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Monte Carlo simulation of early biological damage induced by ionizing radiation at the DNA scale: Overview of the Geant4-DNA project

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Modeling accurately biological damage induced by ionizing radiation at the scale of the DNA molecule remains a major challenge of today's radiobiology research (1). In order to provide the community with an easily accessible mechanistic simulation platform, the general purpose and open source "Geant4" particle-matter Monte Carlo simulation toolkit (2) is being extended in the framework of the "Geant4-DNA" project (3-7) with a set of functionalities allowing the detailed simulation of particle-matter interactions in biological medium. These functionalities include physical, physico-chemical and chemical processes that can be combined with nanometer size geometries of biological targets in order to predict early DNA damage. We will present an overview of the Geant4-DNA project and discuss on-going developments.

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