TT 17: Matter at Low Temperature: Measuring Devices, Cryotechnique

Time: Tuesday 14:00–15:00 Location: H 2053

TT 17.1 Tue 14:00 H 2053

First Results of the Resonant Inelastic X-Ray Scattering Station at the ADRESS Beamline at the Swiss Light Source — •Thorsten Schmitt[1], Vladimir Strocov[1], Giacomo Ghiringhelli[2], Andrea Piazzalunga[2], Xiaoqiang Wang[3], Justina Schlappa[1], Claudia Dallera[2], Lucio Braicovich[2], Marco Grioni[3], and Luc Patthey[1] — [1]Swiss Light Source, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland — [2]Politecnico di Milano, Italy — [3]EPFL Lausanne, Switzerland

Resonant inelastic X-ray scattering (RIXS) is a powerful bulk-sensitive probe of the electronic structure of condensed matter with atomic and orbital sensitivity. It is an unique tool for determining the energy and symmetry of charge neutral electronic excitations (e.g. crystal field or spin-flip excitations) in strongly correlated materials. The ADvanced RESonant Spectroscopies (ADRESS) beamline at the Swiss Light Source (SLS) features advanced instrumentation for RIXS. This year it will be complemented by instrumentation for Angle-Resolved Photoelectron Spectroscopy. The RIXS station is equipped with a spectrometer (resolving power $\approx$ 12000 for 1 keV) so-called SAXES (Super Advanced X-ray Emission Spectrograph) based on a variable line spacing spherical grating. The RIXS station is open since spring 2007 and was undergoing the operation tests during the 2nd half of 2007. We report on first results obtained with RIXS on transition metal monoxides (NiO, MnO and CuO) as reference compounds. These results demonstrate the capability of this set-up for RIXS studies on strongly correlated materials with unprecedented ultra-high resolution.

TT 17.2 Tue 14:15 H 2053

Practical SQUID-based noise thermometers for millikelvin temperatures — •Jörn Beyer, Dietmar Drung, Alexander Kirste, and Jost Engert — PTB, Berlin, Germany

We are developing SQUID-based noise thermometers aiming at compact and easy-to-use, linear and fast noise thermometers to cover the temperature range of dilution refrigerators, i.e., from about 10mK to 4K. The two types of thermometers we investigate are the Magnetic Field Fluctuation Thermometer (MFFT) and the Current Sensing Noise Thermometer (CSNT). In both the MFFT and the CSNT the thermally induced motion of charges in a metallic temperature sensor causes thermal magnetic flux noise detected by a SQUID sensor. The temperature of the metal is extracted from the thermal noise signal via the Nyquist theorem. In our MFFT and CSNT implementations the metal temperature sensor and the SQUID sensor are placed at the same temperature stage. In the case of the MFFT, the temperature sensor is a bulk Copper part and thermal magnetic field fluctuations above its surface are measured inductively by a multiloop SQUID-gradiometer. For the CSNT, the temperature sensor in form of a thin film resistor and a SQUID current sensor to measure the resistor current noise are integrated on a silicon chip. We present a comparison of our MFFT and CSNT configurations in terms of their sensitivity, speed, and linearity. We discuss the design of the temperature sensors and SQUID sensors, thermal anchoring and shielding of external interferences for the MFFT and CSNT. Comparison measurements with the Provisional Low Temperature Scale PLTS-2000 will be presented.

Invited Talk TT 17.3 Tue 14:30 H 2053

The centennial of helium liquefaction - a century of low temperature physics — •Dietrich Einzel — Walther-Meißner-Institut für Tieftemperaturforschung, Garching, Germany

The first liquefaction of helium gas by the Dutch physicist Heike Kamerlingh Onnes 100 years ago meant the dawn of a new discipline: low temperature physics. As we all know, this discipline has developed rapidly since that time and led to many important discoveries of new condensed states of matter (metallic superconductivity, superfluidity of liquid ^{4}He and ^{3}He, BEC in alkali gases etc.), which reside almost exclusively at the cold end of the temperature scale. The centennial discovery of liquid helium provides an occasion to review a few milestones in this development. Besides the pioneering work of Heike Kamerlingh Onnes, the contributions of German low temperature physicists (such as Walther Meißner and Robert Doll) to both the cryotechnical and the fundamental side of low temperature physics are emphasized. Hence you can expect a collection of important historical facts, complemented by some insights into the fascinating effects seen at low and ultralow temperatures.