PAUL SCHERRER INSTITUT

PSI facilities newsletter

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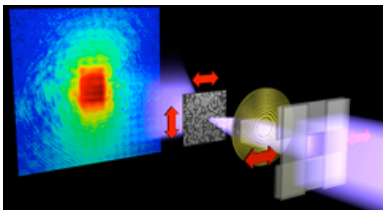
Announcement

2013 PSI Summer School on Condensed Matter Research - August 17-23 / Lyceum Alpinum, Zuoz, Switzerland

This year, the Condensed Matter Research summer school is dedicated to one of the main topics addressed at large-scale synchrotron, neutron and muon user facilities: materials structure and magnetism. Following the school, a practical training is offered at PSI (August 24-26). The number of participants is limited, but the training will provide hands-on experience with each of the state-of-the-art user facilities. http://www.psi.ch/summerschool

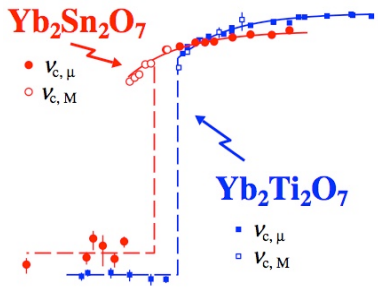
Research highlights



Imaging fluctuations with X-ray microscopy

Pierre Thibault, Andreas Menzel, Nature, 7. February 2013 DOI: 10.1038/nature11806

X-rays allow an inside look at structures that cannot be imaged using visible light. They are used to investigate nanoscale structures of objects as varied as single cells or magnetic storage media. Yet, high-resolution images impose extreme constraints on both the X ray microscope and the samples under investigation. Researchers at the Technische Universität München, Germany, and the Paul Scherrer Institut in Villigen, Switzerland, now showed how to relax these conditions without loss of image quality. They further showed how to image objects featuring fast fluctuations, such as the rapid switching events that determine the lifetime of data storage in magnetic materials. They demonstrated their method with an experiment at the Swiss synchrotron SLS and with computer simulations. The results have been published in the science journal Nature. http://www.psi.ch/sls/scientific-highlights.



Dynamical Splayed Ferromagnetic Ground State in the Quantum Spin Ice $Yb_2Sn_2O_7$

A. Yaouanc et al, Physical Review Letters 110, 127207 (2013)

From magnetic, specific heat, 170Yb Mössbauer effect, neutron diffraction, and muon spin relaxation measurements on poly-crystalline $Yb_2Sn_2O_7$, we show that below the first order transition at 0.15 K all of the Yb^{3+} ions are long-range magnetically ordered and each has a moment of 1.1μB which lies at ≈ 10° to a common fourfold cubic axis. The four sublattice moments have four different directions away from this axis and are therefore noncoplanar. We term this arrangement splayed ferromagnetism. This ground state has a dynamical component with a fluctuation rate in the megahertz range. The net ferromagnetic exchange interaction has an anisotropy that favors the local threefold axis. We discuss our results in terms of the phase diagram proposed by Savary and Balents [Phys. Rev. Lett. **108**, 037202 (2012)] for a pyrochlore lattice of Kramers 1/2 effective spins. http://www.psi.ch/num/2013