

**Geant4 tutorial course at  
Canadian Nuclear  
Laboratories**

**Report of Contributions**

Contribution ID: 1

Type: **not specified**

## Kernel I

*Monday, 26 August 2019 09:00 (45 minutes)*

- General introduction and brief history
- What's new in version 10
- Highlights of user applications
- Geant4 license
- Geant4 kernel – Basic concepts and kernel structure – User classes

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: 2

Type: **not specified**

## User documents and examples

*Monday, 26 August 2019 10:15 (30 minutes)*

Covers the Geant4 website, user guides, basic, extended and advanced examples, and where to get help.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 3

Type: **not specified**

## User interface I

*Monday, 26 August 2019 10:45 (30 minutes)*

- Command syntax
- Macro file
- G4UIExective

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: 4

Type: **not specified**

## Visualization I

*Monday, 26 August 2019 11:15 (30 minutes)*

- Visualization basics
- Major visualization drivers

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: 5

Type: **not specified**

## Scoring I

*Monday, 26 August 2019 13:00 (30 minutes)*

- Introduction to sensitivity
- Command-based scoring
- Add a new scorer/filter

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: 6

Type: **not specified**

# Physics I

*Monday, 26 August 2019 13:30 (1 hour)*

Geant4 physics lists: what they are and how to use them.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 7

Type: **not specified**

## Hands-on I

*Monday, 26 August 2019 15:00 (1h 30m)*

Hands-on instruction

**Session Classification:** Hands-on



Contribution ID: 8

Type: **not specified**

## Material definition

*Tuesday, 27 August 2019 08:15 (30 minutes)*

How materials are defined and how they can be used in an application.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 9

Type: **not specified**

# Geometry I

*Tuesday, 27 August 2019 08:45 (1 hour)*

- Introduction
- G4VUserDetectorConstruction class
- Solid and shape
- Logical volume
- Region
- Physical volume
- Placement

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: **10**

Type: **not specified**

## Primary particle

*Tuesday, 27 August 2019 10:15 (30 minutes)*

- Introduction
- Built-in primary particle generators – Particle gun – Interfaces to HEPEVT and HEPMC – General particle source
- Pre-assigned decay

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: **11**

Type: **not specified**

## Physics II

*Tuesday, 27 August 2019 10:45 (1 hour)*

Provides an overview of Geant4 physics, a discussion of physics processes and a description of secondary particle production thresholds.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 12

Type: **not specified**

## Physics III

*Tuesday, 27 August 2019 13:00 (30 minutes)*

Covers particle decays, optical photon interactions and solid state processes.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 13

Type: **not specified**

## Geometry II

*Tuesday, 27 August 2019 13:30 (1 hour)*

- Various ways of placing volumes – Parameterized volume – Replicated volume – Divided volume – Nested parameterization – Reflected volume – Assembly volume
- Touchable

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: 14

Type: **not specified**

## EM Physics I

*Wednesday, 28 August 2019 08:15 (45 minutes)*

An overview of Geant4 electromagnetic physics, with discussions of multiple scattering, energy fluctuations and atomic de-excitation.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 15

Type: **not specified**

## Geometry III

*Wednesday, 28 August 2019 09:00 (45 minutes)*

- Magnetic field
- Field integration and other types of field
- GDML/CAD interfaces
- Geometry checking tools
- Geometry optimization

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture



Contribution ID: **16**

Type: **not specified**

## **EM physics II**

*Wednesday, 28 August 2019 10:15 (45 minutes)*

Low energy electromagnetic physics processes and models in Geant4 and how to use them.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 17

Type: **not specified**

## Scoring II

*Wednesday, 28 August 2019 11:00 (45 minutes)*

- Define scorers in the tracking volume
- Accumulate scores for a run
- Sensitive detector vs. primitive scorer
- Basic structure of detector sensitivity
- Sensitive detector and hit
- Touchable
- Use of G4HCofThisEvent class

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: **18**

Type: **not specified**

## **EM physics III**

*Wednesday, 28 August 2019 13:00 (45 minutes)*

A detailed discussion of how ionization, bremsstrahlung, multiple scattering and transportation compete to limit step size and choose an interaction.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: **19**

Type: **not specified**

## Hadronic physics I

*Thursday, 29 August 2019 08:15 (45 minutes)*

An overview of Geant4 hadronic physics and discussions of precompound and intranuclear cascade models.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: **20**

Type: **not specified**

## User interface II

*Thursday, 29 August 2019 09:00 (45 minutes)*

- Mechanism of UI command
- Defining basic UI command
- Defining complex UI command
- G4GenericMessenger
- UI command in multithreaded mode

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: 21

Type: **not specified**

# Multithreading I

*Thursday, 29 August 2019 10:15 (45 minutes)*

- Introduction
- Multithreading in Geant4 : the basics
- UI commands for multithreading

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: 22

Type: **not specified**

## Hadronic physics II

*Thursday, 29 August 2019 11:00 (45 minutes)*

A discussion of hadron elastic models, low energy neutrons, ion-ion models, capture, stopping and fission.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 23

Type: **not specified**

## Analysis

*Friday, 30 August 2019 08:15 (30 minutes)*

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture



Contribution ID: 24

Type: **not specified**

## Hadronic physics III

*Thursday, 29 August 2019 13:00 (45 minutes)*

A discussion of QCD string models, gamma- and lepto-nuclear models and radioactive decay.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 25

Type: **not specified**

## Geometry IV

*Thursday, 29 August 2019 13:45 (45 minutes)*

- Parallel geometry
- Layered mass geometry
- Moving objects

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: 26

Type: **not specified**

## Event biasing

*Friday, 30 August 2019 08:45 (45 minutes)*

A discussion of specific biasing options, including reverse Monte Carlo, and the general Geant4 biasing framework.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 27

Type: **not specified**

## Visualization II

*Friday, 30 August 2019 09:30 (15 minutes)*

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: 28

Type: **not specified**

## Choosing a Physics List

*Friday, 30 August 2019 10:15 (30 minutes)*

Tips on choosing a physics list and validating it.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture

Contribution ID: 29

Type: **not specified**

## Kernel II

*Friday, 30 August 2019 10:45 (1 hour)*

- User limits
- Attaching user information to G4 classes
- Fast simulation (a.k.a. shower parameterization)
- Stacking mechanism

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: **30**

Type: **not specified**

## Multithreading II

*Friday, 30 August 2019 13:00 (30 minutes)*

- The challenge of MT : thread safety
- Reading input file in multithreaded mode

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: 31

Type: **not specified**

## How to update your Geant4 installation

*Friday, 30 August 2019 13:30 (30 minutes)*

Tips on upgrading to the latest Geant4 version and where to get help.

**Presenter:** WRIGHT, Dennis (SLAC)

**Session Classification:** Lecture



Contribution ID: 32

Type: **not specified**

## Q/A and closing remarks

*Friday, 30 August 2019 14:00 (30 minutes)*

**Presenter:** ASAI, Makoto (SLAC)

**Session Classification:** Lecture

Contribution ID: **33**

Type: **not specified**

## **Hands-on II**

*Tuesday, 27 August 2019 15:00 (1h 30m)*

Hands-on instruction

**Session Classification:** Hands-on

Contribution ID: **34**

Type: **not specified**

## **Hands-on III part 1**

*Wednesday, 28 August 2019 13:45 (45 minutes)*

Hands-on instruction

**Session Classification:** Hands-on

Contribution ID: 35

Type: **not specified**

## **Hands-on III part 2**

*Wednesday, 28 August 2019 15:00 (1h 30m)*

Hands-on instruction

**Session Classification:** Hands-on

Contribution ID: **36**

Type: **not specified**

## **Hands-on IV**

*Thursday, 29 August 2019 15:00 (1h 30m)*

Hands-on instruction

**Session Classification:** Hands-on