

SCHOOL REPORT

School : PSI Summer School on Condensed Matter Research
Specific Title : Materials structure and magnetism
Date : August 17-23, 2013
Venue : Lyceum Alpinum, Zuoz, Switzerland
Organizer Name : Kurt Clausen, Renate Bercher
Affiliation Organizer : Paul Scherrer Institut
Total budget : 62'182 CHF
Max NMI3-II support : 9'500 EUR

Scope

The PSI summer school 2013 was dedicated to some of the main topics addressed at large scale user facilities such as neutron and muon sources or synchrotron photon sources: **Materials structure and magnetism**. International experts and PSI staff members introduced and deepened the participants' knowledge not only about these scientific topics but also about the main methods applied to understand the phenomena, which are presently at the forefront of modern solid state physics and chemistry.

Following the school a practical training was offered at PSI. It allowed a limited number of participants to get hands-on experience with state-of-the-art instrumentation using photons, neutrons, and muons.

Students

See attached list of participants

Organisation

Paul Scherrer Institut
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Results

The international boarding school 'Lyceum Alpinum' in Zuoz, Switzerland hosted the 12th edition of the PSI Condensed Matter Research Summer School entitled 'Materials structure and magnetism' from August 17-23, 2013. As in previous years the school targeted PhD students and postdoctoral scientists without prior knowledge of neutron, muon, and X-ray techniques, but with an interest in learning how these techniques can be used for their different fields of research. This year the structure and the magnetism of materials was in the focus of the school – a topic that is heavily addressed at neutron and muon user facilities during recent years.

On the first day introductory lectures were given by Andrew Boothroyd (Magnetism), Bertram Batlogg (Materials structure and properties), Denis Sheptyakov (Diffraction with neutrons and photons) and Jonathan White (Magnetic structure determination).

Those talks were followed by topical lectures on “Magnetic frustration” and “Ferroelectrics” given by Leon Balents and Dennis Meier, respectively. Bella Lake then introduced “Spectroscopy with neutrons” using the example of magnetic excitations. The complementary presentation on “Spectroscopy with photons” was given by Thorsten Schmitt who introduced the technique of “Resonant Inelastic X-ray Scattering – RIXS” to the participants.

The next day was mainly used to present the technique of muon spin spectroscopy. Alex Amato and Elvezio Morenzoni introduced μ -SR methods and showed how the technique can be applied to both bulk and surface phenomena, respectively. Hugo Dil then closed the afternoon session with his lecture on “Angle resolved photoemission spectroscopy” and applications like electronic band structures.

Wednesday is the classical excursion day of the PSI summer school. The students enjoyed the free morning and early afternoon by various optional leisure activities such as guided hiking tours in the nearby mountains of the marvellous Engadin valley.

After gathering again the topic of “Heterostructures” was taken on by Phil Willmott. He also covered the subject of interfaces, which was later on discussed in the framework of magnetic phenomena at interfaces by Pietro Gambardella. Further topical lectures have been presented during the evening sessions: Predicting magnetic structures (Ole Krogh Andersen), Multiferroics (Thom Palstra), Magnetic semiconductors (Tomas Jungwirth) and finally a lecture on Topological insulators was given by Jürg Osterwalder.

On Thursday Carlos Fernandes Vaz presented the technique of “Imaging with neutrons and photons” in the framework of magnetic domains. Bruce Patterson looked a bit into future and gave an insight into possible ultrafast structural and magnetic studies at the new PSI SwissFEL X-ray free electron laser facility. Novel routes that might be able to manipulate magnetic and crystal structures were presented by Urs Staub before Sebastian Mühlbauer talked finally about the exotic physics of “Skyrmions”.

The school was closed on Friday before lunch by a presentation of Colin Carlile about new scientific opportunities at the European Spallation Neutron Source ESS.

In a poster session the participants were asked to present their own scientific work. That gave rise to lively scientific discussions among the students and with the lecturers. Finally, 21 participants were actively involved in the practical training at PSI during the ensuing weekend. In small groups of three people the students could use the opportunity to do basic experiments together with their tutors on the following instruments: MS-Powder, SIM, PolLux (all SLS), RITA-II, AMOR, DMC (all SINQ) and GPD ($S\mu$ S).

The NMI3 support was entirely used to directly cover the school fee for totally 12 students. Those fellows were selected by a small selection committee based on their application documents (CV, publication list, recommendation letter etc).

The school was attended by totally 101 participants (73 students and postdocs) from 17 different countries (19 females). More than half of the participants were affiliated with Swiss institutions; the rest came from Germany (19), Denmark (5), UK (5) and 13 other countries. The program is still available on the school’s webpage: <http://www.psi.ch/summerschool>