

## **The referee report on the project**

### **“Open information and educational environment for supporting fundamental and applied multidisciplinary research at JINR”**

**Theme:** 1139, **Leader:** Yu.A. Panebrattsev, **Terms:** 2021-2023

The project is playing an important and necessary role for the Joint Institute for Nuclear Research to create information and educational resources related to the topics of JINR research. This area of activity is included in the “JINR Long-Term Development Strategic Plan up to 2030 and Beyond” as one of the important directions in JINR.

Work in this direction has been going on for over five years. I was a reviewer for the previous stage of the project in 2017–2019. In this review, I want to highlight only the most important results related to 2020 and the first half of 2021.

Among the results obtained, I would like to note the design and creation of an information system for the Laboratory of Neutron Physics – User Club, the creation of the online course by Professor A.V. Belushkin – “The use of neutrons for the study of metals and alloys”, the creation of information video resources for students of Lomonosov Moscow State University (Department of Neutronography) and the JINR department at the Kazan Federal University (Department of Nuclear-physical materials science).

Together with the Laboratory of Nuclear Reactions, educational materials on fundamental and applied research with heavy ions were created. The educational online course on the NICA megaproject was prepared and published on an international platform.

Within the framework of the project, extensive international cooperation is being carried out. Together with the Sofia University “St. Kliment Ohridski” (Bulgaria) and the University of Novi Sad (Serbia), a series of virtual laboratory works on gamma spectroscopy has been prepared. Together with the Mongolian State University of Education (Ulaanbaatar, Mongolia) and the Stellenbosch University (South Africa), a new section of the “Virtual laboratory” project has been prepared for the analysis of experimental data in the ROOT system. Taking into account the request of many universities to create practicums using modern detectors, a new laboratory work using silicon photomultipliers has been developed in 2020. Together with the Warsaw University of Technology (Poland) and the North Ossetian State University (Vladikavkaz, Russia), a remote practicum on the basics of experimental nuclear physics and nuclear electronics is being developed.

I would like to note that the results obtained within the framework of the project have already been used in the creation of JINR information centers in the South of Russia (North Ossetian State University, Vladikavkaz) and Egypt (Cairo).

I would like to note the great work of the authors of the project for teachers and high school students. In 2019, the Publishing House “Prosveschenie” published the courses “Nuclear Physics” and “Fundamentals of Systems Analysis” for grades 10–11 of the professionally-oriented school. One of the sections of the course “Nuclear Physics”, which is called “In the Laboratories of Scientists”, is entirely devoted to the achievements of JINR. In 2021, a physics course for the 7th grade of a Russian school was published as part of the “Engineers of the Future” project. The main

goal of this course is to give an understanding of spheres of professional activities related to modern science, which is very important when training a new generation of specialists for JINR.

I would especially like to note the extremely important result obtained by the authors of the project in 2020–2021. This is the creation of an interactive exhibition dedicated to the 65th anniversary of the Institute (“JINR Basic Facilities”). The exhibition was opened on March 25 this year and is taking place in the Small Hall of the JINR Cultural Center “MIR“. The exhibition includes interactive software and hardware complexes – models of the NICA/MPD detector (VBLHEP), experimental complexes for applied and fundamental research at the cyclotron (FLNR), the IBR-2 pulsed reactor with examples of experimental facilities (FLNP). Stand of the Laboratory of Radiation Biology with information on the results in the field of clinical radiobiology, astrobiology, nuclear planetology, radiation cytogenetics, radiation physiology. Also, at the exhibition there are the stands of the Laboratory of Information Technologies (“Big Data”) and the stand of the Laboratory of Nuclear Problems with the real detecting cells, which tells about the underwater neutrino telescope on Lake Baikal. Each of the exhibits is accompanied by a VR tour.

It is pleasant to note that the quality of the created exhibits corresponds to the level of the best scientific centers and science museums. The creation of this exhibition in Dubna is a good basis for the creation of JINR mobile exhibitions for the JINR Member States and Associate Members, and in the future, the basis for the creation of the Exhibition and Communication Center in Dubna, as provided in the JINR Development Strategic Plan.

The project is provided with qualified human resources. Within the framework of the project, extensive international cooperation is being carried out.

In the presented Questionnaire, the leading contribution of the JINR group to the project, the obtained and planned results, as well as rather broad international cooperation have been sufficiently reflected.

Summing up the above, I believe that it is necessary to assign the project “Open information and educational environment for supporting fundamental and applied multidisciplinary research at JINR” category “A” and support the funding allocation in full.



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