges range from improvement of common equipment, special adaptations of existing equipment, to unique devices designed for a single purpose. Recent developments include a heat shield upgrade and user manual for a closed cycle refrigerator, a spring loaded method for mounting a tubular membrane in the Miller furnace, a method for creating an oxidizing and corrosive environment in a vanadium furnace, and a high-temperature/high-pressure cell for hydriding. Other highlights include simple but elegant solutions to challenges such as low-temperature/moderate-pressure hydrogen loading and a controlled humidity environment.

Type of presentation: Oral

Update on Thermometry at ILL

Xavier Tonon, J. Gonthier, N. Belkhier, J.-P. Gonzales, O. Losserand, P. Mendes,
J.-L. Raggazoni, E. Lelièvre-Berna
Institut Laue Langevin, Grenoble, France

For more than 20 years, the ILL uses the combination of a Carbon probe and a platinum probe for measuring the temperature in Orange cryostats (1.5 - 320K). It was assumed that all Carbon sensors are almost identical (one common calibration curve) and necessitated the use of a controller able to deduce the temperature from a weighted sum in the range 20 - 50K where both sensors are taken into account. For this purpose, the ILL had developed and used its own temperature controller.

Recently, we have investigating the thermometry of our cryostats and decided to use commercial temperature controllers. We have tested three controllers: the Air Liquide BT500, the LakeShore LK340, and a prototype based on Eurotherm 2704. From these tests and considering the experience of other neutron facilities, we have selected the LakeShore unit. The dispersion observed for the old Carbon thermometers has convinced us to use individual calibration curves and their strong sensitivity to shocks and heat has motivated us to replace them with Cernox ones.

The ILL has therefore started the ambitious project to replace the Carbon probes mounted on our ≈70 cryostats and ≈150 sample sticks. As we also install about 40 new probes per year, we have built a high-precision cryogenic thermometer calibration facility (<10mK absolute precision) that is today operational and fully automatic. Batches of 20 probes can now be calibrated simultaneously in about one week.

Type of presentation: Poster

Controls Engineering for a Compact Crystal Positioning System

Prishantha Dunstan (1), Christina Hoffmann (2), Robert Viola (3), Echo Miller (3), Peter Carman (3), Louis Santodonato (2) and Garrett Granroth (2)

1. Columbia University, New York, NY
2. Oak Ridge National Laboratory, Oak Ridge, TN
3. Square One Systems, Jackson Hole, WY

A "Compact Crystal Positioning System" prototype was designed and constructed by Square One Systems in collaboration with the Spallation Neutron Source (SNS), through a DOE Small Business Innovation Research phase-I grant. The device employs linear actuators to perform spherical motions about a center point (the crystal). It shows great promise as the basis for a user-system to be deployed at the SNS Single Crystal Diffractometer. But controls engineering is crucial for turning this into a user-ready system. This poster describes the device and the software developed to manipulate and visualize the crystal orientation, and to calibrate the crystal position for precise centering.

Type of presentation: Poster

Hydrogen Under Pressure at ISIS

Andy Church and C. Goodway, ISIS/RAL, Oxfordshire, UK

New equipment and cells developed at ISIS for Neutron beam lines using hydrogen gas as a pressure medium will be presented.

Type of presentation: Poster

Gas Pressure Cells Designed and Built at the IPNS for Neutron Scattering Experiments

R. Kleb and R. Vitt
IPNS/ANL, Argonne, IL USA

The most widely used form of pressure vessel is a thick walled cylinder. It is reasonably easy to construct and the design criteria are relatively well known. An important constraint on the design of a high pressure neutron scattering experiment is the requirement that the neutrons be able to penetrate the pressure vessel walls. The vessel must be fitted with neutron windows which are sufficiently strong but have reasonable transmission. In the case of isotropic samples it is sometimes possible to make the measurements at just one or two scattering angles, but in single crystal studies it is generally necessary for the window to cover a wide range of angles with respect to both the incident and scattered beams. In such cases a 360º window is usually the most sensible choice. Thus one is immediately limited to more modest pressures than in the case of isotropic samples. A number of pressure cell designs have been effectively used at the IPNS over its 25 year history. Due to the neutron flux limitation, gas cells with large volumes have suited the requirements of the scientific staff and user community. Several successful designs for powder diffraction, single crystal diffraction, and inelastic scattering will be shown.

Type of presentation: Poster

Direct Pressure Measurement using Ruby Fluorescence

Beth E. Evans and J.W. Dreyer
Rutherford Appleton Laboratory, Chilton, UK

Ruby Fluorescence has so far been underexploited at ISIS as a pressure measurement technique. This is set to change with the ongoing development of a ruby fluorescence system for low temperature measurements in CCR and bath cryostats. Part of the project scope will be adapting existing pressure cells, and/or a novel cell design, for use with the ruby fluorescence system.

Type of presentation: Poster

Packaging Top-Loading Closed-Cycle Refrigerators for Beamline Research

Dan Dender
NIST Center for Neutron Research
National Institute of Standards & Technology, Gaithersburg, MD

The NIST Center for Neutron Research has been moving toward closed-cycle refrigerator - based systems for their ease of use in the hands of guest researchers. These systems offer a wide operating range, flexible configuration, and can be used as the basis for quite diverse systems. We now have five top-loading closed-cycle refrigerators capable of spanning the temperature range from 5-800 K, in a variety of configurations that are tailored to particular instruments or equipment. We also have a host of sample sticks for use with these units that are being outfitted to provide specialized capabilities that simply drop in to the standard cryostat. I will describe our efforts to take the product as delivered and re-package it for general consumption and these specialized uses. We will cover initial characterization, improvements in performance, reductions in temperature gradients, and ease-of-use features of the systems when used for neutron scattering experiments. Finally, I will review the different sample stick geometries that are available now and future capabilities.

Type of presentation: Oral

EPICS Control of Sample Environment

Rodney R. Porter
Intense Pulsed Neutron Source
Argonne National Laboratory, Argonne, IL

The Experimental Physics and Industrial Control System (EPICS) was initially chosen for sample environment control at Argonne National Laboratory's, Intense Pulsed Neutron Source (IPNS) to leverage existing knowledge and for compatibility with our data acquisition system (DAS). Having converted seven beam lines to EPICS control, the system is well integrated and conversion of instrumentation and support for new devices is straightforward. Options exist for control and/or monitoring of cryogenic systems, high temperature furnaces, high pressure generators, magnetic fields, sample position and orientation, and sample reaction environments. This support is presently being converted to run with the latest version of EPICS, which will allow for operation from multiple operating systems.

Type of presentation: Oral

SEA – a Modular Sample Environment Control System

M. Zolliker, M. Koennecke
Laboratory for Developments and Methods
Paul Scherrer Institute, Villigen, Switzerland

At the Swiss spallation neutron source SINQ there are about a dozen neutron scattering instruments sharing a large number of sample environment devices. These devices use different hardware for control and monitoring, basically temperature controllers, power supplies, level meters, flow controllers and pressure monitors. A newly developed sample environment application (SEA) has been developed supporting all these devices. The software design is a client server system, where the server part is based on SICS, the instrument control software at SINQ. Its modularity makes the addition of drivers for new hardware easy. The client is a graphical user interface allowing to control the sample enviornment devices and to examine the history of all relevant variables from any computer near the instrument, at the office or at home. The SEA server runs either for a neutron instrument, being controlled from the instrument control software, or stand-alone for test and preparation purposes. Both server and client software are based on open source software, and do not depend on special hardware requirements.

Type of presentation: Oral

Refrigerator Cryostats at BENSC

Michael Meissner and Sebastian Gerischer
Berlin Neutron Scattering Center (BENSC)
Hahn-Meitner Institut Berlin, Germany

We present a status report on a variety of cryogen-free cryostats which have been developed at BENSC by the sample environment group and by cryogenic companies, respectively, to be operated in neutron scattering experiments. Instead of cryogen liquids the cooling capacity in these cryostats is provided by refrigerator machines like the Gifford-McMahon process based Closed Cycle Refrigerator (CCR), the Pulse Tube Refrigerator (PTR) and the Stirling Refrigerator (SR). The commercial refrigerator machines we have tested at BENSC with respect to cooling power and base temperature have been manufactured by Sumitomo (CCR & PTR), by ARS (CCR) and by TransMIT (PTR & SR). However, more important with cryogenic systems is the variation in temperature range, the time to establish a stable temperature and the long time subsequent stability. Given fairly smooth cooling power curves by the refrigerators some emphasis has to be made on the design of the temperature regulation device, the heater element, sample container and radiation shield. We report on our results on four different refrigerator cryostats which cover a certain temperature range within T = 0.28 K … 600 K (systems developed by OI, ARS, ILL and HMI) and two mini-refrigerator cryostats operating between 30 K to 400 K (TransMIT & HMI). With these cryo-engineering efforts we hope to approach on a new variable temperature system which will substitute the Orange-cryostats at the BENSC neutron instrument sites.

Type of presentation: Oral

Latest Developments in Closed Cycle Cryostats at Forschungsneutronenquelle Heinz Maier-Leibnitz (FRM II)

H. Kolb and J. Peters
Forschungsneutronenquelle Heinz Maier-Leibnitz , 85747Garching, Germnay

Closed cycle sample tube cryostats developed in house provide low temperatures now for two years since starting up routine operation at FRM II in 2004. Driven by recent demands for extending the temperature range of our cryostats maintaining features like easy and time saving handling we developed a ^{4}He pumping stage integrated in our sample tube. First results are presented.

Type of presentation: Oral

Exploitation of Pulse Tubes at ISIS

B.E. Evans and O. Kirichek
Rutherford Appleton Laboratory, Chilton, UK

When the pulse tube cryorefrigerator was first reported in 1963 by Gifford and Longsworth it was hailed as a breakthrough in maintenance-free low-vibration cooling. Now, 40 years on, several models are commercially available and users are in a position to judge if the pulse tube has at last fulfilled its promised potential.

A design, development and test programme for a top-loading pulse tube cryostat is underway at ISIS. Its aim is to investigate the inherent advantages and limitations of the pulse tube, and its potential as a replacement for the standard bath cryostat. This presentation will report on current progress and future strategies.

Type of presentation: Oral

Combined Levitation and Neutron Diffraction to Investigate Liquids at Extreme Temperatures

R. Weber and J.E. Rix
Containerless Research, Inc., Evanston, IL, USA,
C.J. Benmore and J.E. Siewenie,
Intense Pulsed Neutron Source, Argonne National Laboratory, Argonne, IL, USA,
L.J. Santodonato
SNS, Oak Ridge National Laboratory, Oak Ridge, TN, USA.

Combined application of neutron diffraction, containerless techniques and laser beam heating enables the structure of solids and liquids to be probed at extreme temperatures and under highly non-equilibrium conditions of interest in connection with materials processing, glass formation and understanding the structure of liquids. Results complement data obtained by X-ray techniques and permit a more detailed understanding of the behavior and relaxation of liquid structures. This paper describes the implementation of experiments onsolids and liquids under containerless conditions at high temperature. Data were obtained for several materials at the Glass Liquids and Amorphous Diffractometer at IPNS using aerodynamic levitation and 250 Watt CO_2 laser beam heating of 3-3.5 mm diameter samples. Levitation was performed in argon gas at reduced pressure and using pure vanadium nozzles that were optimized to avoid scattering contributions by the "virtual sample holder". Structure factors were measured from ambient temperature to ~3350 K. Plans for development of a containerless sample environmeent system for research at the SNS will be outlined.

Type of presentation: Oral

Design and Implementation of a Cryogenic Loading Capability on the Spectrometer for Materials Research at Temperature and Stress (SMARTS)

T. Woodruff[1], V. Krishnan[1], B. Clausen[2], T. Sisneros[2],
D. Brown[2], M. Bourke[2] and R. Vaidyanathan[1]

[1] Advanced Materials Processing and Analysis Center; Mechanical, Materials and Aerospace Engineering, University of Central Florida, Orlando, FL 32816
[2] LANSCE/MST, Los Alamos National Laboratory, Los Alamos, NM 87545

The Spectrometer for Materials Research at Temperature and Stress (SMARTS) at Los Alamos National Laboratory is a third-generation neutron diffractometer commissioned for the study of spatially resolved strain fields in polycrystalline materials under the influence of stress and high temperatures. Until recently SMARTS was configured for conducting *in situ* neutron diffraction measurements on materials subjected to stress while at temperatures ranging from room temperature to +1500^{o}C. This work has developed a cryogenic capability that extends the range of test temperatures on SMARTS during loading down to cryogenic temperatures of around –180^{o}C. The capability utilizes conductive heat transfer to cool the test sample through contact with a set of compression platens that are cooled using circulating liquid nitrogen. Labview software is used along with a network of thermocouples and surface heaters to set the sample temperature to a fixed temperature as desired by the user. This system was recently tested at –183^{o}C while studying twinning and stress/temperature induced phase transformations in a NiTiFe shape memory alloy. This work was partially supported by grants from SRI and NASA (NAG3-2751) to UCF.

Type of presentation: Oral

Automated Sample Changer for Cryogenic Sample Environments

Jim E. Rix and R. Weber
Containerless Research Inc., Evanston, IL, USA,
L.J. Santodonato, B. Hill, J. Hodges, and M. Rennich,
Spallation Neutron Source, Oak Ridge National Laboratory, Oak Ridge, TN, USA, and
K.J. Volin
Argonne National Laboratory, Argonne, IL, USA

The Fast Exchange Refrigerator for Neutron Science (FERNS) enables to 24 sample "cans" per cycle to be inserted and retrieved in a cryogenic environment. A video camera acquires a unique identification marked on the sample can to provide a record of the sequence. All operations are coordinated *via* a LabView™ program that can be operated locally or over a network. The samples are contained in vanadium cans 6-10 mm in diameter and equipped with a hermetically sealed lid that interfaces with the sample handler. The system uses an ARS model DE-210 closed cycle refrigerator for cooling. The sample is delivered to a pre-cooling location that is at a temperature of ~25K, after several minutes, the sample is moved onto a "landing pad" that is held at ~4 K and locates the sample in the probe beam. After the sample is released onto the landing pad, the sample handler is retracted. Reading the sample identification and the exchange operation takes approximately 2 minutes. The time to cool the sample from ambient temperature to a few K is approximately 8 minutes including pre-cooling time. The cooling time increases to approximately 12 minutes if pre-cooling is not used A resistive heating coil can be used to offset the cooling engine so that temperatures up to ~400 K can be accessed and controlled using a PID control loop. The recovery time after heating the sample well to ~250 K is approximately 20 minutes. Design details and results of in progress testing will be presented. The "Fast Exchange Refrigerator for Neutron Science" (FERNS) project is funded by Department of Energy's Small Business Innovation Research program.

Type of presentation: Oral

Super Solid Helium

Richard Down and D. Bruce
ISIS/RAL, Oxfordshire, UK.

Observations of new "supersolid" phase helium-4 at temperatures below 50 mK has been reported by E. Kim and M. H. W. Chan in ***Nature*** and ***Science***. In order to explain results of torsional oscillator experiments Kim and Chan suggested that "supersolid" behaves like a superfluid – a liquid that flows without resistance - but has all the characteristics of a crystalline solid

As in the liquid a possible theoretical explanation involves the production of a Bose-Einstein-Condensate or BEC. On the spectrometer VESUVIO it is possible to observe the production of a BEC via changes in the measured kinetic energy of the sample. In addition, it is possible to simultaneously observe the neutron diffraction pattern from the Helium crystals to check for any structural changes.

Type of presentation: Poster

Sample Environment Testing and Diagnostics using LabVIEW

Rich Como and K. J. Volin
IPNS/ANL, Argonne, IL USA

The first application developed for ancillary equipment was the construction of a serial communication VI that connects a LakeShore controller directly to the controlling computer using only a straight through cable with two modified plugs at each end. This arrangement can be set up very quickly without the need for any other hardware thus comprising a cheap and effective setup for collecting data or in operating the LakeShore controller itself.

Another beginning application of LabView in ancillary equipment was to take an existing LabView VI and modify it into a device for collecting data from a pressure sensor and appending it to a file for the duration of a run cycle. A continuous strain measurement VI was modified to include a transducer analog output calibration so the collected data could be accurately viewed in the appropriate units. After testing on a desktop Gateway computer confirmed the operational characteristics this VI was then loaded onto a laptop. The method of communication for this application was through a plug in that allowed us to use the general purpose bus interface VI which was already available for us as a download from National Instruments. The laptop can now be used as a mobile unit to follow a piece of equipment around to any instrument as an independent measuring system and isolated from any troubling system faults.

The next step was to investigate how such a measuring system when connected to the internet could be remotely monitored and controlled from a remote location. The continuous stain measurement VI now becomes a sub VI and is connected through the data port to a communications protocol VI. We have two different communication protocols set up and working to do this and they are TCP/IP and DataSocket. As of now the pressure reading VI and the LakeShore controller can be set up for remote operation.

Another recent application for the laptop was the development of a temperature recording VI collecting the sample and control temperatures from two thermocouples through the LakeShore controller. The first stage of this VI is a double For Loop with the inside loop taken from the data collecting section from the general purpose interface bus VI. The second stage of this VI will take a set number of measurements from the first stage and average these to produce of graph of averaged values. We will be testing this soon on a Displex test run.

Another application that was developed is for an automation setup. This VI uses a decoupled feedback system to prevent an infinite loop with destructive feedback. The VI automatically cycles through a two stage operation to control a simulated stepping motor and a meter reading the changing voltage sequence. Any number of operations can just be added on creating the potential of completely automating an entire experiment or any other process.

Type of presentation: Poster

New power-bays for ILL-type furnaces

S. Demas, P. Martin, N. Belkhier, E. Lelièvre-Berna
Institut Laue Langevin, Grenoble, France

The ILL-type furnaces, produced by the AS-Scientific company in Great-Britain, are used at many facilities worldwide. The power-bay is aging and time has come to design a new version that is much safer and takes advantage of new electronics available on the market. For ensuring a very good reliability, our philosophy is that the cabinet must be able to control a furnace when the intranet network or control workstation are down.

We have therefore designed and built a prototype cabinet featuring automatic monitoring and control of the primary and secondary pumps, water cooling circuit and temperature readings. The interface of the cabinet presents a synoptic of the device onto which the user finds the very few buttons necessary for powering the system, evacuating/filling the vacuum chamber, acknowledges the detected defaults and setting the temperature.

The use of the furnace is safer thanks to the use of a new security loop that is checked permanently with the main controller (Eurotherm 2704). The recording of the monitored parameters will be performed via an Ethernet connection with the computer installed in the “Sample Environment” cabinet of each instrument.

Type of presentation: Poster

Advanced Magnets for Pulsed Neutron Scattering at ISIS

Dave Bunce and R. Down
ISIS/RAL, Oxfordshire, UK.

The ISIS Advanced Magnets Project was started with a submission to the facilities development fund of the CCLRC in July 2005

Part-I: funding of £2.1M has been obtained June 2006.

Part-II: Will further expand facilities at ISIS and will be submitted after making some progress on and is dependant on part 1.

Details of the proposed wide angle chopper, high field and 3D vector field magnets are presented.

Type of presentation: Poster

New Pressure Cells at ISIS

Andy Church and C. Goodway
ISIS/RAL, Oxfordshire, UK

Various cells that have been developed at ISIS for specific experiments, including the forming of Hydrates and looking at solid Helium will be presented.

Type of presentation: Poster

Radial Collimators, Reducing SE Background on the SEPD

Joe S. Fieramosca, R. Kiyanagi, and R. Kleb,
Intense Pulsed Neutron Source
Argonne National Laboratory, Argonne, IL

The Special Environment Powder Diffractometer (SEPD) is undergoing an upgrade to increase its count rate, extend its range to higher d-spacing and reduce backgrounds. A stationary radial collimator will be installed just outside the sample chamber allowing the detectors to view only a small volume at the sample position and effectively eliminating backgrounds from sample environments, such as heat shields. A Monte Carlo code was written to optimize the design specifications, calculate transmissions and definitely resolve a debt regarding best possible collimator vane alignment with respect to each detector for maximum transmission. This will significantly improve the already good signal-to-noise ratio of the SEPD important for obtaining clean data from SE equipment such as cryostats, furnaces and our new 7 Tesla Superconducting Magnet. These upgrades will make the SEPD an especially powerful instrument for the study of magnetic structures, large-cell structures and small samples.

Type of presentation: Oral

Pulsed High Magnetic Fields for Neutron and X-ray

Hiroyuki Nojiri, K. Ohoyama and Y. H. Matsuda
Institute for Materials Research
Tohoku University, Sendai 980-8577, Japan

Magnetic fields are one of most important parameters for condensed matters because of the strong coupling with spins and orbital motions of electrons. Various phase transitions are induced by the application of high magnetic fields and the combination of neutron and high magnetic fields is one of most powerful tools to investigate such phenomena. The use of pulsed magnets may be the unique choice above 30 T, because of the field limitation of a superconducting coil and the high cost of water-cooling steady fields. A pulsed field instrument can be fitted to different spectrometers for the flexible design and the compactness of a power supply. In this talk, we show the present status of pulsed magnetic field instruments for J-Parc and JRR-3 reactor. The recent successful experiences in X-ray experiments at SPring8 will be also presented.

(1) Pulsed field for J-Parc

(a) Single shot pulsed field for diffraction measurements has been prepared. At the first stage, 250 kJ capacitor bank will be combined with a split magnet of 40-50 T. A solenoid of 60 T is under design.

(b) A compact pulse magnet of 40 T (10-20 msec) with compact capacitor bank (6 kJ) has been developed at JRR-3 reactor. The test measurement is made by using a beam-focusing-device and PSD. The magnet can be inserted into a standard Orange-cryostat.

(c) Repeating pulsed field generator is installed in JRR-3.

(2) Pulsed field for X-ray

A miniature coil has been developed for X-ray diffraction and XAS-spectroscopy. The maximum fields are 33 T and 52 T for split and solenoid magnets, respectively.

Type of presentation: Oral

New High Field Magnet for Neutron Scattering at Hahn-Meitner-Institut

Peter Smeibidl
Berlin Neutron Scattering Center (BENSC)
Hahn-Meitner Institut Berlin, Germany

The Hahn-Meitner-Institute as a user facility for structural research with neutrons and synchrotron radiation has a special emphasis on experiments under high magnetic field. For over 10 years HMI is developing experience in special sample environment at low temperatures and high magnetic fields. Some results of neutron scattering experiments and examples for future research possibilities at very high fields will be given.

Neutron scattering is uniquely suited to study magnetic properties on a microscopic length scale. This is because neutrons have comparable wavelengths and, due to their magnetic moment, they interact with the atomic magnetic moments. Magnetic interactions and magnetic phenomena depend on thermodynamic parameters like magnetic field, temperature and pressure. Therefore special efforts are made in HMI's neutron research to offer outstanding sample environment equipment. Up to now we are running eight different superconducting magnet systems up to the highest static, vertical field for neutron scattering of 17.5 T worldwide. Combined with systems for low and high temperatures as well as high pressure, these magnets can be used at several neutron instruments in our user service.

For the future a dedicated instrument for neutron scattering at extreme fields is under construction (Extreme Environment Diffractometer, ExED). For this instrument the existing superconducting magnets as well as a future hybrid system can be used. The highest fields, above 30 T will be produced by the planned series-connected hybrid magnet system, designed and constructed in collaboration with the National High Magnetic Field Laboratory, Tallahassee, FL. This will be a horizontal magnet system with coned ends at both sides. Reasons for the chosen technical concept will be given as well as a project schedule and information on the planned usage.

Type of presentation: Oral

Sample Environments at the OPAL Neutron Beam Facility

Scott Olsen, J.Schulz, S.Kennedy, R.Robinson, R.Piltz, G.Davidson, M.Perry, G.Horton
Bragg Institute
Australian Nuclear Science and Technology Organisation, Sydney, AUS

Australia's new research reactor, OPAL, has been designed principally for neutron beam science and radioisotope production. It has a capacity for eighteen neutron beam instruments, located at the reactor face and in a neutron guide hall. The neutron beam facility features a 20 litre liquid deuterium cold neutron source and cold and thermal supermirror neutron guides. Nine neutron beam instruments are under development, of which seven are scheduled for completion in early 2007.

This talk will outline the key features of the OPAL Neutron Beam Facility and in particular the initial suite of sample environments that will be available at the OPAL neutron beam facility. The planned future expansion of our capabilities and the standardisation of all instruments and ancillaries, and data acquisition and control system will also be discussed.

A select number of sample environments will be discussed in detail and include; an open geometry closed cycle 5T cryomagnet, an on-line SANS rheometer, a 20 position SANS sample changer, a closed cycle 7.4T cryomagnet, a fast quench heating/cooling sample environment for SANS and a SE that is capable of measuring time-resolved diffraction patterns under an applied stroboscopic electric-field.

Type of presentation: Oral

0.3K– 900K Gas-Loading Apparatus Capability at the NIST Center for Neutron Research

Juscelino B. Leão, D. Dender, C. M. Brown
NIST Center for Neutron Research, Gaithersburg, MD

Hydrogen has the potential to be an economical and environmentally favorable fuel worldwide. To this effect there is a governmental Department of Energy initiative to research methods of production and storage of hydrogen. There are several categorical methods used in the storage of hydrogen, and among these clathrate hydrates, metal hydrides, sodium borohydrides, and carbon nanotubes are a few. Each method has drawbacks related either to extreme conditions or the use of exotic catalysts that prohibit extensive use. Moreover, many studies explore the synthesis of metal-organic-frameworks (MOFs) from transition metals and organic ligands. These have been extensively developed due to their crystallographic diversity and potential applications as catalysts, sensors, and hydrogen storage applications. As a result, several neutron scattering studies are underway worldwide that require extreme sample environments. The ability to provide these *in situ* extreme sample environments is both more demanding and more demanded for national user beamline facilities. The Sample Environment Group at the NIST Center for Neutron Research offers a diversified range of equipment including a computer controlled gas loading station, specialized sample sticks with heated gas-loading lines, and standardized sample can lids designed for glove box loading. In tandem, this equipment offers *in situ* gas loading of pressures up to several atmospheres in combination with temperatures in the range of 0.3K to 900K.

Type of presentation: Oral

Sample Environments for Controlled Gas Deposition up to 10 kbar

Klaus Kiefer, Dirk Wallacher and Michael Meissner
Berlin Neutron Scattering Center (BENSC)
Hahn-Meitner-Institut Berlin, Germany

Gas adsorption techniques provide the basis for a large field of physical and chemical investigations. Except for their importance in conjunction with the characterization and preparation of nano-structured materials in the low pressure regime, in-situ gas absorption experiments at high pressures became a frequently asked service for neutron experiments, particularly, in context with the research on materials for hydrogen storage and fuel cells. The HMI responds to accommodate to this large field of applications by offering to the neutron community a variety of devices for controlled gas deposition in temperature environments ranging from 2 K to 500 K at pressures from 10^{-4} mbar to 10 kbar. The pressure, volume and temperature (PVT) of the gas in neutron suited sample cells can easily and safely be handled by the user via automated pressurizing and gas handling systems.

Type of presentation: Oral

Rheo-SANS at NIST Center for Neutron Research

Bryan Greenwald
NIST/NCNR, Gaithersburg, MD USA

Combining Small Angle Neutron Scattering (SANS) with a deformation field to probe structures under flow has led to significant advances in our understanding of complex fluids. Traditionally this has been done with a Couette device. However, simultaneous measurement of the rheology with SANS is not usually possible. Furthermore, such a device does not typically allow access to the flow-gradient plane common in light scattering applications. I will present the design and operation of two new devices being developed for user experiments at the National Institute for Standards and Technology's Center for Neutron Research. The first is a modified rheometer, which allows simultaneously rheological and structural measurements. The apparatus uses the standard Couette geometry, which allows structural information in the flow-vorticity (1-3 plane) and shear gradient-vorticity (2-3 plane) planes where the incident beam is parallel to the shear gradient and to the flow direction respectively. This device enables a wide variety of measurements such as stress/strain flow curves and oscillatory deformations over a wide range of temperature (-20 to 150 C).

Although use of the Couette geometry to probe structural changes under shear flow had remarkable success, the most important changes in fluid microstructure occur in the 1-2 (flow-shear gradient) plane and cannot be accessed in this way. Since shear flow "lives" in the 1-2 plane, the most dramatic structural effects concern the way the complex fluid microstructure is deformed and rotated within this plane. Experiments in the 1-2 plane always yield at least two pieces of information: degree of structural anisotropy and direction of the anisotropy, which can vary continuously within this plane. We have developed a new prototype Couette shear cell [fig. 1], which allow measurements in the 1-2 plane (vorticity direction) with the additional ability of resolving position within the gap separation as the incident beam is parallel to the vorticity direction. The possibility to access spatial resolution in the gap is essential and critical for resolving shear-induced phase separation as the other 2 configurations available with the standard Couette cell (radial and tangential) probe the average structure through the gap. Eventually we plan to add transducers to allow in situ rheological measurements with this device as well. I will present the design and operation of this new cell along with a few examples that demonstrate the utility of this device.

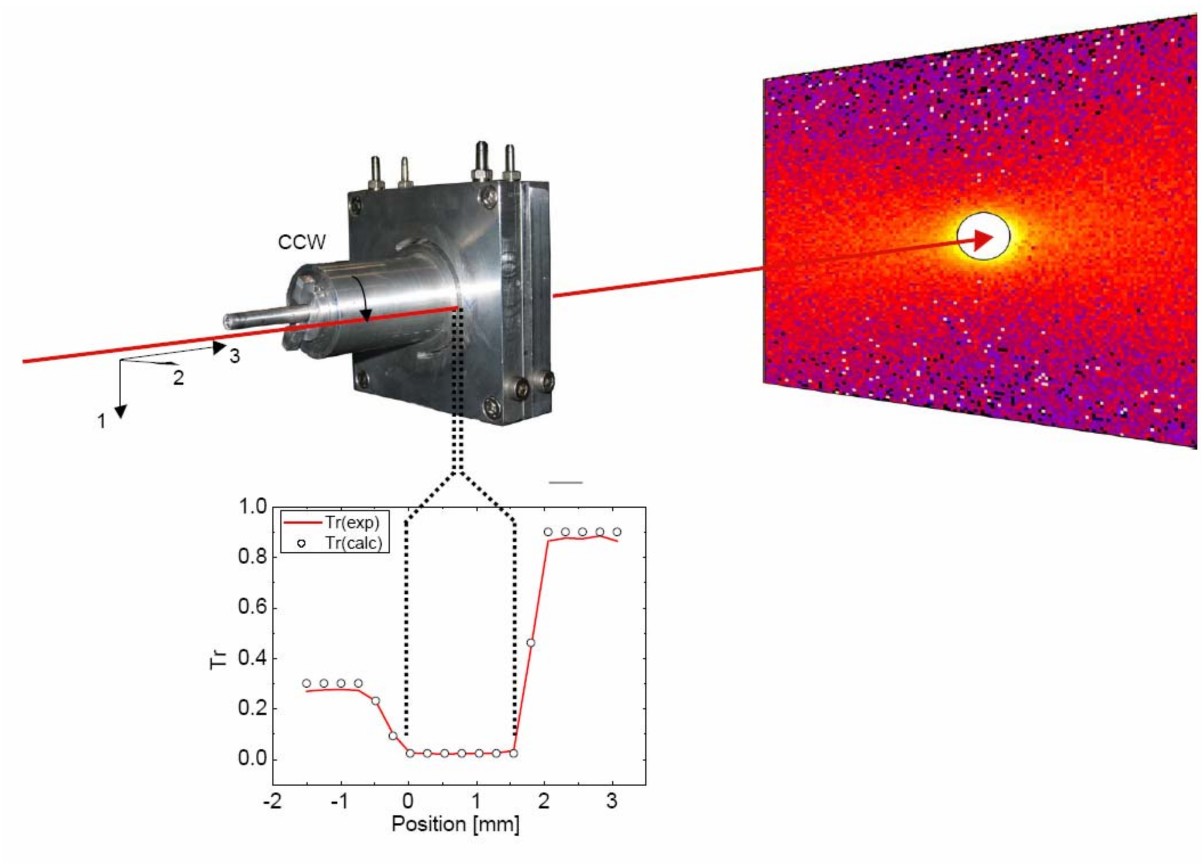


Figure 1: Schematic of the 1-2 plane shear cell in the neutron beam allowing for gap resolved studies. Inset show transmission recorded and predicted.

Type of presentation: Oral

The New Motion Control Systems for TS2

Dennis Cowdery
ISIS/RAL, Oxfordshire, England

The requirement to enlarge the ISIS facility has resulted in the construction of Target Station 2. Seven instruments are scheduled for day one operation -three reflectometers, Inter, Offspec and Polref; a small angle scattering instrument Sans-2D along with high resolution instruments Wish and Let, and a further instrument Nimrod.

The experimental program begins in October 2008.

It is anticipated that about 700 axes of motion control will be needed. An initiative has been made to rationalize the motion control equipment being used. The aim of the process is to ensure that 80% of motor systems can be operated by a standardized control system. This reduction in diversity of suppliers allows better maintenance and spares control, reduction in training needs, strong purchasing leverage, and compliance with EU tendering requirements.

The result of this process is a unit capable of operating mixed motor types, stepper, servo and piezo, absolute synchronization across hundreds of axes, software independence with no prejudgment on operating platforms. Additionally the unit can perform analog and digital I/O for miscellaneous instrument operations.

A pilot project has been undertaken on the CRISP beamline to gain experience with installation and overall performance, and this is now in the final commissioning stage

It is considered that this item of standardization will greatly assist in meeting the timescales demanded for the TS2 project.

This presentation will outline the development of this system.

Type of presentation: Oral

Name		Affiliation	Email Address
Bains	Ravi	ARS, Inc, USA	rbains@arscryo.com
Bowden	Zoe	ISIS/RAL, UK	z.a.bowden@rl.ac.uk
Bunce	Dave	ISIS/RAL, UK	d.j.bunce@rl.ac.uk
Church	Andy	ISIS/RAL, UK	a.j.church@rl.ac.uk
Como	Rich	IPNS/ANL, USA	rcomo@anl.gov
Cowdery	Dennis	ISIS/RAL, UK	d.cowdery@rl.ac.uk
Dender	Dan	NCNR/NIST, USA	dender@nist.gov
Dix	Scott	Vacuum One, USA	sdix@vacuumone.com
Down	Richard	ISIS/RAL, UK	r.b.e.down@rl.ac.uk
Evans	Beth	ISIS/RAL, UK	b.e.evans@rl.ac.uk
Fieramosca	Joe	IPNS/ANL, USA	jfieramosca@anl.gov
Gerischer	Sebastian	BENSC/HMI, GER	gerischer@hmi.de
Greenwald	Bryan	NCNR/NIST, USA	bryan.greenwald@nist.gov
Hapanowicz	Rick	Oxford Instruments, USA	hapanowicz@ma.oxinst.com
Hill	Bruce	SNS/ORNL, USA	hillb@ornl.gov
Jones	Doug	HFIR/ORNL, USA	Jonesdw1@ornl.gov
Kiefer	Klaus	BENSC/HMI, GER	klaus.kiefer@hmi.de
Kleb	Bob	IPNS/ANL, USA	bkleb@anl.gov
Kolb	Heinrich	FRM II/TUM, GER	heinrich.kolb@frm2.tum.de
Kulan	Stephen	CNS/ORNL, USA	kulansj@ornl.gov
Leao	Juscelino	NCNR/NIST, USA	juscelino.leao@nist.gov
Lelievre-Berna	Eddy	ILL, FRA	lelievre@ill.fr
Maierhafer	Daniel	CNS/ORNL, USA	maierhaferdl@ornl.gov
Maxey	Evan	IPNS/ANL, USA	emaxey@anl.gov
Mießner	Michael	BENSC/HMI, GER	michael.meissner@hmi.de
Moore	Scott	CNS/ORNL, USA	mooresa1@ornl.gov
Nojiri	Hiroyuki	IMR/Tohoku U, JPN	nojiri@imr.tohoku.ac.jp
Olson	Scott	Bragg Inst, ANSTO,	sol@ansto.gov.au

AUS

Name		Affiliation	Email Address
Peters	Jurgen	FRM II/TUM, GER	juergen.peters@frm2.tum.de
Pickering	Phil	Oxford Instruments, UK	phil.pickering@oxinst.co.uk
Porter	Rodney	IPNS/ANL, USA	rporter@anl.gov
Redmon	Christopher	CNS/ORNL, USA	redmoncm@ornl.gov
Rix	Jim	CRI, USA	containerless_design@yahoo.com
Rufer	Terry	ARS, Inc, USA	trufer@asrcryo.com
Santodonato	Louis	SNS/ORNL, USA	santodonatol@ornl.gov
Simkin	Valeriy	JINR/ FLNP, RUS	simkin@nf.jinr.ru
Smeibidl	Peter	BENSC/HMI, GER	peter.smeibidl@hmi.de
Tonon	Xavier	ILL, FRA	tonon@ill.fr
Vitt	Rich	IPNS/ANL, USA	rvitt@anl.gov
Volin	Ken	IPNS/ANL, USA	kjvolin@anl.gov
Walker	Lakeisha	SNS/ORNL, USA	walkerl@ornl.gov
Weber	Rick	CRI, USA	rweber@matsdev.com
Woodruff	Tim	U Central Florida, USA	twoodruff@heico.com
Zolliker	Markus	SINQ/PSI, SUI	markus.zolliker@psi.ch

OXFORD INSTRUMENTS

THE UNIVERSITY OF CHICAGO

Office of Science
U.S. DEPARTMENT OF ENERGY

Argonne NATIONAL LABORATORY