

Welcome !



geant4-dna.org

Lecturers

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Geant4-DNA tutorial
Pohang Accelerator Laboratory, Republic of Korea
07/02/2025

Geant4 version 11.3
Released in December 2024



A big thank you!

■ Tutorial's organizers

- Pr Cho, KISTI
- Dr Lee, NCC
- Dr Hahn,
- Pr Jeon, IBS
- Pr Yeom, Yonsei

■ And to

- Pr Choi, SNUH
- Euntaek

Today's tutorial

- **Introduce users to Geant4-DNA**
 - **Overview** of the Geant4-DNA project
 - Introduction **lectures** to **key components**
 - **Physics**: track structures
 - **Chemistry**: water radiolysis
 - (sub-)cellular scale **geometries**
 - **Biological damage** prediction
 - **Hands-ons** based on a selection of **user examples**
- All software is **already fully included in Geant4**
 - No other external software needed
- We also showcase our **Geant4 Virtual Machine** for easier access to Geant4(-DNA)

Today's schedule

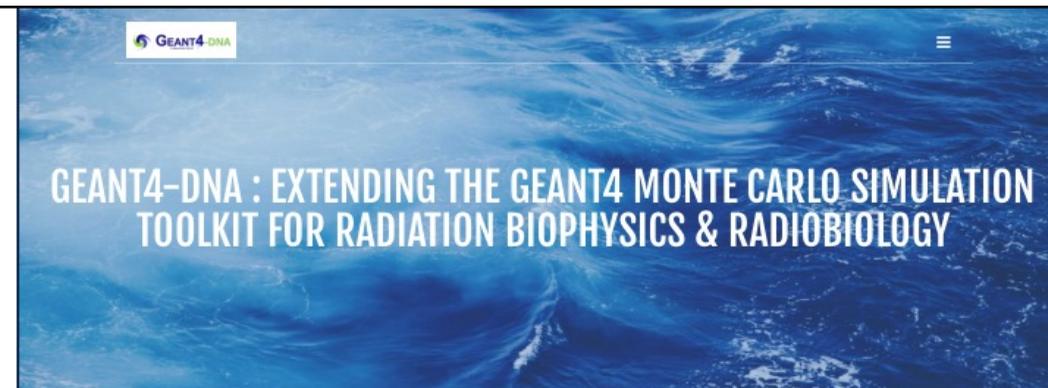
- <https://hep0.kisti.re.kr/event/284/timetable/#20250207.detailed>

	Welcome <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	09:30 - 09:35
10:00	Lecture: Geant4-DNA Overview <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	09:35 - 10:30
	Lecture: The Geant4 Virtual Machine <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	10:30 - 10:50
11:00	Coffee Break <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	10:50 - 11:10
	Lecture: Geant4-DNA Physics <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	11:10 - 11:40
12:00	Hands-on: dnaphysics <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	11:40 - 12:30
13:00	Lunch Break <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	12:30 - 14:00

14:00	Lecture: Geant4-DNA chemistry <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	14:00 - 14:45
15:00	Hands-on: chem6 <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	14:45 - 15:40
	Coffee Break <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	15:40 - 16:00
16:00	Hands-on: UHDR <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	16:00 - 17:00
17:00	Hands-on: molecularDNA <i>Res. Bld-2-201, Pohang Accelerator Laboratory</i>	17:00 - 18:00
18:00		

The Geant4-DNA website

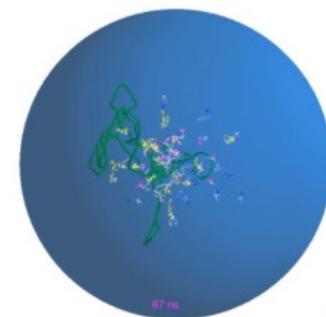
<https://geant4-dna.org/>



Welcome to the web page of the Geant4-DNA project !

The **Geant4** general purpose particle-matter Monte Carlo simulation toolkit is being extended with processes for the **modeling of biological damage induced by ionising radiation at the DNA scale**. Such developments are on-going in the framework of the Geant4-DNA project. This project was originally initiated by the **European Space Agency (ESA)**. Developments are undertaken by an international collaboration, coordinated since 2008 by the **National Institute of Nuclear and Particle Physics (IN2P3)** of the **National Centre for Scientific Research (CNRS)** in France, in collaboration with the **Geant4@IN2P3** activities.

Once published, all developments are freely accessible in **full open access** through the **Geant4** toolkit or through our **Geant4 Virtual Machine**.



Irradiation of a pBR322 plasmid, including radiolysis
- movie courtesy of V. Stepan (NPI-ASCR/LP2IB-CENBG/CNRS/IN2P3/ESA) -

On-going **developments** include

- **Physics** processes in liquid water and other materials
- **Physico-chemistry and chemistry** processes for water radiolysis
- **Molecular geometries**
- Quantification of **biological damage** (such as single-strand, double-strand breaks, base oxidation...)

Dedicated **example applications** are provided as well.

Please refer to our list of **publications and theses** for more information.

Dedicated **documentation** is also provided in the Geant4 **Book For Application Developers**.

Our current **job listing** is available **here**.

You may follow us on **X** and **Bluesky**.

Last posts

Dec. 20, 2024: Geant4-DNA in the **winter 2024 issue of the EFOMP European Medical Physics News**.

Dec. 17, 2024: The **Geant4 11.3.0 LP2i Virtual Machine** with AlmaLinux 9 has been released, see **link**.

You may follow us on **X** and **Bluesky**

Geant4-DNA reference publications

Important notice:

Any communication, report or publication results obtained using the Geant4-DNA software shall cite at least the five following publications by the Geant4-DNA Collaboration

1. **Review of chemical models and applications in Geant4-DNA: Report from the ESA BioRad III Project**,
H. N. Tran et al.,
[Med. Phys. 51 \(2024\) 5873-5889 \(link\)](#)
2. **Geant4-DNA example applications for track structure simulations in liquid water: a report from the Geant4-DNA Project**,
S. Incerti et al.,
[Med. Phys. 45 \(2018\) e722-e739 \(link\)](#)
3. **Track structure modeling in liquid water: A review of the Geant4-DNA very low energy extension of the Geant4 Monte Carlo simulation toolkit**,
M. A. Bernal et al.,
[Phys. Med. 31 \(2015\) 861-874 \(link\)](#)
4. **Comparison of Geant4 very low energy cross section models with experimental data in water**,
S. Incerti et al.,
[Med. Phys. 37 \(2010\) 4692-4708 \(link\)](#)
5. **The Geant4-DNA project**,
S. Incerti et al.,
[Int. J. Model. Simul. Sci. Comput. 1 \(2010\) 157-178 \(link\)](#)

Thank you very much