Review of the project

Development of a wide-aperture backscattering detector (BSD) for the HRFD diffractometer

proposed for implementation at JINR in 2018-2020.

The High-Resolution Fourier Diffractometer (HRFD) developed in the framework of collaboration between FLNP JINR (Dubna), PNPI (Gatchina) and VTT (Espoo, Finland) has been operating at the IBR-2 reactor already more than 20 years. During its use, the diffractometer has proved to be a world-class installation with inherent unique features and world-class main key parameters. However, in order to remain at the preset level and adapt to the new requirements connected first of all with the need to research of new classes of increasingly complex compounds and materials created in recent years and to be ready for tasks that will be put in the future, an essential modernization of the diffractometer is necessary. In 2016 a new mirror neutron guide and fast Fourier chopper were put into operation and in the previous years there was a complete replacement in the data acquisition and experiment control electronics.

The proposed further modernization of the HRFD, which consists in the replacement of existing backscattering detectors with a new version is a key and decisive stage of modernization of the HRFD diffractometer.

From the present-day point of view, the point of view, HRFD detectors have two disadvantages: a high sensitivity to γ-background and an insufficiently large solid angle (~0.16 sr). Due to this, the resulting diffraction spectra have a rather high background and low (by modern criteria) data rate, despite the fact that the neutron flux at the sample position is sufficiently high (10^7 n/cm^2/s).

The scientific significance of the project is beyond doubt. The implementation of the project will allow to make a great contribution to the development of experimental facilities for condensed matter investigations with beams of the IBR-2 facility.

Compared to the existing detector, the new detector will increase the solid angle by a factor approximately 12 times to 2.0 sr. The detector efficiency range via the scattering angle interval becomes 59%-96% and on average it increases to 85%. This increase in efficiency, combined with the aperture increased to 2 sr, will bring the backscattering detector to a completely new level.

The intellectual contribution to the creation of the project is, probably here, decisive. The offered configuration using the electronic-geometric focusing is original absolutely and has no analogues.

The technical feasibility of implementation of the project within the specified time frames is well- justified.

The proposed schedule and necessary resources required for the implementation of the Project “Development of a wide-aperture backscattering detector (BSD) for the HRFD diffractometer” intended for 2018-2020 is seems reasonable and the project is being implemented in the case of regular financing of the project stages.

The requested financial resources correspond to project tasks.

The project is completely provided with appropriate human resources at JINR. Experienced and highly qualified specialists are involved to implementation of the project.

Unfortunately, I am not able to estimate the human resources in cooperating organizations.

In conclusion, I fully support the implementation of the project in the presented form. The estimates show that the solution of these problems will allow an approximately two- to three-fold increase in the number of conducted experiments, and permit us to substantially improve the accuracy of obtained structural information, as well as significantly enhance the possibilities of the diffractometer in performing experiments under various external conditions.

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