Review on the project "Development of the open educational environment to support research priorities in nuclear physics"

Reviewer: Prof. DSc Latchezar Avramov – IE, Sofia, Bulgaria, avramov@ie.bas.bg, latchezar.avramov@gmail.com

The present project continues work of the JINR University Center on creation of new electronic educational resources within the JINR subject-matter based on the use of modern educational technologies. This activity is very important for JINR Member States because it introduces to students researches conducted at JINR, for example condensed matter research at the IBR-2 reactor, new superheavy elements synthesis, building of Superheavy Elements Factory (SHE Factory) and building of superconducting collider NICA.

I agree with project authors that project realization will actually help to involve new generation of talented young people from the JINR Member States into the JINR activities.

I would like to pay the special attention to the design and development of educational web-resource "Virtual Laboratory of Nuclear Physics." Sofia University and INRNE BAS are participating in these works. We hope to apply the results of this project into the educational process of the Bulgarian universities. The proposal of the project authors to develop a professional web-resource for nuclear physics «Nuclear Science and Technology» seems to be interesting. Using modern internet-technologies this resource will allow us to attract the youth audience interested in developing career in the field of nuclear physics.

One of the JINR good traditions is publishing of the courses from the leading scientists from the JINR Member States on modern problems of physics. The project authors' proposal to make such the courses in the form of massive open online resources corresponds to modern educational trends.

1. Scientific merits, elements of novelty, timely nature of the research

All modern large scientific centers have educational programs for students, teachers and school students. Education of specialists for modern research projects is not possible without active participation of leading scientists and engineers together with the basic departments of JINR UC.

The novelty of the project is that new courses are supposed to develop in the form of open online courses using the visualization capabilities on the base of the interactive 3D-graphics and interactive quizzes and exercises. Also the novelty lies in the use of real experimental data in the virtual and remote laboratory practicums. To implement the project objectives the authors propose to use modern computer technologies in all parts of the project, that will actually allow to create the open educational environment to support research priorities in nuclear physics.

2. Expertise of the group and technical feasibility of the project within the proposed timescale

The project authors have 15 year experience in development of e-learning resources for university and school students as well as in development of interactive multimedia popular

science exhibitions and web-resources. In 2016 the exhibits devoted to the 60th anniversary of JINR, developed by the project authors, were presented in many JINR Member States. The great interest was aroused by interactive models of the JINR basic facilities.

The project authors developed the hardware-software complex "Virtual Laboratory of Nuclear Fission". This complex includes the wide spectrum of virtual laboratory works with data obtained on real experimental equipment. It allows to use this e-learning tool to train students for their experimental work in the field of nuclear physics. Results of this work were presented at the Science Forum in RSA.

The project authors developed the interactive model of IBR-2 reactor and interactive model of experimental hall with facilities for condensed matter research using neutron beams.

The project authors mastered online course development technologies in the form of mass open education platforms (Coursera and edX). This experience will be applied to create courses on the priority research topics of the JINR.

Taking into account the qualifications of development team and its previous experience, the project implementation in established period is beyond doubt.

3. Compliance of the requested financial resources with the objectives of the project/theme
Integrally requested financial resources correspond to the project tasks for the period 2017–2019.

4. Availability of human resources at JINR and in the collaborating institutions
The JINR Member States and Associated Members (RSA, Egypt, Serbia) show the great interest to the results of the project and its implementation in the educational process. The participation of different universities at the stage of design and development of all components of the project will allow to implement its results into the educational process, taking into account the specifics of different universities and different countries. It is important that the JINR University Centre coordinates these works.

In general, development of educational courses, laboratory practicums and educational programs will involve the participation of university professors in collaboration with JINR specialists. Works, connected with realization of the educational content in the form of software, are supposed to carry out on the base of JINR with the assistance of IT specialists, including specialists from the "InterGraphics" LLC with which JINR and BNL has been successfully collaborating since 2001.

I think that the project "Development of the open educational environment to support research priorities in nuclear physics" is an important activity direction for the JINR Member States. I propose to support it with first priority and funding allocation in full.

Latchezar Avramov
IE, Sofia, Bulgaria