

Theme: «Scientific and methodological research and developments for condensed matter investigations with IBR-2 neutron beams» for 2021-2025

Project: Construction of a wide-aperture backscattering detector (BSD) for the HRFD diffractometer (proposed for implementation at JINR in 2021-2023).

Review

High Resolution Fourier Diffractometer (HRFD) is operating in FLNP JINR for more than 20 years. It is one of few neutron diffraction facilities in the world where the experiments requiring resolution as high as $\Delta d/d \approx 0.001$ or better can be realized. The purpose of HRFD is mainly precise structure analysis of polycrystalline substances, such as, for example, high temperature superconductors, modern functional alloys and electrode materials. In addition, HRFD is used also for monocrystal analysis in the cases when its unique high resolution is required.

The current project is a natural extension of the proceeding project "Development of a wide-aperture backscattering detector (BSD) for the HRFD diffractometer" executed in 2018-2020. The purpose of that previous project was development of a new detector which would be free of drawbacks intrinsic to HRFD: small solid angle and high sensitivity to gamma-background. This new device will be a wide aperture scintillation detector with implemented combined electronic-geometric focusing. The new detector will have 12.5 times larger solid angle (increased up to 2.0 sr), while replacement of scintillators of lithium glass with scintillation screens of $\text{ZnS(Ag)}^6\text{LiF}$ decreases sensitivity to gamma-background, besides a curved shape of the screens provides at the same time a space-time focusing. It is planned also to change the obsolescent electronics and data acquisition system to modern developments.

The tasks of the previous project were completely achieved by the authors: the technical project of the backscattering detector has been prepared, the manufacturing processes for scintillation detectors production and necessary for this accessories developed, a test-bench for testing of the detector sectors produced. The construction and testing of the first sector of the detector will be finished up to the end of the current year

In the frame of the project under consideration, it is planned to finish construction of the backscattering detector completely: to produce the rest 11 sectors of the detector, to install and tune new electronics and software, to assemble and test the detector BSD HRFD with the system of readout and collection of data.

Realization of this project will bring the diffractometer HRFD at IBR-2 into world leaders among the similar experimental facilities.

The group of employees working on the project is well balanced including scientists, engineers and technicians. Their qualification, as well as good results of the previous project, leaves no doubts that the project under consideration will be successfully fulfilled.

The requested resources and work schedule look reasonable.

I recommend to approve the project "Construction of a wide-aperture backscattering detector (BSD) for the HRFD diffractometer" with the first priority.

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