

# **Computer simulation of radiation protection using the Geant4 toolkit**

Project coordinator: Alexey Zhemchugov

Laboratory of Nuclear Problems

## **1. Description of the project:**

Geant4 is a toolkit for the simulation of the passage of particles through matter. Its areas of application include high energy, nuclear and accelerator physics, as well as studies in medical and space science. Recent applications of Geant4 include calculation of dose distribution in various materials and tissues, simulation of radiation protection and dosimeter design and optimization.

## **2. Purpose of the project:**

The aim of the presented project is to enable all students to gain practical experience of using the Geant4 toolkit to solve typical problems of radiation protection. Practical work of students is related to the calculation of basic dosimetry quantities useful for radiation protection applications and to the simulation of radiation shielding of different shape and composition.

## **3. Short description of the practical work:**

- Calculate flux-to-dose equivalent factor for different radiation type and spectrum. Compare simulation results with experimental data.
- Calculate the dose rate for a given radiation source and distance.
- Simulate shielding and radiation protection efficiency

## **4. Requirements**

Good knowledge of C++ programming.

Basic knowledge of radiation dosimetry and radiation protection.

Experience of using the Geant4 toolkit and ROOT data analysis framework is not necessary, but helpful.

## **5. References:**

Geant4 home page: <http://cern.ch/geant4>

F.H.Attix, Introduction to Radiological Physics and Radiation Dosimetry (2004) Wiley-VCH, Weinheim.

J. E. Martin, Physics for Radiation Protection (2013) Wiley-VCH, Weinheim.

## **6. The number of participating students is limited to 2.**

## **7. Contacts of the project coordinator**

Alexey Zhemchugov

Head of Department of Collider Physics, PhD

Laboratory of Nuclear Problems, Joint Institute for Nuclear Research,  
Joliot-Curie, 6, 141980 Dubna, Moscow region, Russia

E-mail: [zhemchugov@jinr.ru](mailto:zhemchugov@jinr.ru)

Phone: +7 (49621) 62014