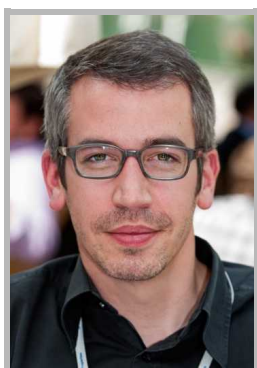




No. IV/14 - 19 December 2014

PSI photon, neutron and muon user facilities newsletter

Editorial



Christian Rüegg

Dear colleagues,

On October 9 construction of the European Spallation Source **ESS**

[<http://europeanspallationsource.se>](http://europeanspallationsource.se) was officially started with a foundation stone ceremony in Lund Sweden. It was an important moment for many

that have contributed to the project so far, including scientists and engineers

at PSI designing instruments and serving on many important advisory bodies, the PSI directorate, and representatives from the State Secretariat for Education, Research and Innovation. The ESS is a real opportunity for science in Europe and will enable breakthroughs in many important areas of science and technology where only neutrons can give the right answer. Waiting for the final approval by the Swiss parliament, we together with Swiss industry are very eager to start contributing to the realization of this powerful future neutron source for Europe.

Speaking of Europe, it has been a challenging year for science in Switzerland in the aftermath of a vote in February for the introduction of immigration limits. As "collective punishment" students and scientists from Swiss institutions were temporarily excluded from participation in the **Horizon 2020** [<http://ec.europa.eu/programmes/horizon2020/>](http://ec.europa.eu/programmes/horizon2020/) research programs of the EC. International collaborations and mobility have always been extremely important for science and education. We should emphasize more clear-

New calls for proposals

SLS: non-PX beamlines

deadline: March 15, 2015

SLS: PX-beamlines, attention: new date

deadline: April 15, 2015

more information

[<http://www.psi.ch/sls/calls>](http://www.psi.ch/sls/calls)

SINQ

deadline: May 15, 2015

more information

[<http://www.psi.ch/sinq/call-for-proposals>](http://www.psi.ch/sinq/call-for-proposals)

SLS/SINQ: joint X+N powder diffraction

deadline: February 20, 2015

more information

[<http://www.psi.ch/useroffice/x-plus-n>](http://www.psi.ch/useroffice/x-plus-n)

SμS

deadline: June 2015

more information

[<http://www.psi.ch/smus/calls>](http://www.psi.ch/smus/calls)

An **overview** about all proposal submission deadlines of the PSI facilities can be

ly to our neighbours, friends, family, collaborators, funding agencies, and governments that they are the way we want and need to work. This is especially true for science involving large-scale facilities. For example at SINQ we provide currently 2000 experiment days per year to the Swiss and International, largely European, user community, allocated solely on the basis of scientific quality, while in return we are invited to do our experiments at complementary facilities abroad. We want to continue this way.

Switzerland as many of the larger European countries has followed a dual strategy running an own - national but open-access - source while contributing to a larger European central facility for neutron scattering. Similar models apply to synchrotrons and free-electron lasers. For neutron sources this very efficient and effective mode of collaboration is currently under serious threat because some of the national reactor-based sources cannot be replaced by newer ones. With less than 20 years of operation SINQ is young and accelerator-based. For SINQ we are currently proposing a comprehensive upgrade including new neutron guides based on the latest supermirror technology and instrumentation. Further gains are possible by optimizing its moderators. As we have always been completely open to users from any country, we are equally open to collaborations in science, instrumentation and operation. Maybe there will be fewer national sources in the future. But we will have ESS and more powerful and possibly multi-national sources.

Merry Christmas!

Christian Rüegg, on behalf of the Laboratory for Neutron Scattering and Imaging, PSI

Research highlights

SLS - Materials Science: Puzzling new behaviour observed in high-temperature superconductors

obtained **here** <<http://www.psi.ch/useroffice/proposal-deadlines>> .

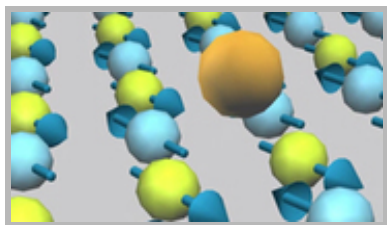
Facility news

SLS: SLS-PX-CALLS: Change from three to two calls per year

From 2015 on the SLS changes the call-for-proposals-scheme for its PX beamlines. Starting with April 2015 there will be only two rather than three calls per year. The call II/15 (submission deadline: **April 15, 2015**) will collect proposals for the beam time period July - December 2015 and the following call I/16 (submission deadline: **October 15, 2015**) for January - June 2016, **more information** <<http://www.psi.ch/sls/calls>> .

SINQ: Proposal for upgrade of supermirror neutron guides

SINQ was the first neutron source to including a supermirror neutron guide system. Experts directly at PSI and companies like "**Swiss-Neutronics** <<http://www.swiss-neutronics.ch>> " have developed that technology further, now coating shaped



New effect might be important for emergence of High-Temperature Superconductivity

W. S. Lee et al, Nature Physics advance online publication 19 October 2014, DOI: 10.1038/nphys3117 <<http://dx.doi.org/10.1038/nphys3117>>

An international team of researchers from SLAC National Accelerator Laboratory and Stanford University (both California) and the Paul Scherrer Institute (Villigen, Switzerland) has observed a new, unexpected kind of behaviour in copper-based high-temperature superconductors – materials that are capable of conducting electric current without any loss when cooled to low enough temperatures. Explaining the new phenomenon - a new, unexpected form of collective movement of the electrical charges in the material - poses a major challenge for the researchers. A success in explaining the phenomenon might be an important step toward understanding high-temperature superconductivity in general. The crucial experiments were conducted at the Paul Scherrer Institute's Swiss Light Source. The results of this project have been published in the journal Nature Physics on 19 October 2014.

Read the full story <<http://www.psi.ch/media/puzzling-new-behaviour-observed-in-high-temperature-superconductors>>

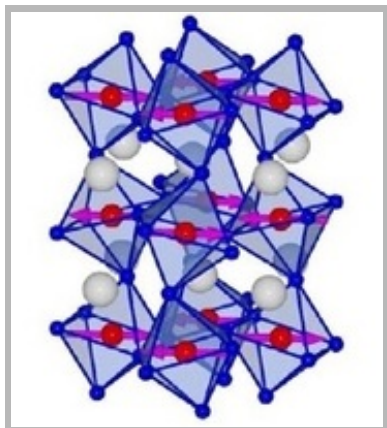
SINQ - Neutrons solve the magnetic structure of an extremely neutron absorbing material

k=0 Magnetic Structure and Absence of Ferroelectricity in SmFeO_3

glass and metal for efficient delivery of neutrons from the source to the sample and complex neutron optics. First simulations of a fully optimized new guide system show that for present and future instruments at SINQ, and especially those for experiments on small volumes of bulk samples measured under extreme conditions, thin films, and heterostructures gains of up to two orders of magnitude are possible.

μS: First experiments using the new oven for LEM

This November, the three first experiments using the new oven for low energy muon spin spectroscopy were successfully conducted. The oven reaches temperatures of up to 600 K and allows for the simultaneous application of up to 8 kV making it possible for the first time to perform depth dependent μSR measurements at these high temperatures. Additionally, the oven can be cooled down to 200 K by a liquid nitrogen system without changing the setup to the usual helium cryostats. Therefore it offers a convenient way to



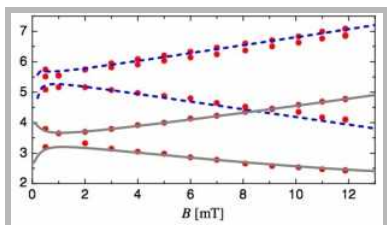
C.-Y. Kuo et al, Physical Review Letters 113, 217203 (2014), DOI: 10.1103/PhysRevLett.113.217203

<<http://dx.doi.org/10.1103/PhysRevLett.113.217203>>

SmFeO₃ has attracted considerable attention very recently due to its reported multiferroic properties above room temperature. We have performed powder and single crystal neutron diffraction as well as complementary polarization dependent soft X-ray absorption spectroscopy measurements on floating-zone grown SmFeO₃ single crystals in order to determine its magnetic structure. We found a k=0 G-type collinear antiferromagnetic structure that is not compatible with inverse Dzyaloshinskii-Moriya interaction driven ferroelectricity. While the structural data reveal a clear sign for magneto-elastic coupling at the Néel-Temperature of ~675 K, the dielectric measurements remain silent as far as ferroelectricity is concerned.

Read the full story <<http://www.psi.ch/num/2014#kuo>>

μS - Material Science: Muons provide evidence for turning an insulator into a semiconductor



Direct Spectroscopic Observation of a Shallow Hydrogenlike Donor State in Insulating

SrTiO₃

Z. Salman et al, Physical Review Letters 113, 156801 (2014), DOI: 10.1103/PhysRevLett.113.156801 <<http://dx.->

cover a broad temperature range around room temperature.

Upcoming events

Future Muon Sources

<<http://www.isis.rl.ac.uk/useroffice/MuonSources/Register.asp>>

January 12-13, 2015, Huddersfield, UK

January 12-13, 2015, Huddersfield, UK

6th MaNEP Winter School

<<http://www.manep.ch/saas-fee15/>>

January 18-23, 2015, Saas-Fee, Switzerland

10th SOLEIL Users' Meeting 2015

<<http://www.synchrotron-soleil.fr/Workshops/2015/SUM2015>>

January 22-23, 2015, Gif-sur-Yvette, France

January 22-23, 2015, Gif-sur-Yvette, France

9th International Symposium 'Hydrogen and Energy'

<<http://www.hesymposium.ch>>

January 25-30, 2015, Emmetten, Switzerland

BESSY II - From PICO to FEMTO: Time-resolved studies at BESSY II

<<http://www.helmholtz-berlin.de/user/workshops/from->

berlin.de/user/workshops/from-

doi.org/10.1103/PhysRevLett.113.156801

We present a direct spectroscopic observation of a shallow hydrogenlike muonium state in SrTiO₃ which confirms the theoretical prediction that interstitial hydrogen may act as a shallow donor in this material. The formation of this muonium state is temperature dependent and appears below ~70 K. From the temperature dependence we estimate an activation energy of ~50 meV in the bulk and ~23 meV near the free surface. The field and directional dependence of the muonium precession frequencies further supports the shallow impurity state with a rare example of a fully anisotropic hyperfine tensor. From these measurements we determine the strength of the hyperfine interaction and propose that the muon occupies an interstitial site near the face of the oxygen octahedron in SrTiO₃. The observed shallow donor state provides new insight for tailoring the electronic and optical properties of SrTiO₃-based oxide interface systems.

Read the full story <<http://www.psi.ch/num/2014#salman>>

News

SLS



Award ceremony; Foto: M. Setzpfand/HZB.

SLS receives Innovation Award on Synchrotron Radiation 2014 for high-resolution 3D hard X-ray microscopy

The 2014 Innovation Award on Synchrotron Radiation was bestowed to researchers Ana Diaz, Manuel Guizar-Sicairos, Mirko Holler, and Jörg Raabe from the Paul Scherrer Institut, Switzerland, for their contributions to method and instrumentation development, which have set new standards in high-resolution 3D hard X-ray microscopy. **Read the full story** <<http://www.psi.ch/coherent-x>

pico-to-femto-time-resolved-studies-at-bessy-ii/index_en.html
January 26-27, 2015, Berlin, Germany

2015 European XFEL Users' Meeting and Satellite Meetings

<http://www.xfel.eu/events/users_meetings/2015_users_meeting/>
January 28-30, 2015, Hamburg, Germany

ISIS Molecular Spectroscopy Science Meeting

<<http://www.isis.rl.ac.uk/useroffice/MoleSpecUG-M2015/Register.asp>>
January 29-30, 2015, Abingdon, UK

46th Juelich IFF Spring School: Functional Soft Matter

<<http://www.iff-springschool.de/>>
February 23 - March 6, 2015, Jülich, Germany

35th Berlin School on Neutron Scattering

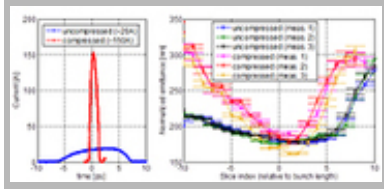
<<http://www.helmholtz-berlin.de/events/neutronschool/>>
February 26 - March 6, 2015, Berlin, Germany

HERCULES 2015: Higher European Research Course for Users of Large Experimental Systems

<<http://hercules-school.eu>>
March 1 - April 1, 2015,

ray-scattering/innovation-award-on-synchrotron-radiation-2014-for-high-resolution-3d-hard-x-ray-microscopy>

SwissFEL



Emittance measurements and minimization at the SwissFEL Injector

Test Facility.

Eduard Prat et al., PHYSICAL REVIEW SPECIAL TOPICS-ACCELERATORS AND BEAMS 17, 104401 (2014) DOI:

10.1103/PhysRevSTAB.17.104401 <[http://dx.-](http://dx.-doi.org/10.1103/PhysRevSTAB.17.104401)

[doi.org/10.1103/PhysRevSTAB.17.104401](http://dx.-doi.org/10.1103/PhysRevSTAB.17.104401)>

The emittance of the electron beam is crucial for Free-Electron Laser facilities: it has a strong influence on the lasing performance and on the total length of the accelerator. We present our procedure to measure and minimize the projected and slice emittance at the SwissFEL Injector Test Facility. The normalized slice emittance resolution achieved is about 3 nm and the longitudinal resolution is about 13 fs, with measurement errors estimated to be below 5%. After performing a full optimization we have obtained, for uncompressed beams, a slice emittance of about 200 nm for a beam charge of 200 pC, and a slice emittance of about 100 nm for 10 pC. These values are consistent with our simulations and are well below the requirements of the SwissFEL under construction at the Paul Scherrer Institute. At these bunch charges our measured slice emittances are, to our knowledge, the lowest reported so far for an electron linear accelerator.

Users Association

Grenoble, France

MaMaSELF Status Meeting

2015 <<http://indico.psi.ch/event/mamaself15>>

May 26-29, 2015, Rigi Kulm, Switzerland

PSI Summer School on Condensed Matter Research

2015 <<http://indico.psi.ch/conferenceDisplay.py?confId=3407>>

August 15-21, 2015, Zuoz, Switzerland

M2S 2015: 11th International Conference on Materials and Mechanisms of Superconductivity

<<http://www.m2s-2015.ch>>

August 23-28, 2015, Geneva, Switzerland

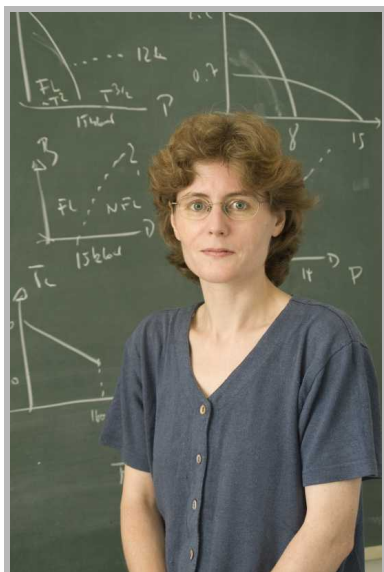
more events <<http://www.psi.ch/useroffice/conference-calendar>>

Current Openings

Job opportunities at PSI

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

JUSAP - The Joint Users Association



Sarah Dunsiger

The issue of resources for travel is of relevance for all users of large scale neutron, muon and synchrotron sources. The European Synchrotron Users Organization (**ESUO**) <<http://www.esuo.org>> in particular, is currently making strong efforts to promote transnational access to European large scale facilities within Horizon 2020, the EU Framework

Programme for Research and Innovation. During the last two months, ESUO delegates have been in contact with their national representatives within the European Commission Programme Research Infrastructures (RI) committee. A similar initiative has been taken by the neutron and muon facilities and by the European Neutron Scattering Association **ENSA** <<http://www.neutrons-ensa.eu>> .

In advance of a meeting which took place in Brussels on November 5, 2014, the ESUO distributed various materials to the RI national representatives. These included a brochure "**Towards even Brighter European Photon Science**" <<http://esuo.org/?node=ESUOhome&file=esuo-manifesto-2014.pdf>> , copies of a letter of concern **published recently** <<http://dx.doi.org/10.1107/S1600577514007619>> in the "Journal of Synchrotron Radiation", as well as suggested text for a RI call entitled «Joint facility and user approach of the Europe-wide accelerator-based light source user community». During this meeting the majority of European countries supported the inclusion of transnational access to large scale facilities in the next RI calls, foreseen for 2016-2017. This is an important and promising outcome for users.

The preparation for the expected new RI working pro-

gramme for Horizon 2020 is now underway, the next meeting of the RI policy committee members being foreseen for February 2015. We hope that this meeting will allow us to share further good news with you early next year.

With best wishes for 2015 from the JUSAP committee members,

Sarah Dunsiger (JUSAP chair)

Announcements

The PSI Protein Production Platform (P4)

The PSI Protein Production Platform (P4) of the Biology and Chemistry Department (BIO) is a research facility specialized in recombinant protein production, with state-of-the-art equipment and a team of highly skilled and dedicated professionals with extensive experience in protein expression and purification.

P4 collaborates with research groups in Switzerland and world-wide and also offers recombinant protein production on a fee-for-service basis. Together with the PSI Crystallization Facility, P4 represents the 'gene-to-structure' pipeline designed to cover all steps from cloning to rapid mutant generation, biophysical and functional studies, as well as X-ray data collection at the SLS and high-resolution structure determination. A recent publication of **Benoit et al in 'Nature'** <<http://dx.doi.org/10.1038/nature12732>> represents an example of a successful pipeline project. Access to the facilities for European users with an interest in eukaryotic membrane protein expression and/or crystallization is funded by the **BioStruct-X programme** <<http://www.biostruct-x.eu>> . More information can be obtained from the **Protein Production Platform (P4)** <<http://www.psi.ch/lbr/psi-protein-production-platform-p4>> .

PSI Summer School 2015

The 2015 (14th) PSI summer school on condensed matter research will again be organized at the Lyceum Alpinum in Zuoz/CH from **August 15-21, 2015**. The PSI summer schools aim to train young researchers in the methods being used at large scale facilities such as neutron and muon sources or synchrotron photon sources. International experts and PSI staff members will introduce and deepen your knowledge not only on those methods but also on the phenomena, which are presently at the forefront of modern solid state research.

Following the school a practical training is offered at PSI (August 22-23). It will allow a limited number of participants to get hands-on experience with state-of-the-art instrumentation using photons, neu-

trons, and muons. The online application will open early 2015. Please visit the **school's homepage** <<http://indico.psi.ch/conferenceDisplay.py?confId=3407>> for more information.

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/expertise>> lists services on offer by these facilities. For the SLS beam lines industrial use is facilitated by the SLS Technology Transfer AG. If you are not an expert in a particular technique or you are unsure which technique is best suited for your application(s), please contact us via the email address published on the **SLS TT homepage** <<http://www.psi.ch/sls-techno-trans-ag/sls-techno-trans-ag>> .

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>>

Contact: PSI User Office, Phone: +41-56-310-4666, Email: useroffice@psi.ch