



No. II/12 - 29 June 2012

# PSI photon, neutron and muon user facilities newsletter

## Editorial



Elvezio Morenzoni

Dear colleagues,

The now closed second proposal round has confirmed that the Swiss Muon Source ( $S\mu S$ ) continues to be an intensively requested facility. Over the past 25 years  $S\mu S$  evolved from a small group of experiments designed and run by a relatively small community of engaged and interested scientists to a user facility with more than 200 proposals per year, several hundreds of users and six instruments. Probably, as a consequence of this continuous transition we did not celebrate  $S\mu S$  anniversaries as it should be done and is customary to do. Nevertheless, I think we can look back with satisfaction and proudness to what all the people involved in  $\mu SR$  have achieved in the past 25 years.

Nowadays,  $S\mu S$  consists of six user friendly instruments allowing to perform experiments in bulk materials, thin films and heterostructures under a wide range of experimental conditions. These instruments are delivering topical results in magnetism, superconductivity and other fields of materials science. Besides its research activities,  $S\mu S$  is characterized by a vigorous development program, which, just to name a few, led to the development of muons on request, low energy  $\mu SR$  or the pioneering use of solid state detectors for  $\mu SR$  spectrometers. In the same spirit substantial progress has been made this year

## New calls for proposals

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

deadline: September 15, 2012

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

deadline: October 15, 2012

### **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>>

### **$S\mu S$ /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>> .

towards the new high-field, low-temperature instrument. This novel instrument will essentially contribute to maintain PSI as a leading center in  $\mu$ SR science. Moreover, recent studies indicate that the potential of  $\mu$ SR is by far not exhausted at PSI.

In the frame of the strategic planning of PSI, the Laboratory for Muon Spin Spectroscopy and the  $S\mu$ S activities were recently evaluated by an external committee, which was impressed by the strength, level of research and nature of developments and concluded «the Committee looked very hard to find weaknesses but did not find any serious ones». With this, I think we should look optimistically into the future. I would like to thank all the staff at PSI and all the present and past users for their continuous contributions to this success.

Elvezio Morenzoni on behalf of the PSI Laboratory for Muon Spin Spectroscopy - LMU

## Research highlights

### SLS - Spinons and Orbitons: a story about splitting electrons

Error: (1) can't find psi\_15032012\_2070-1.jpg at AU-THOR\_WWW/Info.FN20120630FacilityNewsEN

### Physicists observe the splitting of an electron inside a solid

**J. Schlappa et al, Nature Advance Online Publication, 18.04.2012, DOI: 10.1038/nature10974**

An electron has been observed to decay into two separate parts, each carrying a particular property of the electron: a spinon carrying its spin – the property making the electron behave as a tiny compass needle – and an orbiton carrying its orbital moment – which arises from the electron's motion around the nucleus. These newly created particles, however, cannot leave the material in which

## Upcoming events

### 9th International Workshop on Polarized Neutrons in Condensed Matter Investigations

<<http://www-llb.cea.fr/PNCMI2012>>

July 2-5, 2012, Paris, France

### NSS7: 7th International Workshop on Nano-scale Spectroscopy and Nanotechnology

<<http://indico.psi.ch/conferenceDisplay.py?confid=1381>>

July 2-6, 2012, ETH Zurich and Paul Scherrer Institut, Switzerland

### SRI 2012 satellite workshop: X-Ray Detectors for Synchrotron Applications

<<http://indico.psi.ch/event/sride-tector>>

July 5-7, 2012, Zurich, Switzerland

### 11th International Conference on Synchrotron Radiation Instrumentation

<<http://www.lepublicsystemepco.com/events.php?IDManif=661&IDModule=71%20&IDRub=208>>

July 9-13, 2012, Lyon, France

### Science at FELs 2012

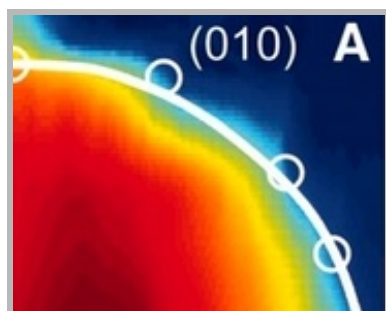
<<http://science-at-fels-2012.desy.de/>>

July 15-18, Hamburg, Germany

they have been produced. This result is reported in a paper published in Nature by an international team of researchers led by experimental physicists from the Paul Scherrer Institut (Switzerland) and theoretical physicists from the IFW Dresden (Germany).

**Read the full story** <<http://www.psi.ch/media/current-news>>

### SINQ - New insights into fundamental magnetism



#### Dipolar Antiferromagnetism and Quantum Criticality in $\text{LiErF}_4$

**C. Kraemer et al, Science 336, 1416 (2012)**

Magnetism has been predicted to occur in systems in

which dipolar interactions dominate exchange. We present neutron scattering, specific heat, and magnetic susceptibility data for  $\text{LiErF}_4$ , establishing it as a model dipolar-coupled antiferromagnet with planar spin-anisotropy and a quantum phase transition in applied field  $H_{\text{cl}} = 4.0 \pm 0.1$  kilo-oersteds. We discovered non-mean-field critical scaling for the classical phase transition at the antiferromagnetic transition temperature that is consistent with the two-dimensional XY/ $h_4$  universality class; in accord with this, the quantum phase transition at  $H_c$  exhibits three-dimensional classical behavior. The effective dimensional reduction may be a consequence of the intrinsic frustrated nature of the dipolar interaction, which strengthens the role of fluctuations.

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

### SμS - Fundamental Science: Approaching a quantum critical point with pressure

**Direct Observation of the Quantum Critical Point in Heavy Fermion  $\text{CeRhSi}_3$**

### 11th PSI summer school on condensed matter research

<<http://www.psi.ch/summer-school>>

August 11-20, 2012, Zug and Villigen, Switzerland

### 6th CIMST Summer School on multiscale Bio-medical Imaging

<[http://www.cimst.ethz.ch/education/summer\\_school/12](http://www.cimst.ethz.ch/education/summer_school/12)>

September 3-14, 2012, Zurich, Switzerland

### 16th Laboratory Course Neutron Scattering

<<http://www.neutronlab.de>>

September 3-14, 2012, Juelich and Garching, Germany

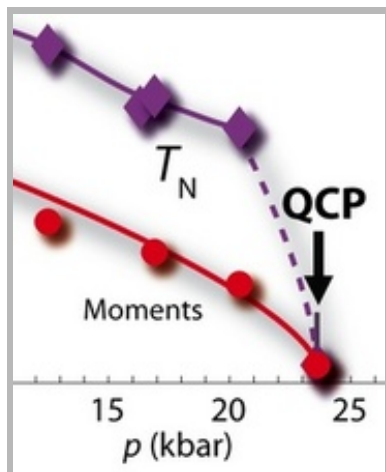
### 10th International Conference on Quasielastic Neutron Scattering and 5th Workshop on Inelastic Neutron Spectrometers

<<http://j-parc.jp/researcher/MatLife/en/meetings/QENS-WIN-S2012/index.html>>

September 30 - October 4, 2012, Nikko Sogo Kaikan, Japan

## Facility news

**SLS: Tomographic nano-**

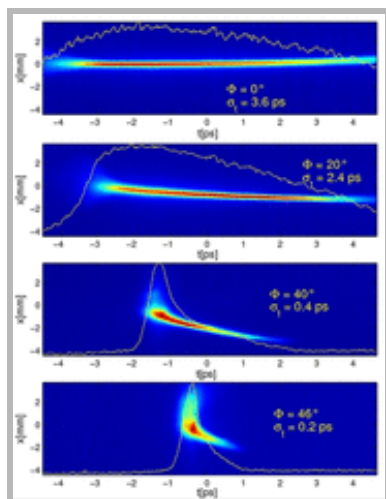


**N. Egetenmeyer et al, Physical Review Letters 108, 177204 (2012)**

We report on muon spin rotation studies of the non-centrosymmetric heavy fermion antiferromagnet  $\text{CeRhSi}_3$ . A drastic and monotonic suppression of the internal fields, at the lowest measured temperature, was

observed upon an increase of external pressure. Our data suggest that the ordered moments are gradually quenched with increasing pressure, in a manner different from the pressure dependence of the Neel temperature. At 23.6 kbar, the ordered magnetic moments are fully suppressed via a second-order phase transition, and  $T_N$  is zero. Thus, we directly observed the quantum critical point at 23.6 kbar hidden inside the superconducting phase of  $\text{CeRhSi}_3$ .

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



## Progress at the SwissFEL Injector

From 2011 to 2012 major progress was made at the SwissFEL Injector test facility. The installation of the magnetic bunch compression chicane was completed in July 2011. The following months were dedicated to

the consolidation of the S-band RF system, the integration of the longitudinal diagnostics at the bunch compressor and the amelioration of the stability of the photo-cathode laser system.

In early April 2012 beam development studies started again, for the first time with all RF accelerating cavities in

## imaging towards 10 nm resolution

OMNY (tOMography Nano crYo stage) is an ongoing instrumentation project at the SLS implementing an end-station for tomographic nano-imaging at 10 nm resolution in 3D using ptychography. A test-setup operating at room temperature and atmospheric pressure has been built and first measurements demonstrate a resolution of 8 nm in 2D and  $\sim 50$  nm in 3D (limited by sample issues). This test setup is now in user operation at the cSAXS beamline. The next OMNY version will be implemented in UHV and samples will be protected from radiation damage by cryogenic cooling to allow imaging of radiation sensitive materials, such as biological specimens.

## SINQ: Soft matter studies

Studies on soft matter systems require experimental conditions that are different from those typically applied to hard-matter samples (ultra-low temperatures, high magnetic fields and pressures). A new rheometer for studies of complex viscosities of fluids is the latest ad-

operation at the same time. The nominal beam energy of 250 MeV was reached for the first time on April 11. Within a couple of weeks of operation at the SwissFEL nominal charge of 200 pC it was possible to demonstrate transverse beam quality fulfilling the FEL requirements for uncompressed beam thus reaching an important milestone. The smallest measured values for projected and slice emittance at the beam core are 0.37 and 0.25 mm mrad, respectively.

The first compression experiments using the bunch compression chicane resulted in a compression factor of 18 corresponding to a reduction of the rms bunch length from 3.6 to 0.2 ps. To achieve the nominal bunch parameters after compression a harmonic (X-band) RF cavity is foreseen to be installed upstream of the bunch compressor later in 2012. This additional cavity will compensate the electron bunch curvature in longitudinal phase space introduced by the RF non-linearity in the preceding accelerating cavities. This system will be the last key component required to complete the SwissFEL Injector test facility.

dition at SINQ and will be available for user experiments on the small-angle scattering instruments.

### **µS: Permanent installation of DOLLY in the new PiE1 area**

A major reconstruction and enlargement of the PiE1 area has recently been started to accommodate a permanent installation of the DOLLY spectrometer and a particle physics experiment at the same time. The modified beam line will allow to send the muons to either of the two instruments. Besides the obvious advantages of a permanent installation for the instrument performance this will drastically reduce the setup times and therefore increase the number of available experimental days to be distributed to the µSR user community. Commissioning of the new setup is envisaged for autumn 2012.

### **SwissFEL: Establishment of European free-electron laser collaboration**

On May 31, 2012 ten European research centres, including PSI agreed on a long-term close collabora-

tion in the field of free-electron lasers and accelerator-based short-pulse sources. With combined efforts, the technologies and methods will be further developed and implemented for operation and use of these novel research facilities, thus creating a unique top level research infrastructure for science in Europe, offering optimal experimental conditions for a wide range of applications. On May 31 in the margins of the ERF workshop «Socio-economic Relevance of Research Infrastructures», this collaboration agreement was signed at DESY by representatives of all institutes.

## Current Openings

### **Job opportunities at PSI**

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

## Announcements

### **PSI-FELLOW/COFUND – International Fellowship Program for Postdocs at Paul Scherrer Institut**

The new EU co-financed funding program PSI-FELLOW addresses international postdocs and offers these researchers the opportunity to perform their innovative scientific project in one of the four at-

tractive scientific fields tackled at PSI: i) materials and matter, ii) life-sciences, iii) energy and environment and iv) accelerator technologies. The application has to be made together with a senior scientist at PSI, who will act as the fellow's mentor. The list of mentors and themes is published on:

<http://www.psi.ch/psi-fellow/list-of-mentors-and-themes> <<http://www.psi.ch/psi-fellow/list-of-mentors-and-themes>> . The collaboration with the mentor guarantees the feasibility of the project with regard to available resources and instrumentation. Project proposal together with CV and two reference letters has to be submitted not later than by **August 6, 2012** via the **PSI-Job-Portal** <<http://www.psi.ch/pa/offenstellen/>> . Please find more details on the **PSI-FELLOW webpage** <<http://www.psi.ch/psi-fellow/psi-fellow>> .

### BioStruct-X Access Program at SLS

A new EU access program for Macromolecular Crystallography, Small Angle X-ray Scattering and X-ray Imaging has been launched by September 2011: **BioStruct-X** <<http://www.biostruct-x.eu>> aims to financially support transnational users of synchrotron radiation techniques with research projects regarding the determination of structures of biological macromolecules and cellular and subcellular ultra structures. At the Swiss Light Source, the beamlines involved in this programme are PX-I (X06SA), PX-II (X10SA) and PX-III (X06DA).

The project operates a central Block Allocation Group (BAG) proposal mechanism and applications for financial support need to have been made prior to requests for facility access. Proposals can be submitted via the **Biostruct-X web portal** <<http://www.biostruct-x.eu/content/apply-funding>> . The evaluation of proposals will be carried out electronically and is expected to take less than one month (30 days) following each application deadline. Guidelines and further information can be found **here** <<http://www.biostruct-x.eu/content/application-guidelines-0>> .

### PSI Scientific Report 2011

The PSI scientific annual report 2011 has recently been published and is available now either as printed or online version. Please download or order your copy **here** <<http://www.psi.ch/info/info>> !

### 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](mailto:useroffice@psi.ch)