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计算数学与控制系

Факультет вычислительной математики
и кибернетики

Faculty of Computational Mathematics and
Cybernetics

应用数学报告 (96)

Научный Семинар по Прикладной Математике

Research Seminar on Applied Mathematics

报告人 / Докладчик / Speaker: Researcher Tetiana Nagorna, National Institute for Nuclear Research, Genova section, Italy

题目 / Название / Title: Application of numerical Monte Carlo methods in nuclear physics

时间 / Время / Time: 2024.01.03, 14:00-17:00

地点 / Место / Venue: 336

摘要 / Аннотация / Abstract:

This study highlights the capabilities of numerical Monte Carlo methods in analyzing fundamental particles. It focuses on a Monte Carlo-based software, Geant4, which is pivotal in simulating particle or radiation movement through various materials. Applications built on Geant4 can simulate any setup or detector and radiation source, and record the chosen output of physical quantities due to source particles and secondaries interacting with the material of the setup.

A key application of this research is in the realm of radiation shielding for high-intensity environments. The project is directed towards assessing and designing effective radiation barriers for the nuBDX-MINI detector, soon to be operational at Jefferson Lab in the USA. By utilizing this Monte Carlo approach, we define the optimal strategies for protecting the sensitive, low-threshold detector from background radiation.

Moreover, the study explores the optimum way to shield the low-threshold detector from a radiation background. In this regard, two radiation sources are considered: cosmic radiation and radiation from the dump.

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The Monte Carlo simulations are instrumental in identifying the types of particles generated in specific materials, their energy profiles, and the overall attenuation factor, which is crucial for efficient shielding and neutron moderation in contemporary facilities. Additionally, the work presents a practical radiation protection model for experiments involving high-energy beams.

Tetiana Nagorna 简介:

Tetiana Nagorna is a researcher in National Institute for Nuclear Research, Genova, Italy. Her research interest are Monte Carlo simulations for tracking the particles in the matter. She completed her academic journey at the Taras Shevchenko National University of Kyiv, Ukraine, earning her B.S., M.S., and Ph.D. degrees in 2013, 2015, and 2020, respectively. Her professional career includes a significant tenure at the Joint Institute for Nuclear Research, specifically in the Frank Laboratory of Neutron Physics in Dubna, Russia, from 2014 to 2022. Subsequently, she had a brief engagement at the Adam Mickiewicz University in Poznan, Poland, from June to August 2022. Since September 2022, she has been contributing as a researcher at the National Institute for Nuclear Research in Genova, Italy.