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Primary data treatment software for position-sensitive detector of small-angle neutron scattering spectrometer in isotropic pattern scattering case

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The modern trends in use of the small-angle scattering method consist in varying a sample environment, e.g. temperature, pressure, magnetic or electric fields. The objects under investigation can be oriented in the field or by the flow of a liquid. In this case the need for the position-sensitive detector (PSD) arises.

The position-sensitive detector of the new type has been created for the YuMO spectrometer. Currently, this spectrometer has a two-detector system with coaxial ring detectors with a central hole [1] and does not have azimuthal angle sensitivity. And the SAS package [2-4] is used for its data treatment. PSD is planned to be mounted either in the place of one of YuMO detectors, or in addition to them (turning it into three-detector system). And the problem of PSD data processing is actual.

Due to small size of PSD cells statistics in them is often poor. That fact negatively impacts on data treatment. On the other hand, in most of the experiments one needs isotropic pattern of scattering only, when objects in a sample are not oriented. Thus in most cases it is possible to combine PSD cells into concentric rings what first improves statistics and finally makes applicable the algorithms already used for data processing in SAS.

To implement this task of data reduction ROOT framework [5] was chosen. The final script [6] allows one to choose the number of rings, to correct their common center if needed, to visualize and to control all the data at every stage of the conversion. The cross-section area of a cell and the resulting ring is taken into account. And the next step will be implementing it as the SAS module for reading PSD data directly.

Short biography note

[1] A.I.Kuklin, A.Kh.Islamov, and V.I.Gordeliy. Two-detector System for Small-Angle Neutron Scattering Instrument, Neutron News, 2005, vol. 16, 3, pp.16-18.

[2] Soloviev A G, Solovieva T M, Stadnik A V et al SAS. The Package for Small-Angle Neutron Scattering Data Treatment. Version 2.4. Long Write-Up and User's Guide. Communication of JINR P10-2003-86, Dubna, 2003

[3] <https://wwwinfo.jinr.ru/programs/jinrlib/sas/index.html>

[4] A G Soloviev et al. SAS program for two-detector system: seamless curve from both detectors. Journal of Physics: conference series. In print (2017)

[5] <https://root.cern.ch/>

[6] <https://wwwinfo.jinr.ru/programs/jinrlib/psd2sas/index.html>

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