VA 4 Instruments for neutrons

Time: Monday 14:40–17:40 Room: HSZ 101

VA 4.1 Mon 14:40 HSZ 101

Implementation of the Munich Spm at Nepomuc — •Christian Piochacz[1], Gottfried Kögel[2], Werner Egger[2], Peter Sperr[2], Werner Triftshäuser[2], and Günther Dollinger[2] — [1]TU München, ZWE FRM-II, Lichtenbergstr. 1, 85747 Garching — [2]UniBw München, LRT/2, Werner-Heisenberg-Weg 39, 85577 Neubiberg

The Munich scanning positron microscope (Spm) permits positron lifetime measurements with a lateral resolution down to 2 μm. A limit in using the SPM was set by the long measurement times of several days per picture due to the low intensity positron beam produced by standard ^{22}Na source. This disadvantage will be overcome by installing the Spm at the high intensive positron beam facility Nepomuc at the research reactor FRM-II in Garching. Thus the time for one measurement will be shorten by a factor 60 and the lateral resolution will improve to about 100 nm.
Because of the beam characteristic of the Nepomuc source an interface is needed, which enhances the phase space density of the beam. The requirements, which have to be fulfilled by the interface, will be pointed out and an overview of the different components (bunching units, remoderation stage and rf-elevator) will be given.

VA 4.2 Mon 15:00 HSZ 101

MIRA - A flexible instrument for long wave length neutrons — •Robert Georgii[1], Sebastian Mühlbauer[2], and Peter Böni[2] — [1]ZWE FRM-II, TUM, Lichtenbergstr.1, 85747 Garching — [2]E21, Physikdepartment, TUM, James-Frankstr., 85747 Garching

MIRA, the beam line for very cold neutrons at the FRM-II provides a beam of cold neutrons ($7\AA < \lambda < 30\AA$). The instrument has several different operation modes. Currently it can be used as a reflectometer and as a SANS machine. Both modes can be combined with a spin echo-option or a full 3D-polarisation analysis. Magnetic fields up to 10 Tesla and temperatures in the range of mK to 2000 K can be provided using the FRM-II standard sample environment. The instrument is furthermore ideally suited as a testing platform for new experimental set-ups as it is constructed in a modular way allowing for quick configuration changes. Here the instrument and its sample environment together with selected measurements showing the use of the different modes of operation will be presented.

VA 4.3 Mon 15:20 HSZ 101

Horizontal ToF-Reflectometer REFSANS at FRM-II: Potential and First Results — •Reinhard Kampmann[1], Martin Haese-Seiller[1], Valery Kudryashov[1], Bert Nickel[2], Christian Daniel[3], Wilhelm Fenzl[3], Kirstin Seidel[2], Andreas Schreyer[1], Erich Sackmann[3], and Joachim Rädler[2] — [1]Institut für Werkstoffforschung, GKSS-Forschungszentrum Geesthacht GmbH, D-21502 Geesthacht, Germany — [2]Lehrstuhl für Experimentelle Physik/Biophysik, Sektion Physik, Ludwig-Maximilians-Universität, Geschwister-Scholl Platz 1, D-80539 München, Germany — [3]Physik-Department E22, Technical University Munich, 85748 Garching, Germany

The reflectometer REFSANS allows the performce of comprehensive analyses of vertical and lateral surface and interface structures by means of specular and off-specular neutron reflectivity as well as small-angle neutron scattering at grazing incidence (GISANS). All measurements can be performed on air-water interfaces with horizontally aligned samples. This is achieved by a novel ToF- and neutron optical design of the instrument that allows settings of very different scattering geometries and resolutions. The performance of REFSANS will be discussed with relation to the minimum specular reflectivity achievable both for a strongly and a weekly incoherently scattering substrate. Furthermore, the potential of REFSANS for the investigation of laterally structured surfaces by means of GISANS is presented. REFSANS can optionally be operated with polarized neutrons including polarization analysis (3He-filter) from autumn 2006.

VA 4.4 Mon 15:40 HSZ 101

PANDA - first results from the cold three axes spectrometer at FRM-II — •Astrid Schneidewind[1], Peter Link[2], and Michael Loewenhaupt[1] — [1]TU Dresden, Inst. f. Festkörperphysik, 01062 Dresden — [2]TU München, FRM-II, Lichtenbergstr. 1, 85747 Garching

We report about the commissioning and first experimental results of the cold neutron three axes spectrometer PANDA at the new research reactor FRM-II. The obtained data are within our expectations with respect to resolution and intensity from previously reported simulations confirming the design concept of PANDA.

VA 4.5 Mon 16:00 HSZ 101

New facilities of the JCNS for ultra-high resolution neutron spectroscopy — •Michael Monkenbusch, Olaf Holderer, Michael Ohl, Ralf Biehl, and Dieter Richter — IFF, Forschungszentrum Juelich, D-52425 Juelich

The Jülich Centre of Neutron Science (JCNS) will in the near future supply two neutron spin-echo spectromteres to the user community. These ultra-high resolution spectrometers will be located at the new FRMII reactor and at the new MW-spallation source in Oak-Ridge. The FRMII instrument is an enhanced version of the FRJ2-NSE which is in operation at the FRJ2-DIDO reactor since 1996. With new electronics, improved correction elements and adjustment degrees of freedom it will benefit from increased flux and better neutron extraction allowing the usage of neutrons from 4.5Å to $\simeq$ 16Å or longer if the intensity is sufficient. The flux gain on the sample due to reactor power and larger beam cross section will be in the range of a factor of 10. With a maximum field integral of 0.5Tm Fourier times beyond 200ns will be accessible at 13Å wavelength. The scattering angle range extends from 2^0 to 90^0. It is planned that the instrument will be operational at the FRMII end of 2006. With a somewhat longer time horizon we are constructing a NSE instrument at the SNS spallation source in Oak Ridge. Using short fully compensated superconducting main solenoids it allows for a magnetically shielded enclosure necessary for stable and undisturbed operation. The design field integral is 1.5Tm, using a broad band of incoming neutrons a dynamical range of 1:10^6 will be achieved and a maximum Fourier time at 18Å is one of the design goals.

VA 4.6 Mon 16:20 HSZ 101

The new V12a diffractometer at HMI and neutron computerized tomography — •Markus Strobl[1,2], Wolfgang Treimer[1,2], and André Hilger[1,2] — [1]Hahn Meitner Institut, Glienickerstr. 100 14109 Berlin — [2]University of Applied Sciences (TFH) Luxemburger Str. 10 13353 Berlin

Double crystal diffractometers (DCD) are widely used for structural investigations at the limit between macroscopic and microscopic inner structures of sample materials. Operating in an ultra small angle neutron scattering (USANS) q-range between 10ˆ(-4) nmˆ(-1) and 10ˆ(-1) nmˆ(-1) structures between 50 nm and nearly 100 micrometer can be resolved. Hence the DCD connects the resolvable ranges of small angle neutron scattering (SANS) instruments and neutron tomography facilities. However, the DCD does not only link the resolvable size ranges but can also be operated to yield both, q-space information on microscopic structures combined with real space information in the range of macroscopic inner structures. This method was developed in recent years at the V12 DCD at HMI by introducing refraction and USANS contrast for tomography. The new V12 DCD set-up has now been optimised to exploit all the opportunities of USANS measurements, refraction and USANS contrast tomography and conventional attenuation contrast tomography with an intense monochromatic neutron beam. The new contrast methods will be introduced as well as the final set-up of the V12 instrument. Additionally several examples and results achieved by the new techniques and instrument will be given.

VA 4.7 Mon 16:40 HSZ 101

The new cold neutron radiography and tomography instrument CONRAD at HMI Berlin — •Nikolay Kardjilov[1], André Hilger[1,2], Ingo Manke[1], Markus Strobl[1,2], Wolfgang Treimer[1,2], and John Banhart[1] — [1]Hahn-Meitner-Institut Berlin — [2]University of Applied Sciences Berlin (TFH), FB II

The new cold neutron radiography instrument CONRAD is a multifunctional facility for radiography and tomography with cold neutrons at Hahn-Meitner-Institut Berlin. It is located at the end of a curved neutron guide, which faces the cold neutron source of the BER-II research reactor. The geometry provides a cold neutron beam with wavelengths between 0.2 nm and 1.2 nm. Two measuring positions are available for radiography and tomography investigations. The first one is placed at the end of the guide and it is optimized for in-situ experiments in which a high neutron flux is required. The available flux at this position is app. 10ˆ9 cmˆ-2sˆ-1. The second measuring position uses a pin-hole geometry which allows better beam collimation (L/D up to 500) and higher image resolution in the range of 200 microns in the CCD based detector system (15 x 15 cmˆ2). The use of cold neutrons for radiography purposes increases the image contrast and improves the sensibility for e.g. the detection of small amounts of water and hydrogen containing materials in metal matrixes. On the other hand the cold neutron beam can be modified easily by using diffraction and neutron optical techniques. This enables to perform radiography and tomography experiments with more sophisticated measuring techniques. Recent examples of research and industrial applications will be presented.

VA 4.8 Mon 17:00 HSZ 101

A double monochromator device for the CONRAD radiography instrument at HMI and applications — •Markus Strobl[1,2], Nikolay Kardjilov[1], André Hilger[1,2], Wolfgang Treimer[1,2], and Ingo Manke[1] — [1]Hahn Meitner Institut Glienickerstr 100 14109 Berlin — [2]Univerity of Applied Sciences (TFH) Luxemburger Str. 10 , 13353 Berlin

CONRAD is the new cold neutron radiography and tomography instrument at the Hahn Meitner Institute in Berlin which recently started operation as a part of the Berlin Neutron Scattering Centre (BENSC). It includes two measurement positions of which the first one directly at the end of the NL1b neutron guide was used to install a flexible monochromator device as an additionally available insert. While the CONRAD instrument uses in standard operation the full cold spectrum of the lower part of the guide a first PCG[002] monochromator with a mosaic spread of app. 1 degree is placed in the upper beam part deflecting neutrons downwards. The initial lower beam part is blocked by a shutter and on a linear manipulation table behind it the second corresponding graphite crystal is installed. Hence, while both crystals can be rotated to chosen Bagg angles, the second one can be positioned in along the original beam direction in order to reflect the monochromatic beam from the first crystal into the initial beam path of the CONRAD instrument. This construction enables to choose a monochromatic beam with wavelengths between 0.25 nm and 0.65 nm for high resolution imaging at the second measurement position of CONRAD app. 5 m downstream. Applications are ranging from energy selective radiography to stress mapping.

VA 4.9 Mon 17:20 HSZ 101

Strain mapping by energy selective neutron radiography — •Nikolay Kardjilov[1], André Hilger[1,2], Ingo Manke[1], Markus Strobl[1,2], Wolfgang Treimer[1,2], and John Banhart[1] — [1]Hahn Meitner Institut Glienickerstr. 100, 14109 Berlin — [2]University of Applied Sciences (TFH) Luxemburger Str. 10, 13353 Berlin

The neutron attenuation coefficient is resulting from different interactions of neutrons with matter. It can be divided into absorption, scattering and diffraction effects attenuating a neutron beam. While all of them are energy dependent especially the diffraction at crystalline and polycrystalline materials has a significant influence on the energy dependence of the attenuation coefficient by introducing so called Bragg-edges to the spectrum of the coefficient. Hence the spectroscopic analyses of the attenuation of a neutron beam passing a polycrystalline sample can identify and quantify crystalline phases, determine applied and residual stresses or the orientation distribution of crystallites. Inserting an energy selecting double monochromator device in the cold neutron radiography instrument (CONRAD) at HMI Berlin enables two dimensional mapping of these spectra on sample sizes up to at least 10 x 10 cmˆ2 with high spatial resolution. The device accesses a spectrum between 1.94 meV and 15.5 meV including e.g. Fe, Cu and Al Bragg edges. The first results of strain mapping obtained at the neutron radiography instrument CONRAD at HMI using its new energy-selective option will be presented.