## MAIN DIRECTIONS OF YUMO SPECTROMETER DEVELOPMENT

A.I. Kuklin[1,2], O.I. Ivankov[1], A.Kh. Islamov[1], A.H.A. Elmekawy[1,3], A. Rogachev[1,2], T.N. Murugova[1], V. Skoi[1], T.V. Cuong[1,4], A.V. Vlasov[1,2], Y.L. Ryzhykau[1,2], A.G. Solovjev[1], V.I. Gordeliy[1,2]

[1] *Joint Institute for Nuclear Research, Dubna, Russia*
[2] *Moscow Institute of Physics and Technology, Dolgoprudny, Russia*
[3] *Nuclear Research Centre, Egyptian Atomic Energy Authority, Cairo, Egypt.*
[4] *Dalat Nuclear Research Institute, Lam Dong, Viet Nam*

E-mail: alexander.iw.kuklin@gmail.com

Small-angle neutron scattering (SANS) is one of the most widely used neutron diffraction techniques due to its broad applicability across scientific field. Its instrumentation requires high neutron flux at the sample, low background, a wide momentum-transfer range (Q range), versatile sample environments, and an automation. The neutron flux depends on the source power, moderator, setup configuration, and collimation system, while the dynamic Q range is defined mainly by the multi-detector system and modular detector configuration.

The evolution of the experimental setup has been closely linked to instrument development. A multi-detector system for the SANS spectrometer was first proposed and implemented as described in Ref. [1], and subsequent detector designs were adapted to this configuration. The development of a position-sensitive detector (PSD) with a central aperture followed from this approach [2-4]. Current spectrometer development is focused on two main directions: firstly, expanding the detector base through small angle scattering (SAS), ring detectors, advanced PSDs, and direct-beam detectors; and secondly, developing normalization methods to overcome invariant-related limitations and enable determination of both the small-angle scattering cross section on an absolute scale and the total scattering cross section of samples.

This report presents results on neutron flux stability, transmission studies of materials used in YuMO spectrometer components, and measurements obtained in a non-standard configuration employing an original PSD design. The main directions for the spectrometer's near- and medium-term modernization are also discussed.

[1] A.I. Kuklin, A.Kh. Islamov, V.I. Gordeliy, and et al (2005). Scientific Reviews: Two-Detector System for Small-Angle Neutron Scattering Instrument. Neutron News, 16(3), 16–18. https://doi.org/10.1080/10448630500454361
[2] A.I. Kuklin, D. Zabelskii, V.I. Gordeliy, and et al (2020). On the Origin of the Anomalous Behavior of Lipid Membrane Properties in the Vicinity of the Chain-Melting Phase Transition. Sci Rep 10, 5749. https://doi.org/10.1038/s41598-020-62577-9
[3] A. Zeleňáková, P. Hrubovčák, A.I. Kuklin, and et al (2019). Size and distribution of the iron oxide nanoparticles in SBA-15 nanoporous silica via SANS study. Sci Rep 9, 15852 (2019). https://doi.org/10.1038/s41598-019-52417-w
[4] B. Balasoiu, A.I. Kuklin, and et al (2010). Rom. Journ. Phys., Vol. 55, Nos. 7–8, P. 782–789, Bucharest.