

## **Review of the Project**

### **“Development of the open educational environment to support research priorities in nuclear physics”**

Reviewer: Ana Otilia Culicov – FLNP Deputy Director for Science, [culicov@nf.jinr.ru](mailto:culicov@nf.jinr.ru).

Nowadays, tens of millions of students are active users of popular platforms of mass open online courses (MOOC) and educational channels on YouTube. In this regard, to develop the open educational environment to support research priorities in nuclear physics is the actual problem for the Joint Institute for Nuclear Research.

The use of blended learning, when a full-time educational process is complemented with e-learning tools, solves a number of important problems:

- Lack of teaching specialists at universities;
- Need for allocation of significant financial resources in order to provide transportation and social infrastructure for a large number of students from the Member States, which is required for their long-term training at the JINR basic facilities.

#### **1. Scientific importance, novelty aspects, and relevance of the Project**

The major international research centers – European Organization for Nuclear Research (CERN) and Brookhaven National Laboratory (BNL) – pay great attention to the development and implementation of educational programs for teachers, school and university students.

The Project is aimed at attracting public attention (school and university students, parents and generally interested audience) to the scientific achievements of JINR. The Project results can be used in various activities related to popularization of science (exhibitions, science days in Dubna and JINR Member States). Using modern technologies of 3D-modeling, scientific data visualization, development of learning management systems will enable the development of informational and educational resources of JINR at the level of the world's leading research centers. It will stimulate the motivation of school and university students to study physics and engineering sciences and encourage young people to choose them as their future profession.

Using interactive 3D-graphics in the visualization of the JINR basic facilities as a part of the educational component of JINR laboratories' websites will attract the attention of a wider range of university students from JINR Member States and motivate them to build a scientific career at JINR.

Interactive 3D-models of the JINR basic setups and other physics facilities, where the research is conducted, are a very important tool for distance learning. They provide a clear visual image of the structure of each assembly unit, and, in addition to virtual tours, give a complete picture of a setup. They also play an important role in the training of engineers, as they allow minimizing the time spent in radiation-hazardous conditions.

## **2. Expertise and technical resources allowing the team to implement the Project within the specified terms**

The Project team has extensive experience in the development of e-learning software for secondary and higher education, as well as in the development of multimedia interactive popular-science and educational outreach resources.

It should be emphasized that the Project participants have developed the JINR-related multimedia exhibits presented at various Russian and international events, days of science, museum exhibitions. In 2016 alone, the exhibits devoted to the 60th anniversary of JINR were presented in the Slovak Technical Museum, at the Science Festival in Moscow, in the Kazan Federal University, in many JINR Member States, at the Science Forum in RSA. This activity is planned to be further developed within the Project framework.

## **3. Adequacy of the requested funding to the tasks of the Project/theme**

As a whole, the requested financial resources are adequate for the Project tasks stated for 2017–2019.

## **4. Availability of human resources at JINR and cooperating organizations**

In the visualization of physics processes and phenomena, experimental facilities and sophisticated devices, close cooperation of specialists from different fields – physicists and engineers, teachers and IT experts – is essential. Such cooperation in this Project is provided by attracting not only JINR specialists, but also university teachers from Russia, JINR Member States and RSA, as well as IT experts from “InterGraphics” LLC, a resident company of the special economic zone “Dubna”. In recent years the company has been involved in the development of interactive 3D-models of IBR-2 and other JINR basic facilities, as well as online courses for the leading international platforms Coursera and edX. The company possesses the modern technologies required for the implementation of this joint Project.

After testing the developed products in the universities that are co-authors of the Project, the Project results should be actively spread in all JINR Member States and other countries, not only for educational purposes, but also to raise awareness and create a positive attitude to JINR.

I consider that the project “Development of the open educational environment to support research priorities in nuclear physics” is important for JINR and its Member States. It is recommended to provide financial support of the Project on a first-priority basis and in full.

Ana Otilia Culicov  
FLNP Deputy Director for Science

