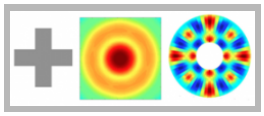
No. I/11 - 31 March 2011

PSI photon, neutron and muon user facilities newsletter

Editorial

Rafael Abela

Dear colleagues,
An important milestone for the realization of the new SwissFEL facility was reached on the 24th of August 2010, when the core of the new facility, the 250 MeV injector, was set into operation at the Paul Scherrer Institute. This part will be used to develop and test new schemes in accelerator physics as well as diagnostics and undulators. The SwissFEL facility is expected to start user operation in 2017. It is already evident that the experiments performed at FLASH (Hamburg) and LCLS (Stanford) will enable discoveries in many areas of current research that cannot be obtained using existing methods.
For this reason the SwissFEL Photonics Group is now developing novel measurement methods for use with the X-ray free electron laser. These include a) a demonstration of ultrafast initiation of chemical reactions using high-energy pulses of terahertz radiation – for future THz pump / XFEL probe experiments, and b) exploiting correlated scattering to determine the structure of biomolecules in solution. Regarding project b), the Figure shows the simulated average scattering (central panel) and the cross-correlation scattering (right-hand panel) from randomly oriented 4-fold symmetric structures (left-hand panel). A robust method is being developed to extract the structure from the measured cross-correlation.



simulated scattering

New calls for proposals

SLS: PX-beamlines
deadline: June 15, 2011
non-PX beamlines
deadline: September 15, 2011
more information
<http://www.psi.ch/sls/calls>

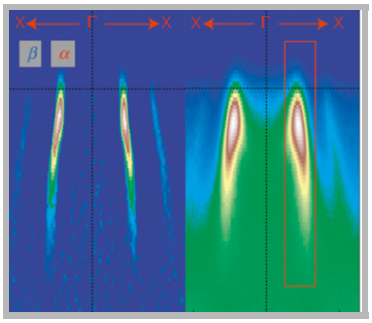
SINQ/all instruments
deadline: May 15, 2011.
more information <http://sinq.web.psi.ch/sinq/sinq_call.html>

SμS/instruments GPS, LTF, and GPD
deadline: June 2011
More information
<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> **.**

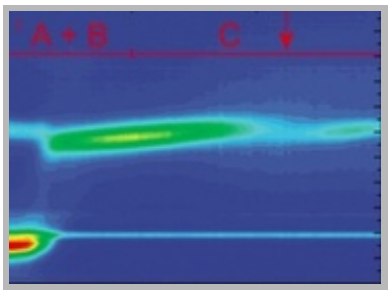
Rafael Abela on behalf of the PSI SwissFEL team

Research highlights



SLS/LMN: Observation of a ubiquitous three-dimensional superconducting gap function in optimally doped $Ba_{0.6}K_{0.4}Fe_2As_2$
Y-M. Xu et al, Nature Physics 7, 198 (2011)

The iron-pnictide superconductors have a layered structure formed by stacks of FeAs planes from which the superconductivity originates. Given the multiband and quasi three-dimensional[1] (3D) electronic structure of these high-temperature superconductors, knowledge of the quasi-3D superconducting (SC) gap is essential for understanding the superconducting mechanism. By using the k_z capability of angle-resolved photoemission, we completely determined the SC gap on all five Fermi surfaces (FSs) in three dimensions on $Ba_{0.6}K_{0.4}Fe_2As_2$ samples. **Read the full story** <http://www.psi.ch/sls/scientific-highlights>



SINQ: Tuning the Structure and the Magnetic Properties of Metallo-supramolecular Polyelectrolyte–Amphiphile Complexes
G. Schwarz et al, Journal of the American Chemical Society 133, 547 (2011)

Self-assembly of Fe2+ ions and the rigid ditopic ligand 1,4-bis(2,2′:6′,2′′-terpyridin-4′-yl)benzene results in metallo-supramolecular coordination polyelectrolytes (MEPE). Sequential self-assembly of MEPE and dialkyl phosphoric acid esters of varying chain length via electrostatic inter-

Upcoming events

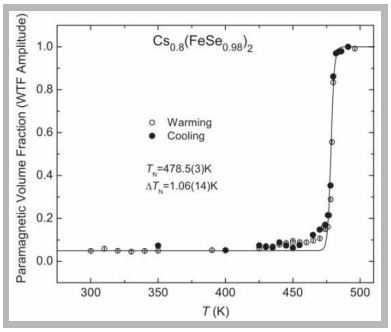
18-21 April 2011, Advances in X-ray Free-Electron Lasers: Radiation Schemes, X-ray Optics and Instrumentation" part of the SPIE 2011 Optics and Optoelectronics Symposium, Prague, Czech Republic. **More information** <http://spie.org//app/program/index.cfm?fuseaction=conferencedetail&export_id=x25149&ID=x25082&redir=x25082.

13-22 August 2011, 10th PSI summer school on condensed matter research: phase transitions
Zug, Switzerland. Early registration is open. **More information** <http://indico.psi.ch/conferenceDisplay.py?confId=258>

15-16 September 2011, 2nd Joint Users' Meeting at PSI: JUM@P'11
PSI Villigen, Switzerland. Registration is open. **More information** <http://indico.psi.ch/event/jump11>

Please have a look at the full conference calendar <http://www.psi.ch/useroffice/conference-calendar>

actions leads to the corresponding polyelectrolyte–amphiphile complexes (PAC), which have liquid–crystalline properties. The PACs have a stratified architecture where the MEPE is embedded in between the amphiphile layers. Upon heating above room temperature, the PACs show either a reversible or an irreversible spin-crossover (SCO) in a temperature range from 360 to 460 K depending on the architecture of the amphiphilic matrix. As the number of amphiphiles per metal ion is increased in the sequence 1:2, 1:4, and 1:6, the temperature of the SCO is shifted to higher values whereas the amphiphile chain length does not have a significant impact on the SCO temperature. In summary, we describe in this article how the structure and the magnetic response function of PACs can be tailored through the design of the ligand and the composition. To investigate the structure and the magnetic behavior, we use X-ray scattering, X-ray absorption spectroscopy, differential scanning calorimetry, faraday-balance, and superconducting quantum interference measurements in combination with molecular modeling.
Read the full story <http://www.psi.ch/num/2011#schwarz>



SμS: Coexistence of Strong Magnetism and High-Tc Superconductivity in the Iron-Based Compound $Cs_{0.8}(FeSe_{0.98})_2$
Z. Shermadini et al, Physical Review Letters 106, 117602 (2011)

Muon-spin rotation and relaxation (μSR), electrical resistivity, magnetization and differential scanning calorimetry measurements performed on a high-quality single crystal of $Cs_{0.8}(FeSe_{0.98})_2$ are reported. Whereas the transport and magnetization data confirm the bulk character of the superconducting state below T_c=29.6(2) K, the μSR data indicate that the system is magnetic below T_N=478.5(3) K, where a first-order transition occurs. The first-order character of the magnetic transition is confirmed by differential scanning calorimetry data. Taken all together, these

Facility news

SLS: Materials science beamline upgrade
The MS beamline actually undergoes a comprehensive upgrade. In addition to providing fundamental improvements to both powder and SXRD experiments, the upgrade should allow new experimental setups previously excluded to the beamline. The beamline should be ready for user operation beginning 2012.

SINQ: New option on AMOR reflectometer
The SELENE option on the reflectometer AMOR passed its first test with an exchangeable elliptical guide, allowing measurements on small samples, in the time-of-flight mode, to be improved by approximately one order of magnitude.
More information: Nucl Instr Meth A 634, S12 (2011) <http://dx.doi.org/10.1016/j.nima.2010.06.221> .

SμS: Successful test of the new high field magnet
In February 2011 the 9.5 Tesla superconducting magnet for the new high field spectrometer has been delivered and successfully tested at

data indicate in $Cs_{0.8}(FeSe_{0.98})_2$ a microscopic coexistence between the superconducting phase and a strong magnetic phase. The observed TN is the highest reported to date for a magnetic superconductor.
Read the full story <http://www.psi.ch/num/2011#shermadini>

PSI Summer School on Condensed Matter Research

The theme for this year's summer school (August 13-19) is dedicated to probing phase transitions using photons, muons and neutrons. Phase transitions are not only a well known fact of everyday life, but also an important field of current research and of technological applications. In this summer school more than 20 world-class experts will introduce the different aspects of phase transitions from an experimental and theoretical point of view. Following the school a practical training is offered at PSI (August 20-22). It will allow a limited number of participants to get hands-on experience with state-of-the-art instrumentation using photons, neutrons and muons. More details: **PSI Summer School 2011** <http://indico.psi.ch/event/psi-summer-school-2011> .

PSI. This constitutes a key milestone in the completion of the high priority project of the µSR facility. In addition, all essential parts of the spectrometer are currently under construction.

New low temperature capabilities at Dolly

Recently, first µSR experiments have been performed at Dolly down to 300 mK by using a ^{3}He (Heliox) stick inserted in the existing ^{4}He Variox cryostat. Furthermore first cryogenic tests have been done with a dilution fridge (Kelvinox) insert which in the future will allow to perform µSR measurements at temperatures down to 50 mK at Dolly.

Current Openings

Job opportunities at PSI
<http://www.psi.ch/en/pa/offen-estellen/>

Announcements

First operation of the ultracold neutron source at the Paul Scherrer Institute

In December 2010 the UCN source team has demonstrated excellent functioning of all major subsystems of the new facility. Ultracold neutrons have been produced for the first time from this source and under full load. The performance was as expected under operational conditions. The source was

operated with the aim and duty to demonstrate the principle functioning of all major subsystems. **More information.** <http://www.psi.ch/num/NewsArchive2010EN/First_UCN_final_KK.pdf>

Proprietary research

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

Joint Users' Meeting at PSI: JUM@P'11

The next users' meeting from the **JUM@P** series will be organized at PSI on **September 15-16, 2011**. The meeting will consist of a plenary session with keynote and invited lectures as well as information about PSI and its user facilities on the first day. The second day is reserved for topical parallel workshops of a half or one day duration. Poster sessions, a tour of the PSI user facilities and the award of the second **PSI thesis medal** <http://indico.psi.ch/internalPage.py?pageId=0&confId=42> accomplish the program. Registration and call for abstracts is open now. **More information** <http://indico.psi.ch/event/jump11>

Facility publications

More than 600 publications appeared during the year 2010 based on experiments performed at SLS, SINQ and SμS! We congratulate all our users on this outstanding performance. To keep track of the publications we urgently ask you to register each publication in the **DUO system** <https://duo.psi.ch/duo/publications> and to link them to the respective beamlines and instruments.

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**