Review of the scientific and technical justification for the opening of the project "Development of the conception of an ultracold neutron source at the IBR-2 pulsed reactor"

The aim of the proposed project is to develop the conception of an intensive ultracold neutron source (UCN) at the IBR-2 pulsed reactor. The construction of such a source would put an end to the paradoxical situation, which consists in the fact that the laboratory, which holds the honor of discovering the UCN, and whose works are largely associated with the formation of UCN physics, does not have its own UCN source. Moreover, there are currently no such sources in Russia.

The authors of the project intend to take the first important steps to solve this problem. The parameters and design of the IBR2 pulse reactor available at JINR make this task quite difficult. The relatively low average power with a high pulsed flux forced the authors of the project to turn to the idea of pulsed neutron accumulation in a trap. The distance of the trap from the reactor core required finding a solution to the problem of maintaining the pulsed structure of the neutron flux during their transportation. The solution proposed by the authors consists of a two-stage approach to the generation and transport of UCN from the moderator to the trap. In this case, to the source initially come neutrons with velocities significantly higher than those of the UCN, the flux of which near the trap still has a pulsed structure, and the final deceleration of neutrons occurs in a gradient (adiabatic) magnetic resonance spin-flipper directly near the trap. It should be noted that this method of neutron slowing down was proposed in the PNPI more than half a century ago and has not yet been applied in practice.

To create a source, it is necessary to solve a number of difficult tasks. These include the creation of a superconducting gradient spin flipper with a magnetic field of about 18 T, the creation of a mirror neutron guide that ensures the dispersion of neutron transport times at a level better than 0.01, and the creation of a UCN liquid hydrogen converter with the necessary level of safety.

The strength of the project is the decision of the authors not to limit themselves to calculations and designing, but to construct a source-prototype. This will allow them to verify the correctness of the technical solutions taken to create the projected source, as well as to conduct experimental studies necessary to create a complete conception of the projected Source.

The proposed version of the research program on a future source, given in the text of the scientific and technical justification of the project, is largely based on the previous results of the authors of the project and it probably should not be considered final.

It can be seen from the text of the scientific and technical justification that the present project is based on significant preliminary work by the author's team, which

has prepared five scientific publications, the results of which form the basis for the preliminary design of the source.

In my opinion, the project is well founded and should be supported.

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