



Educational goals

ERROR Summer School

Dosimetry evaluation in pediatric ionizing radiation protocols with Monte Carlo techniques and anthropomorphic phantoms

May 30-31, 2019 |

University of Patras, Department of Medical Physics,
Rion, Greece

- To learn the clinical value of internal and external dosimetry
- To understand the recent techniques (Monte Carlo simulations and computational anthropomorphic models) applied in pediatric imaging and therapy applications for dosimetry purposes
- To learn the usage of the GATE platform for dosimetry applications

Program

Attendees: Interested scientists (researchers, BSc, MSc, and PhD students) should directly contact the Summer School organizer Dr. George Kagadis (gkagad@gmail.com)

Day 1 | Thursday May 30, 2019

9:00 – 9:15 am

Welcome – short introduction and an overview of the program

G. Kagadis

9:15 – 10:00 am

Introduction to Nuclear Medicine (General concepts – imaging techniques – radiopharmaceuticals)

N. Papathanasiou

10:00 – 10:30 am

Internal and external dosimetry in medical imaging and radiotherapy applications

G. Kagadis

10:30 – 11:00 am

Break

11:00 – 11:30 am

Introduction to Monte Carlo Simulations and Evolution of Anthropomorphic Phantoms. (Dosimetry Applications in GATE)

P. Papadimitroulas

11:30 – 1:00 pm

Presentation of GATE toolkit – how to run a simulation and macro file description (GATE benchmarks)

P. Papadimitroulas

1:00 – 2:30 pm

Break

2:30 - 4:00 pm

General concepts for Dosimetry

- Description of a dosimetry macro file and input files
- Visualization
- Description of Actors – How to use actors
- How to import Sources
- How to import Phantoms – (e.g. pediatric models)
- Examples

K. Chatzipapas

Lab: T. Kostou – D. Plahouris

4:00 - 5:00 pm

Define and use of dose actor (ImageJ & Matlab)

Exercise 1: Understand the principles of MC dosimetry.

T. Kostou

Lab: D. Plahouris – K. Chatzipapas

Day 2 | Friday May 31, 2019

9:15 – 11:30 am

Dosimetry in Nuclear Medicine

- How to create and integrate an Anthropomorphic Phantom in the simulation (.mhd)
- How to define activity maps (activity distribution)
- How to define attenuation maps (organ definition)
- How to import clinical CT/SPECT data in the simulations

Exercise 2: Calculation of Dose/organ in a pediatric model (calculation of S-value)

D. Plahouris

Lab: P. Papadimitroulas – T. Kostou – K. Chatzipapas

11:30 – 12:00 pm

Break

12:00 – 2:00 pm

Dosimetry in CT applications

- Modeling of CT scanner: Description of a macro file and input files
- Definition of the spectrum and helical motion

Exercise 3: Dosimetry calculation in a realistic CT pediatric irradiation

T. Kostou

Lab: D. Plahouris – K. Chatzipapas

2:00 – 3:00 pm

Break

3:00 - 5:00 pm

Dosimetry in external Radiotherapy

- Definition of a LINAC spectrum / beam

Exercise 4: Irradiation of a phantom box with different media

K. Chatzipapas

Lab:P. Papadimitroulas – T. Kostou – D. Plahouris

5:00 - 5:30 pm

Summer School closing remarks

G. Kagadis, P. Papadimitroulas, K. Katsanos, D. Karnabatidis