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# PSI photon, neutron and muon user facilities newsletter

## Editorial



Mike Seidel

Dear colleagues,

PSI's particle accelerators HIPA, SLS and the medical facility PROSCAN represent the backbones of the respective research facilities. The accelerators are operated by a common team from a single control room, nonetheless each has a rather individual character.

The high intensity proton accelerator (HIPA) is optimized for beam power to maximize the production of secondary particles, muons and neutrons. Due to several improvements a new record beam power of 1.4 MW was achieved in 2011, after the level of unwanted beam losses was reduced further. The strengths of the Swiss Light Source (SLS) are extremely stable beam conditions and a high brightness, properties that both result in very competitive conditions and unique research opportunities at SLS. Application of advanced optimization techniques to beam orbit and magnet lattice led to a record minimum vertical beam emittance in 2011.

PROSCAN has been running since the startup in 2007 without major interruptions of more than a few days for service. This reliability is of utmost importance since the patients must receive their treatment fractions over several weeks without long interruptions.

Operating accelerators at a high level of uptime is always

## New calls for proposals

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

deadline: October 15, 2012

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

deadline: March 15, 2013

### **more information**

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

### **SINQ/all instruments**

deadline: November 15, 2012

### **more information**

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

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

deadline: December 2012

### **more information**

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

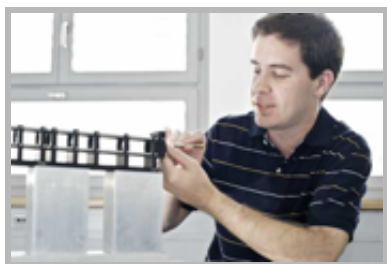
An **overview** about all proposal submission deadlines of the PSI facilities can be obtained **here** <<http://www.psi.ch/useroffice/proposal-deadlines>> .

a challenge. These facilities typically contain thousands of active components, and often the failure of a single component is sufficient to interrupt the beam. Individual components must be extremely reliable to ensure predictable operation of the whole complex. Thanks to thoughtful investments by the many involved technical teams, given the limited operation budget, it was possible to establish excellent availabilities at all facilities in recent years. The variety of different technologies and science themes, ranging from challenging cooling problems over ultrahigh vacuum systems to complex beam dynamics makes the operation of particle accelerators an interesting and exciting task. The most satisfying reward for the accelerator team is to observe the intense usage of the facilities by a broad user community with a wide spectrum of research applications.

Mike Seidel, Accelerator Operation and Development,  
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## Research highlights

### SLS / SwissFEL - Maintaining the quality of the pulses from an X-ray laser



**Ultra-short X-ray laser pulses precisely surveyed for the first time**

**S. Rutishauser et al, Nature Communications 3, 947 (2012)**

X-ray lasers belong to a modern generation of light sources from which scientists in widely different disciplines expect to obtain new knowledge about the structure and function of materials at the atomic level. On the basis of this new knowledge, it could then be possible one day to develop better medicines, more powerful computers or more efficient catalysts for energy transfor-

## Upcoming events

### Structural Dynamics and Dynamical Structures

<<http://www.ill.eu/sdds2012/>>

October 3-5, 2012, Grenoble, France

### LCLS/SSRL Users Meeting

<<http://www-conf.slac.stanford.edu/ssrl-lcls/2012/>>

October 3-6, 2012, San Francisco, USA

### JCNS Workshop 2012: Trends and Perspectives in Neutron Scattering for Soft Matter and Biophysics

<[http://www.fz-](http://www.fz-juelich.de/jcns/EN/Leistungen/ConferencesAndWorkshops/JCNSWorkshops/2012Workshop/_node.html)

[juelich.de/jcns/EN/Leistungen/ConferencesAndWorkshops/JCNSWorkshops/2012Workshop/\\_node.html](http://www.fz-juelich.de/jcns/EN/Leistungen/ConferencesAndWorkshops/JCNSWorkshops/2012Workshop/_node.html)>

[shop/\\_node.html](http://www.fz-juelich.de/jcns/EN/Leistungen/ConferencesAndWorkshops/JCNSWorkshops/2012Workshop/_node.html)

October 8-11, 2012, Tutzing, Germany

Germany

### EMBO practical course on Solution Scattering from Biological Macromolecules

<<http://events.embo.org/12-sas/>>

October 17-24, 2012, Hamburg, Germany

### SwissFEL Pump Laser Workshop

<<http://indico.psi.ch/conferenceDisplay.py?confId=1872>>

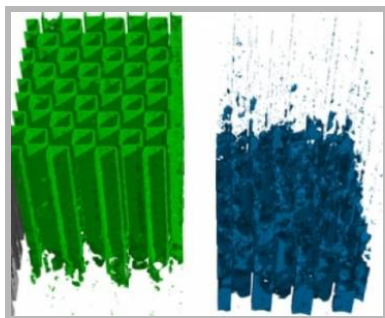
November 16, 2012, Villigen PSI, Switzerland

### SwissFEL Sample Mounting and Injection Workshop

mation. The scientific value of an X-ray laser stands or falls on the quality of the ultra-short X-ray pulses it produces and which researchers use to illuminate their samples. An international team led by scientists from the Paul Scherrer Institute, PSI, has now precisely measured these pulses. In so doing, they have laid the foundation for a scientifically optimal utilisation of X-ray lasers – not least, of the planned SwissFEL at PSI. The results of this work have recently been published in the scientific journal Nature Communications.

**Read the full story**

### SINQ - Innovative results for the car industry



**Distribution of soot particles in particulate filters of diesel vehicles seen for the first time**

**C. Grünzweig et al, MTZ  
Motortechnische Zeitschrift  
73, 326 (2012)**

Nowadays, all diesel motor vehicles are fitted with a particulate filter as standard, as part of the 'Euro 5' Emission Standard. These filters prevent the harmful soot and ash particles in exhaust gases from entering the environment. However, within the automotive industry, exactly how the soot particles are deposited inside these filters has not been known. Now, using a special imaging technique - Neutron Tomography - researchers at the Paul Scherrer Institute have made the soot inside filters visible, creating a foundation from which these filters can be optimised and developed further.

**Read the full story** <<http://www.psi.ch/num/2012#gruenzweig>>

### SμS - Nano Science: Tuning the spin dynamics of molecular magnets

<<http://indico.psi.ch/conference-Display.py?confId=1866>>

November 20, 2012, Villigen  
PSI, Switzerland

### SAS2012: International Small-Angle Scattering Conference

<<http://www.sas2012.com/>>

November 18-23, 2012, Sydney, Australia

### MRS Symposium VV: Advanced Materials Exploration with Neutrons and Synchrotron X-Rays

<<http://mrs.org/f12-cfp-vv/>>

November 25-30, 2012, Boston, MA, USA

### PSI Powder Diffraction School

November 27-29, 2012, PSI  
Villigen, Switzerland

### 5th MaNEP Winter School - Understanding electronic and magnetic correlations

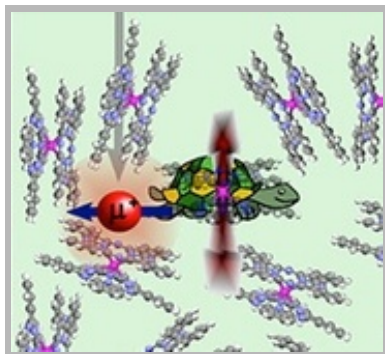
<<http://www.->

[manep.ch/en/events/saasfee13](http://www.manep.ch/en/events/saasfee13)>

January 13-18, 2013, Saas-Fee, Switzerland

## Facility news

### SLS: Advanced diffraction data collection with multi-axis goniometer and single-



### Depth-Dependent Spin Dynamics in Thin Films of TbPc<sub>2</sub> Nanomagnets Explored by Low-Energy Implanted Muons

**A. Hofmann et al, ACS Nano, August 2012**

We present measurements of the magnetic properties

of thin film TbPc<sub>2</sub> single-molecule magnets evaporated on a gold substrate and compare them to those in bulk. Zero-field muon spin relaxation measurements were used to determine the molecular spin fluctuation rate of TbPc<sub>2</sub> as a function of temperature. At low temperature, we find that the fluctuations in films are much faster than in bulk and depend strongly on the distance between the molecules and the Au substrate. We measure a molecular spin correlation time that varies between 1.4 μs near the substrate and 6.6 μs far away from it. We attribute this behavior to differences in the packing of the magnetic cores, which change gradually on the scale of 10–20 nm away from the TbPc<sub>2</sub> / Au interface.

**Read the full story** <<http://www.psi.ch/num/2012#hofmann>>



### ERC Grant for the development of a new imaging method with high potential clinical impact

Marco Stampanoni, Assistant Professor for X-ray microscopy at the ETH

Zürich and Head of the “X-ray Tomography Group” of the SLS has been recently awarded one of the coveted European Research Council (ERC) Starting Grant for the project PhaseX: “Phase contrast X-ray imaging for medicine”. Marco Stampanoni’s project will be supported by the ERC with 1.5 million euros for the next 5 years. The

### photon counting detector at beamline Xo6DA

A new type of multi-axis goniometer called PRIGo (Parallel Robotics Inspired Goniometer) has been developed for macromolecular crystallography applications at the Swiss Light Source. It allows to precisely reorient crystals and to collect very accurate data with high mechanical precision. With the very compact design, it offers the highest degree of freedom in a crowded sample environment. Combined with single-photon counting PILATUS 2M-Fast detector, the beamline Xo6DA now offers new data collection opportunities taking full advantages of crystal geometry and detector properties. This setup is therefore extremely well suited for difficult phasing experiments and allows users to tackle even more challenging projects.

### SINQ: EIGER spectrometer in user operation

The new thermal triple-axis spectrometer **EIGER**

<<http://spectroscopy.web.psi.ch/eiger/>>

is available for user operation in the next SINQ cycle and is ready to

highly competitive ERC Starting Grants are reserved for outstanding young research talents. With his team, Stamparoni has been working on the development of phase contrast X-ray imaging methods since several years. This technique can potentially revolutionize the radiological approach to medical imaging because it is intrinsically capable of detecting subtle differences in the electron density of soft tissue and of measuring the effective integrated local small-angle scattering power generated by the microscopic density fluctuations in a specimen. It goes therefore well beyond the conventional, absorption-based approach used daily in the clinical routine which usually lacks in contrast when imaging soft-tissue. Stamparoni's ERC project aims at transferring this technique -- so far successfully and efficiently implemented exclusively on synchrotron -- to the clinical environment, with the final purpose to provide medical doctors a new, powerful diagnostic tool. A few preliminary applications of the method have been investigated in the field of **mammography** and **Alzheimer research** already.

receive first proposals. The instrument will therefore be fully included into the next **call for proposals**

<http://www.psi.ch/sinq/call-for-proposals> , which will end with the submission deadline on **November 15**.

Interested users are kindly requested to **contact the instrument responsible** in advance of submitting a proposal to discuss the feasibility of the planned experiments.

#### **µS: New capabilities for Low Energy Muon experiments**

The LEM spectrometer has been extended by the possibility to illuminate the sample with light and simultaneously perform µSR or resistivity measurements. The new setup utilizes LEDs which are able to provide a light intensity of up to 100 mW/cm<sup>2</sup> at the sample with a wavelength of 405 nm. It is of special advantage that the probing depth of the low energy muons perfectly matches the attenuation length of the used light. An external stimulus like light now allows to use LEM to study unconventional electronic states of matter in an

out-of-equilibrium situation.

**SwissFEL: New opportunities for coherently exciting magnetic materials**

The ability to manipulate matter on ultra-short time scales offers potential breakthroughs in future device technologies as well as a better understanding of fundamental material properties. For this purpose, it is of immense importance to be able to selectively drive excitations of interest. This has recently been demonstrated by team of researchers from PSI, the ETH Zurich, Stanford (SLAC) and Berkeley with an experiment (performed in July 2012) at the x-ray free electron laser LCLS **more information** <<http://www.psi.ch/swissfel/highlights>> .

## Current Openings

**Job opportunities at PSI**

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

## Announcements

## PSI Users Association - board elections

Over the summer the PSI users association **JUSAP** <<http://www.psi.ch/useroffice/users-association>> organised the election of part of its board members, whose term of office ended in rotation by August 2012. In particular, Bernd Schönfeld from ETH Zurich stepped back from his duties after four years being chairman of JUSAP between 2008 and 2012. Bernd really was a driving force behind several innovations regarding the representation of the PSI users: During his term of office the association was extended to represent not only the SLS but also the SINQ and SμS users. He was also very active in initiating the JUM@P Joint Users Meetings, which are now regularly organized every two years as well as in calling for a regular electronic feedback from the users regarding their experiments performed recently. Dear Bernd, PSI and its user community thank you very much for your strong engagement over the past years.

The new head of JUSAP has been elected now: Sarah Dunsiger from TU Munich took over the task as chairwoman from September 1, 2012. We wish her all the best for the new task and look very much forward to a continuation of a very good cooperation between PSI and JUSAP.

A list of all board members and contact addresses is available from the **JUSAP webpage** <<http://www.psi.ch/useroffice/users-association>> .

## User feedbacks

Since 2010 the PSI User Office calls regularly for an electronic feedback from the users. A few weeks after each experiment every participant receives an email with a request to take 5 minutes and fill in a brief online questionnaire with feedback about the recent experiment and stay at PSI.

In 2011 totally 1300 users participated and provided feedback in the various categories. The best rated categories were 'scientific support', 'technical support', 'machine operation', 'beamline hardware' and 'Digital User Office (DUO)'. In those categories far more than 90% of the users gave one of the two highest scores "5" or "4". Main criticism on the other hand are the missing opening hours of the PSI restaurant during the weekends - a problem, which is not easy to solve.

The overall impression of our users is extremely positive: In this category 56% of the users provided the highest score (5), 34% gave a "4", 8% a "3" and only 2% rated their stay with the two lowest scores "1" or "2". **Thanks a lot for continuously providing this feedback, which helps us enormously to improve the service for our users!**

## Proprietary research

A certain fraction of the beamtime at PSI research facilities is reserved for proprietary use. This is handled by the **PSI Technology Transfer** <<http://www.psi.ch/industry/technology-transfer>> . The following **directory** <<http://www.psi.ch/industry/industry-services>> lists services on offer by these facilities.

## 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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