

Development of SANS Data Treatment at YuMO Facility

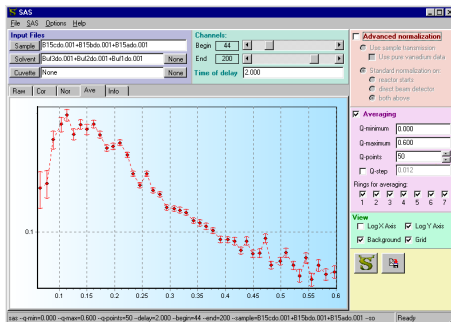
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SAS development

The SAS program[1] is aimed to process the spectra measured on YuMO spectrometer (channel four of the IBR-2 reactor). The program allows to combine the data referring to the same sample, to calculate the spectrometer resolution function for the given experiment conditions, to carry out data correction on dead times of neutron detectors, and to subtract a background substrate from detector data (in two possible modes: using the neutron beam breaker or without it), to carry out the normalization of the obtained spectrum on standard vanadium scatterer, to subtract background sample data.

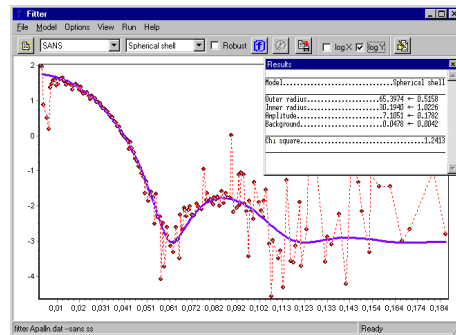
In the framework of modernization we use of the two detectors of YuMO setup. One of detectors is position sensitive. Determination of invariants for small-angle scattering curves allows it to analyze investigated object parameters. Raw data treatment includes preprocessing, namely, calibration, normalization and conversion from time-of-flight scale into the momentum transfer scale Q . Since data are registered by two different detectors, they must be combined and merged accounting for detector resolution. The old program SAS showed good results. During this year we continue to develop the mathematical background of the methodical principle of the small angle neutron scattering method. We suggest avoiding the problems regarding the direct beam detector. In particular, it was suggested to use some data of scattering detector rings for its aim. The mathematical background is done. Now we are working for including mathematical changes into SAS program. In the next year (2010) we would finish this part of program, improve user interface and visualization.



Fitter development

Fitter [2, 3] is a C++ program aimed to fit a chosen theoretical multi-parameter function through a set of data points. The method of fitting is chi-square minimization. Moreover, the robust fitting method can be applied in Fitter. Fitter was designed to be used for a small-angle neutron scattering data analysis. Respective theoretical models are implemented in it. Some commonly used models (Gaussian and polynomials) are also implemented for wider applicability.

New version provides portable GUI and Gluplot-based visualisation.



References

- [1] <http://www.jinr.ru/programs/jinrlib/sas/>
- [2] <http://www.jinr.ru/programs/jinrlib/fitter/>
- [3] Soloviev A.G., Stadnik A.V., Islamov A.H. and Kuklin A.I. FITTER. The package for fitting a chosen theoretical multi-parameter function through a set of data points. Application to experimental data of the YuMO spectrometer. Version 2.1.0. Long Write-Up and User's Guide. Communication of JINR E10-2008-2, Dubna: JINR, 2008.
- [4] A.I. Kuklin, A.V. Rogachev, A.Yu. Cherny, T.N. Murugova, E.B. Dokukin, A.Kh. Islamov, O.I. Ivankov, Yu.S. Kovalev, D.V. Soloviev, P.K. Utrobin, A.G. Soloviev, V.I. Gordeliy. Nanoscale Size Effects. Communication of JINR P14-2009-128, Dubna: JINR, 2009.
- [5] A.I. Kuklin et al. 10th Int. Balkan Workshop on Applied Physics, Balkan Physics Society, Constanta, Romania, 2009.