



No. IV/11 - 22 December 2011

# PSI photon, neutron and muon user facilities newsletter

## Editorial



J. Friso van der Veen

Dear colleagues,

This year we have celebrated the tenth anniversary of the Swiss Light Source. User operation started in 2001 with just four beamlines. Now the SLS has eighteen beamlines, covering the entire radiation spectrum from the infrared to the hard X-ray range. From day one of its operation,

the SLS storage ring featured small-gap in-vacuum undulators in combination with top-up injection. These features, combined with stable temperature in the ring tunnel and sophisticated beam position monitoring, provided extremely high stability and reliability. Recently, the machine group achieved a '**world record**' low value [http://gfa.web.psi.ch/news/sls\\_wr2011.php](http://gfa.web.psi.ch/news/sls_wr2011.php) for the vertical emittance of 1pm rad.

The users have greatly profited from these excellent beam conditions. In the first ten years of SLS operation, the SLS users have generated more than 2000 publications, many of them in high-impact journals. The in-house staff has contributed substantially to the advancement of high-resolution spectroscopy, imaging and diffraction. Last but not least, our detector group is a world leader in the development of hybrid pixel detectors (PILATUS). In the years to come PSI needs to put many of its resources into the realization of its X-ray free electron laser SwissFEL and both SLS staff and the machine physics

## New calls for proposals

### **SLS: PX-beamlines**

deadline: February 15, 2012

### **non-PX beamlines**

deadline: March 15, 2012

### **more information**

<http://www.psi.ch/sls/calls>

### **SINQ/all instruments**

deadline: May 15, 2012

### **more information**

<http://www.psi.ch/sinq/call-for-proposals>

### **SμS/instruments GPS, LTF, and GPD**

deadline: June 2012

### **more information**

[http://lmu.web.psi.ch/facilities/next\\_call.html](http://lmu.web.psi.ch/facilities/next_call.html)

### **Joint neutron and muon powder diffraction proposals**

deadline: February 15, 2012

### **more information**

<http://www.psi.ch/useroffice/x-plus-n>

An **overview** about all pro-

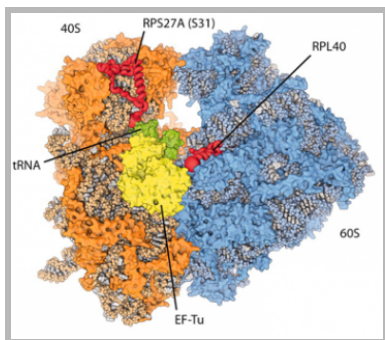
department are heavily involved in the project. As a consequence of this engagement, the SLS will certainly enter a consolidation phase. However, maintenance and regular upgrades of the SLS and its beamlines will remain a priority over the next ten years.

I would like to thank all users for the excellent science that they have brought to the SLS and the PSI staff for their inventiveness and support.

J. Friso van der Veen

## Research highlights

### SLS - Life sciences



#### New insights into the cell's protein factory

**S. Klinge et al, Science 334, 6058 (2011)**

Eukaryotic ribosomes are among the most complex cellular machineries of the cell. These large macromol-

ecular assemblies are responsible for the production of all proteins and are thus of pivotal importance to all forms of life. Two independent research groups at the ETH Zürich and the Institute of Genetics and Molecular and Cellular Biology in Strasbourg have obtained new insights into the atomic structure of the eukaryotic ribosome. The results have been published in the journal Science. All diffraction data were measured with synchrotron light at the Swiss Light Source macromolecular crystallography beamline X06SA at the Paul Scherrer Institute.

**Read the full story** <<http://www.psi.ch/sls/scientific-highlights>>

### SINQ - Plants, water and soil

posal submission deadlines of the PSI facilities can be obtained **here** <<http://www.psi.ch/useroffice/proposal-deadlines>> .

## Upcoming events

**January 25-26: SμS Users' Meeting 2012**, PSI Villigen, CH, **more information**

<<http://lmu.web.psi.ch/research/bvra.html>>

**January 25-27: European XFEL Users' Meeting**, Hamburg, DE, **more information**

<[http://www.xfel.eu/events/users\\_meetings/2012\\_users\\_meeting/](http://www.xfel.eu/events/users_meetings/2012_users_meeting/)>

**January 29 - February 1: Neutrons and Food 2012**, Delft, NL, **more information**

<<http://neutronfood.tudelft.nl/index.html>>

**January 29 - February 3: 5th European School on Multi-ferroics**, Monte Verita, CH, **more information**

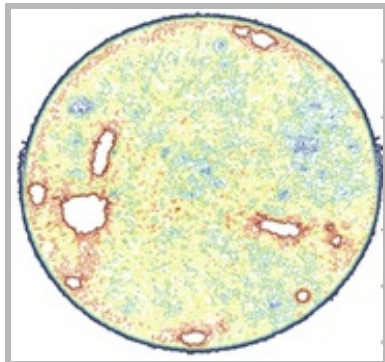
<<http://www.esmf.ethz.ch/>>

## Facility news

**SLS: First light at PEARL**

**PEARL** <<http://www.psi.ch/sls/pearl/pearl>> (Photo-Emission and Atomic Resolu-

### Three-dimensional visualization and quantification of water content in the rhizosphere



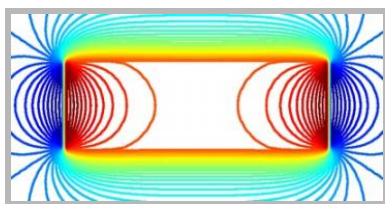
**A.B. Moradi et al, New Phytologist 192, 653 (2011)**

An international research team has demonstrated by experiments at SINQ that the soil in the vicinity of roots contains more water –

contrary to the earlier belief that there must be less water in this region, as the plant takes up water from the soil. Apparently, however, plants create a small water reserve that helps to tide them over through short periods of drought. These findings could help, in the long term, in the breeding of plants to cope better during periods of drought or in support of the development of efficient irrigation systems. These results were obtained from experiments carried out with the benefit of neutron tomography at the Paul Scherrer Institute, using a method that makes it possible to exactly show the distribution of water to a fraction of a millimetre, without having to remove a plant from the soil.

**Read the full story** <<http://www.psi.ch/num/2011#moradi>>

### $\mu$ S - Matter under extreme conditions



**Muon spin rotation investigation of the pressure effect on the magnetic penetration depth in  $\text{YBa}_2\text{Cu}_3\text{O}_x$**

**A. Maisuradze et al, Physical Review B 84, 184523 (2011)**

The pressure dependence of the magnetic penetration depth  $\lambda$  in polycrystalline samples of  $\text{YBa}_2\text{Cu}_3\text{O}_x$  with different oxygen concentrations  $x=6.45, 6.6, 6.8,$  and  $6.98$  was studied by muon spin rotation ( $\mu$ SR). The pressure dependence of the superfluid density  $\rho_s \propto 1/\lambda^2$  as a function of the superconducting transition temperature  $T_c$  is found to deviate from the usual Uemura line. The ratio  $(\partial T_c / \partial P) / (\partial \rho_s / \partial P)$  is smaller by a factor of  $\approx 2$  than that of

tion Laboratory) is a new soft X-ray beamline dedicated to surface science. The main synchrotron-based technique is photoelectron diffraction, while scanning tunnelling microscopy provides complementary real-space information. The X-ray optics section of the beamline has been set up, and saw first synchrotron light in December. Commissioning of the optics, and installation of the end station are planned for 2012.

### SINQ: EIGER ready for neutrons

The construction of the thermal triple-axis spectrometer EIGER has now been finished. EIGER is a new modern instrument with a double focusing monochromator and an efficient non-magnetic shielding in order to allow experiments with strong magnetic fields. Tests with neutrons will be made after the shutdown in spring 2012 and we expect that EIGER will be ready for first experiments in summer.

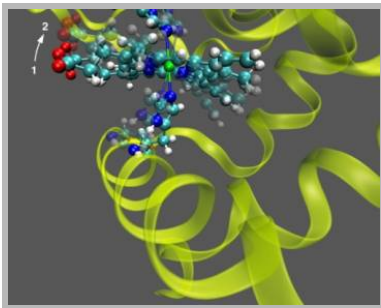
### SINQ: New proposal record

In 2011 more than 400 new SINQ proposals have been

the Uemura relation. In underdoped samples, the zero-temperature superconducting gap  $\Delta_0$  and the BCS ratio  $\Delta_0/kBT_c$  both increase with increasing external hydrostatic pressure, implying an increase of the coupling strength with pressure. The relation between the pressure effect and the oxygen isotope effect on  $\lambda$  is also discussed. In order to analyze reliably the  $\mu$ SR spectra of samples with strong magnetic moments in a pressure cell, a special model was developed and applied.

**Read the full story** <<http://www.psi.ch/num/2011#maisuradze>>

## SwissFEL - News



### Recent SwissFEL workshops 2011

On September 12 and November 21, 2011, two Workshops were held at the University of Bern with the goal

of collecting user input for the design of the initial set of instruments at the SwissFEL hard X-ray „ARAMIS“ undulator beamline. The first Workshop concentrated on spectroscopic experiments and was attended by 40 scientists from 10 different institutions, and the second Workshop focused on scattering and diffraction experiments and was attended by 80 scientists from 20 institutions. The results of the Workshops, a booklet of 35 project posters (see cover picture to the left), a discussion summary of requested capabilities and features and a preliminary definition of 4 experimental user groups, are posted **here** <<http://www.psi.ch/swissfel/swissfel-workshops>> . The next step in the instrument design process will be four focused Workshops, to be held at PSI – for topics and dates, please consult the **SwissFEL web page** <<http://www.psi.ch/swissfel/>> .

submitted, which is a new all time record for the facility. The proposals, which have been submitted in November 2011 are presently under evaluation. The results will be published in early February.

### S $\mu$ S: Successful user operation 2011

A total of 226 experiments were performed on the S $\mu$ S instruments in 2011 by 160 different users. The facility received 196 new proposals - a number that is remarkably high, since no call was opened for DOLLY and ALC and proposals could be submitted for four instruments only. So far the largest proposal number was received in 2010 with 201 proposals for six instruments!

## Current Openings

### Job opportunities at PSI

<<http://www.psi.ch/en/pa/offenstellen/>>

## Announcements

### Joint X + N powder diffraction proposals: 2012

The synchrotron (SLS) and neutron (SINQ) facilities at PSI are launching again a **joint proposal round** with the aim to promote and facilitate the complementary use of X-rays and neutrons. The call will open in January with a proposal submission deadline on **February 15, 2012, midnight**. Proposals are expected, for which the use of both synchrotron X-ray **and** neutron diffraction is required and adequately justified. The call involves the MS powder diffraction beamline **Xo4SA** <<http://www.psi.ch/sls/ms/>> at SLS and the high resolution neutron powder diffractometer **HRPT** <<http://sinq.web.psi.ch/sinq/instr/hrpt/index.html>> at SINQ. The beamtime allocation will be from July to December 2012. Applications should be submitted solely through the **PSI Digital User Office** <<https://duo.psi.ch>> . **More information** <<http://www.psi.ch/useroffice/x-plus-n>>

### PSI summer school on condensed matter research 2012

The 11th PSI summer school will be organized from August 11-17, 2012 in Zug, Switzerland. The 2012 edition of the traditional school is dedicated to the fascinating and growing field of imaging experiments at large scale facilities. International experts and PSI staff members will introduce and deepen your knowledge about real space imaging from life to materials sciences. Again, the school will be accomplished by a hands-on practical training at the PSI large scale facilities for selected participants. **More information** <<http://www.psi.ch/summerschool>>

### Facility publications 2011

Please remember to register your 2011 publications that are based on experiments at SLS, SINQ and  $\mu$ S in the **DUO system** <<https://duo.psi.ch/duo/publications>> and to link them to the respective beamlines or proposals. By doing that you will help us very much in keeping track of our facility publications. Thanks a lot in advance!

## Imprint

PSI Facility News addresses the users of the PSI large facilities and appears quarterly in English. Any feedback is highly welcome! **More information.** <<http://www.psi.ch/imprint>>

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