

**First steps with Geant4**

**Report of Contributions**

Contribution ID: 24

Type: **not specified**

## Welcome - Introduction

How the course will proceed

Technical aspects – using Zoom breakout rooms to interact with lecturers during hands-on session

Interacting via Mattermost for questions ‘online’

Exercise follow up

**Presenter:** APOSTOLAKIS, John (CERN)

Contribution ID: 25

Type: **not specified**

## What is Geant4 ?

The toolkit / library 'nature' of Geant4 and how differ from radiation transport tools ?

Is there is no Geant4 'executable' ? If not, why ?

Variety of existing Geant4-based application / tools.

How do you use Geant4 ?

**Presenter:** APOSTOLAKIS, John (CERN)

Contribution ID: 26

Type: **not specified**

## **Describing your detector - Concepts**

**Presenter:** COSMO, Gabriele (CERN)

Contribution ID: 27

Type: **not specified**

## Introduction

*Monday, May 9, 2022 2:00 PM (2 hours)*

- scope and goal of this course
- a short introduction to Geant4
- introduction of some important Geant4 concepts such as run, event, track, etc.

**Presenter:** NOVAK, Mihaly (CERN)

Contribution ID: 28

Type: **not specified**

## **Hands-on: Examine parts of a first example**

**Presenters:** COSMO, Gabriele (CERN); APOSTOLAKIS, John (CERN)

Contribution ID: 29

Type: **not specified**

## **Hands on: Adding volumes to the world**

**Presenters:** COSMO, Gabriele (CERN); APOSTOLAKIS, John (CERN)

Contribution ID: **30**

Type: **not specified**

## **Questions & Answers plus Homework**



Contribution ID: **31**

Type: **not specified**

## Detector Description

*Tuesday, May 10, 2022 2:00 PM (2 hours)*

- introduction of the G4UserDetectorConstruction interface
- introduction to the Geant4 geometry description
- introduction to the Geant4 material description

**Presenter:** NOVAK, Mihaly (CERN)

Contribution ID: **32**

Type: **not specified**

## Visualisation - lecture & hands-on

- Visualise your detector geometry

Brief overview and hands-on exercises

**Presenters:** APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN)

Contribution ID: 33

Type: **not specified**

## Implementation of the Detector-Construction of our application

*Tuesday, May 10, 2022 4:15 PM (1h 45m)*

- we will develop the main of our application then we start to implement the mandatory components, first the DetectorConstruction, i.e. the detector geometry and material description

**Presenter:** NOVAK, Mihaly (CERN)

Contribution ID: 34

Type: **not specified**

## **Generation of primaries - lecture & hands-on**

**Presenter:** IVANTCHENKO, Vladimir (CERN)

Contribution ID: 35

Type: **not specified**

## Hands on

- Finding information in G4Step, G4Track
- Creating Sensitive Detector ProcessHits() method that extract energy deposit
- Alternative method: Built-in scorer

**Presenters:** APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN); IVANTCHENKO, Vladimir (CERN)

Contribution ID: 36

Type: **not specified**

## **Review of homework - questions & answers**

**Presenters:** APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN); IVANTCHENKO, Vladimir (CERN)

Contribution ID: 37

Type: **not specified**

## **Extracting information: Part 2 - scoring and hits**

Overview of sensitive detectors and built-in scorers.

**Presenter:** APOSTOLAKIS, John (CERN)

Contribution ID: **38**

Type: **not specified**

## **Complete the Detector-Construction implementation**

*Wednesday, May 11, 2022 2:00 PM (2 hours)*

**Presenter:** NOVAK, Mihaly (CERN)



Contribution ID: 39

Type: **not specified**

## Primary particle generation

*Wednesday, May 11, 2022 4:15 PM (1h 45m)*

- a (very basic) look behind multi-threaded Geant4
- introduction of the G4VUserPrimaryGeneratorAction and usage
- introduction of G4VUserActionInitialization interface
- implementation of the primary generator of our application

**Presenter:** NOVAK, Mihaly (CERN)

Contribution ID: 40

Type: **not specified**

## **Review of homework - questions & answers**

**Presenters:** APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN)

Contribution ID: 41

Type: **not specified**

## **Defining / using magnetic field**

**Presenter:** APOSTOLAKIS, John (CERN)

Contribution ID: 42

Type: **not specified**

## Introduction to (some of) the further Geant4 user actions

*Thursday, May 12, 2022 4:15 PM (1h 45m)*

- recapitulation of the related Geant4 concepts (run, event, step)
- introduction of the Stepping-, Event- and Run-Actions and the related Geant4 interfaces (G4UserRunAction, G4UserEventAction, G4UserSteppingAction)
- implement the remaining user actions of our application

**Presenter:** NOVAK, Mihaly (CERN)

Contribution ID: 43

Type: **not specified**

## Hadronic physics

**Presenter:** RIBON, Alberto (CERN)

Contribution ID: 44

Type: **not specified**

## Hands on - Magnetic Field

Creating and registering a simple magnetic field.

**Presenter:** APOSTOLAKIS, John (CERN)

Contribution ID: 45

Type: **not specified**

## Add some flexibility to our application through UI commands

*Friday, May 13, 2022 2:00 PM (2 hours)*

- introduction to Geant4 UI commands
- implement some UI commands to allow e.g. change of the target material, thickness

**Presenter:** NOVAK, Mihaly (CERN)

Contribution ID: 46

Type: **not specified**

## **Complete the primary generator implementation**

*Thursday, May 12, 2022 2:00 PM (2 hours)*

**Presenter:** NOVAK, Mihaly (CERN)



Contribution ID: 47

Type: **not specified**

## Multi-threading

**Presenter:** APOSTOLAKIS, John (CERN)

Contribution ID: 48

Type: **not specified**

## Followup topics - questions & answers

Extension of existing concepts

**Presenters:** RIBON, Alberto (CERN); COSMO, Gabriele (CERN); APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN); IVANTCHENKO, Vladimir (CERN)

Contribution ID: 49

Type: **not specified**

## Hands on - messengers

- Use of messengers

**Presenters:** APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN)

Contribution ID: 50

Type: **not specified**

## Hands on - EM physics

- Simple magnetic field
- EM physics exercises
- Hadronic: choose hadronic physics list + compare profile of pion shower to electron shower

**Presenters:** RIBON, Alberto (CERN); APOSTOLAKIS, John (CERN); IVANTCHENKO, Vladimir (CERN)

Contribution ID: 51

Type: **not specified**

## Hands on - Hadronics

- Hadronic: choose hadronic physics list + compare profile of pion shower to electron shower

**Presenters:** RIBON, Alberto (CERN); APOSTOLAKIS, John (CERN); IVANTCHENKO, Vladimir (CERN)

Contribution ID: 52

Type: **not specified**

## Hands on - multithreading

- Running in multi-threading mode

**Presenters:** APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN)

Contribution ID: 53

Type: **not specified**

## Recapitulation

*Friday, May 13, 2022 4:15 PM (1h 45m)*

- enjoy using the application that we developed together, compare the results with experimental data
- summary of the course and outlook

**Presenter:** NOVAK, Mihaly (CERN)

Contribution ID: 54

Type: **not specified**

## Preliminaries

*Monday, May 9, 2022 4:15 PM (1h 45m)*

- introduction of our work environment (i.e. the virtual machine installation, demystification of Geant4 install and CMake configuration, etc.)
- recapitulation of some object oriented concept of C++ crucial for the course (such as interface and their usage)

**Presenter:** NOVAK, Mihaly (CERN)



Contribution ID: 55

Type: **not specified**

## Checkin

Problems with Geant4 Virtual Machine ?

Issue with alternative Geant4 installation (for those with Mac computers with M1 processor.)

**Session Classification:** Preparation

Contribution ID: 56

Type: **not specified**

## Zoom check

**Session Classification:** Preparation

Contribution ID: 57

Type: **not specified**

## Lecturer Preparation