Data management for the SANS instruments at LAHN

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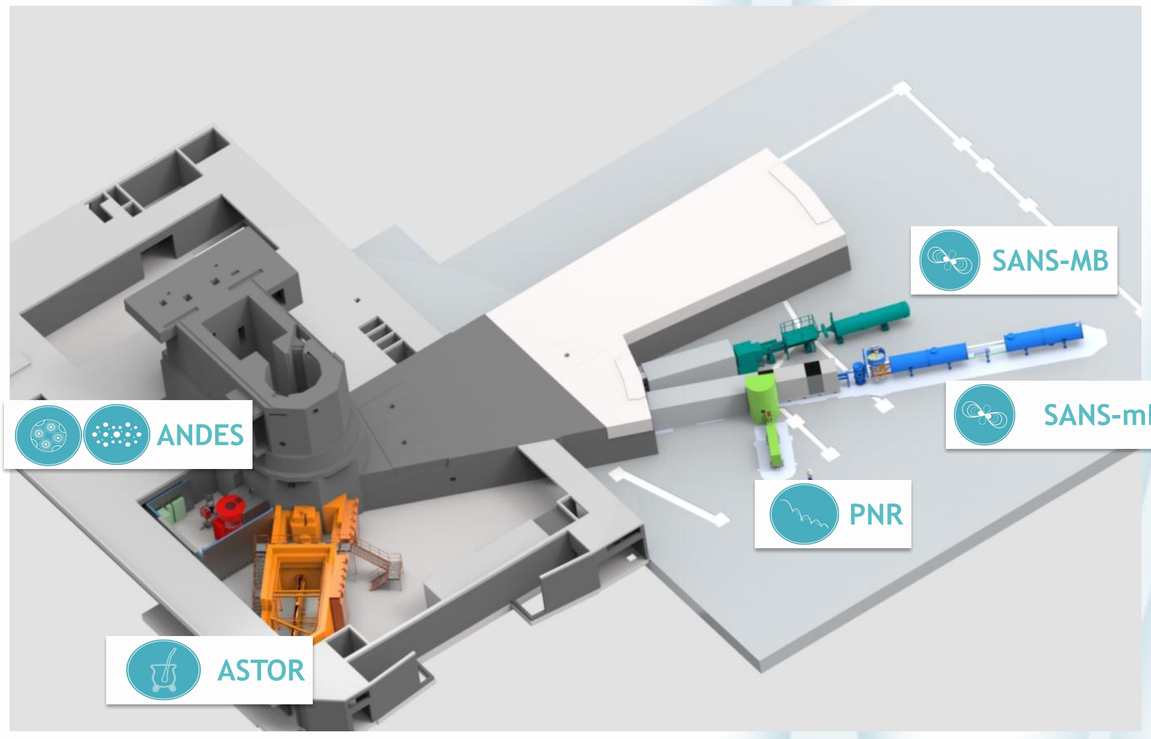
The Argentinean Neutron Beam Laboratory (LAHN)

A 30MW reactor source is being built near Buenos Aires, Argentina to provide thermal and cold neutrons for the Argentinean Neutron Beam Laboratory (LAHN) [1], a large scale facility for research and development using neutron beams and related techniques.

The inicial suite of instruments of LAHN includes an imaging and neutrography instrument (ASTOR), a diffractometer with strain-scanning capabilities (ANDES), a neutron reflectometer and two SANS instruments.

The LAHN project also encompases a wide set of complementary characterization techniques, as well as groups doing basic research in diverse fields (soft and hard condensed matter, nanotechnology, cultural heritage, etc…), developing new sample environments and neutron detectors.



The SANS instruments at LAHN

The V4 instrument from Helmholtz Zentrum Berlin is being transfered to Argentina to function as a multi-purpose SANS at LAHN. It has a maximum collimation length of 16m, a polarizer and spin-flipper, a system of choppers and up to 16m sample-detector distance.

On the other hand, former SANS-II instrument from Paul Scherrer Institut will function as a soft matter instrument at LAHN. It has the possibility of functioning with a continuous vacuum throughout the whole neutron path, minimizing the scattering from windows.


Former SANS-II instrument at PSI will be repurposed as a Soft Matter SANS at LAHN

SANS Data at LAHN

We aim to provide users with a versatile platform for data management, based on the NeXus data format[2], and compatible with other data formats by using ad-hoc code for conversion. Users should be able to perform with ease usual corrections and data treatment, such as automated background subtraction, corrections for pixel efficiency, absolute scaling of the scattering cross-section using standards, masking and averaging procedures, curve fitting, etc.

NICOS control system[3] will provide the framework for the hardware control and operation during the experiments, not only for the SANS instruments, but for all the instruments in the facility. Routines for typical data reduction and analysis procedures will be available for the users.

In addition to the standard data treatment, we expect to implement some unique features. One example is using Kernel Density Estimation for sector averaging when statistics is low[4]. Acquiring time-sliced registers of the detector data will provide the possibility of using statistical techniques on a pixel-by-pixel basis, such as the use of bootstrapping for better estimation of confidence intervals and the use of robust estimators.

References:

[1] https://www.lahn.cnea.gov.ar/
[2] M. Könnecke et al, *"The NeXus data format"*, J. Appl. Cryst. **48**, 301 (2015)
[3] https://www.nicos-controls.org/
[4] K. Saito et al. *"Accelerating small-angle scattering experiments on anisotropic samples using kernel density estimation"* Sci. Rep. **9**, 1526 (2019)

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