**Referee Report to the 55th meeting of the PAC for Nuclear Physics**

**4. Report on theme “Investigations of neutron nuclear interactions and**

**properties of the neutron” and proposal for its extension**

The report presents the results of research and work performed or completed in 2020 - 2021. Work is carried out in three directions

1. Investigations of fundamental properties of the neutron, ultracold and very cold neutron physics:

here, interesting and very promising results were obtained on the formation of neutron beams using moving reflectors, diffraction gratings and their surface nanostructure; preparations have begun for a test experiment to create a high-density ultracold neutron source.

2. Investigations of violations of fundamental symmetries in neutron-nucleus interactions and obtaining related nuclear data:

- the analysis of previous experiments has been completed and preliminary results have been obtained on investigations of violations of fundamental symmetries in neutron-nucleus interactions using the example of *235U* fission;

- new experimental data have been obtained on the cross sections for reactions *(n,α)* and *(n,n'γ)* and others on a number of atomic nuclei of elements that are promising for nuclear energy problems and related to nuclear astrophysics;

- studies of rare (many-particle) modes of spontaneous fission of the *Cf-252* nucleus were carried out;

- research continues in the framework of other tasks.

3. Applied and methodological research:

a large amount of research work and applied research has been carried out for the tasks of ecology, archeology, nanotoxicology, etc. using neutron activation analysis, prompt gamma-activation analysis, neutron-resonance capture analysis methods and other.

Research is carried out in wide international cooperation.

The research results are widely presented at conferences and published in high-ranking journals.

In general, I believe that the results obtained in 2020 - 2021 are aimed at clarifying urgent problems in studying the properties of the neutron and nuclear processes with their participation and form promising areas of research.

I recommend extending the implementation of the topic “Investigations of Neutron Nuclear Interactions and Properties of the Neutron” until the end of 2023.

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Vladimir Ostashko,

Leading Researcher

Department of Nuclear Reactions,

Institute for Nuclear Research, Kiev