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MODELLING OF NONLINEARITY OF LIGHT COLLECTION IN LARGE-VOLUME SCINTILLATORS

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In the state of progressive extension of information technologies around the world, non-analytic methods of calculation are widely used by means of powerful computer systems. In particular, it is very effective today to use the Monte Carlo method to simulate the transport of ionizing radiations in different materials.

Keywords: Monte Carlo method, scintillation, optical photons.

The systems of radiation portal monitors are an effective way to provide homeland security on potential dangerous objects. Recently, the idea of categorization of isotopes to increase the speed and quality of inspection at customs facilities has been actualized. In RPM the large volume scintillators are usually used to achieve the maximum sensitivity at low exposure rate. This inevitably leads to the problem of nonlinearity of light collection. In other words, the amount of light detected depends on the detector point where the flash occurred. The nonlinearity of the light collection results in a deterioration of detector's resolving power and, consequently, the possibility of correct categorization of isotopes.

GEANT4 is an open-source software toolkit for simulation of the transport of different types of particles through matter [1]. It has traditionally been used in medium and generally high energy physics applications. However, there is on-going development to extend the capabilities of this toolkit beyond this traditional scope [2]. In particular, some effort has been made into applying GEANT4 in the simulation of the optics of scintillation. For example, the simulation may commence with the propagation of a charged particle and end with the registration of the ensuing optical photons on photo sensitive areas, all within the same event loop [3].

In this research capability of GEANT4 to predict the nonlinearity of light collection in large-volume scintillators was investigated.

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AUTOMATING THE MANAGEMENT OF THE PORTAL RADIATION MONITORS SYSTEM

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Modern world is filled with events that disastrously influence nature and society. Some of these events, such as acts of terror at potentially dangerous facilities or illicit trafficking of ionizing radiation sources and nuclear materials, can be prevented by usage of specialized radiation monitoring systems – radiation portal monitors. Automation of management of such systems allows to speed up and increase work quality of various security services.

Keywords: radiation control, automation, software.