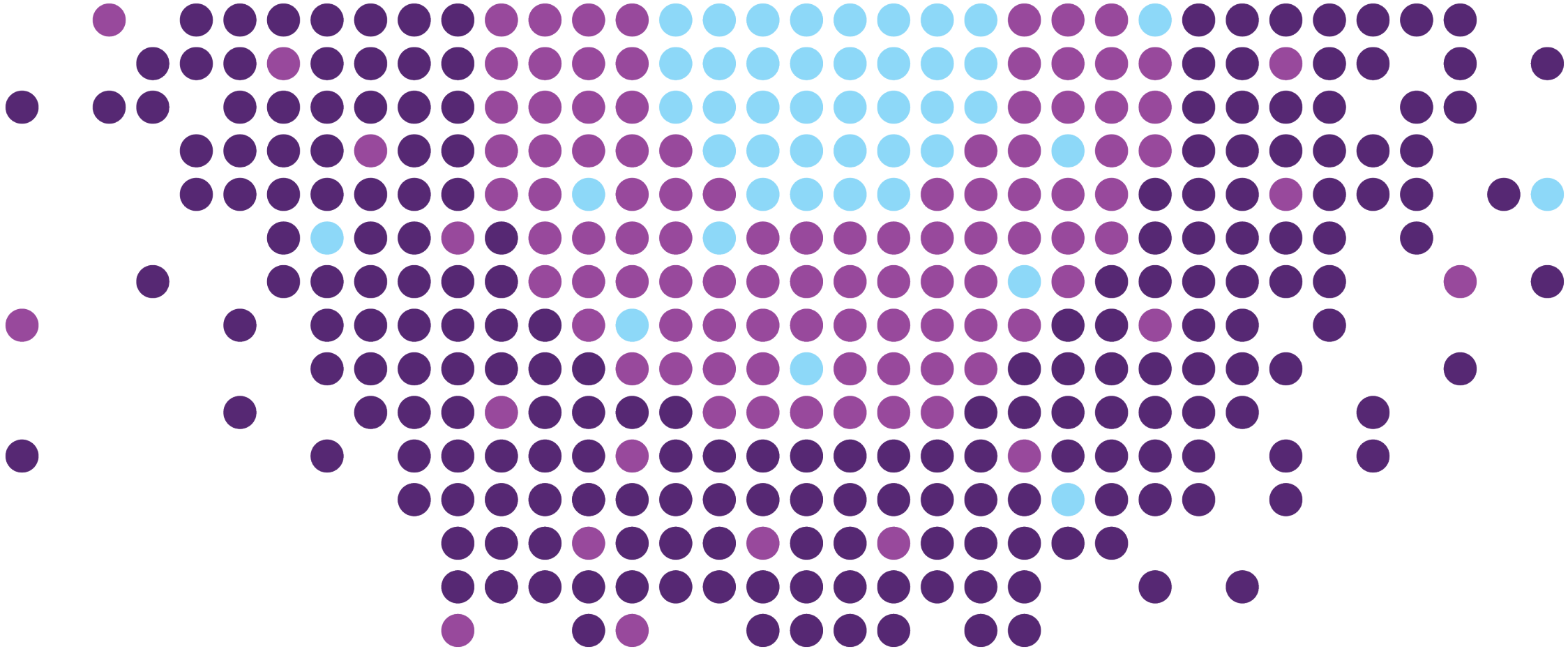


sck cen
Belgian Nuclear Research Centre

Filip Vanhavere- 20/10/2022

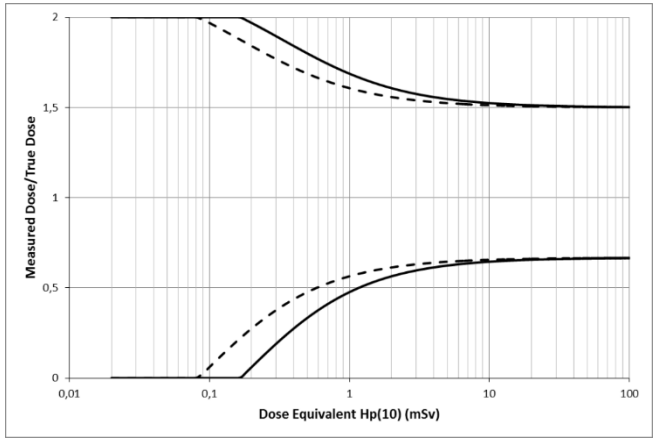
The PODIUM project: Personal Online Dosimetry using Computational Methods

Agenda Webinar PODIUM

- Introduction of PODIUM + general set-up - *Filip Vanhavere*
- Fast Monte Carlo methods for interventional radiology - *Maria A. Duch*
- Feasibility of PODIUM in Interventional Radiology and Interventional Cardiology - *Una O'Connor*
- Application of the PODIUM approach in simulated and realistic workplace neutron fields - *Jon Eakins*

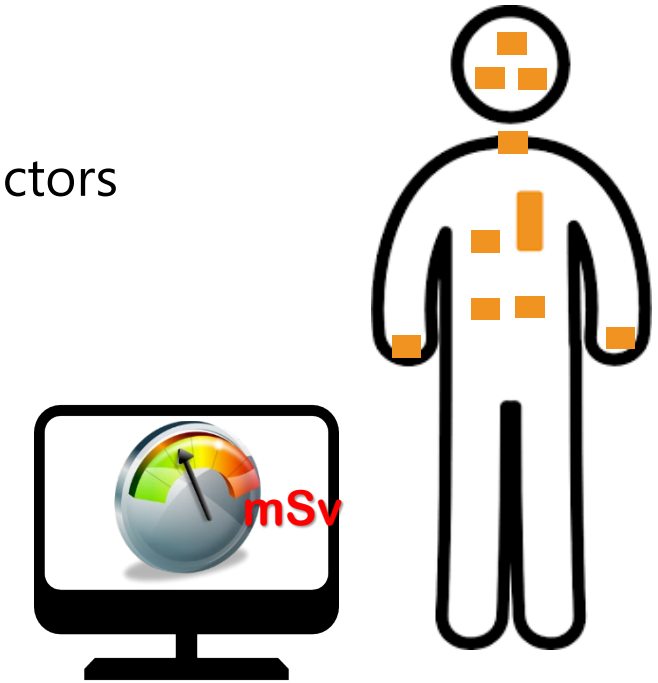
Problems with individual dosimetry

- Workers don't like to wear a dosemeter
- Workers especially don't like to wear more than one dosemeter
- Still not all parts of body covered
  - What if other parts of body need dosimetry in future (brain, heart,…)?
- Not always strict use of dosemeters:
  - Forgetting
  - Not correct place
  - Loosing dosemeter
- Large uncertainties in personal dosimetry



Personal Dosimetry: what brings the future?

- May be no need for physical dosimeters?
- Suppose we can use Monte-Carlo simulations to calculate on-line all doses
- Advantages:
  - No more need for physical dosimeter
  - No more loosing dosimeters
  - No more need for operational quantities
  - No more worries for changing quantities/weighting factors
  - Doses to all organs can be known
  - Personalized dosimetry possible
  - Better accuracy possible
  - Faster feedback to workers
  - ….

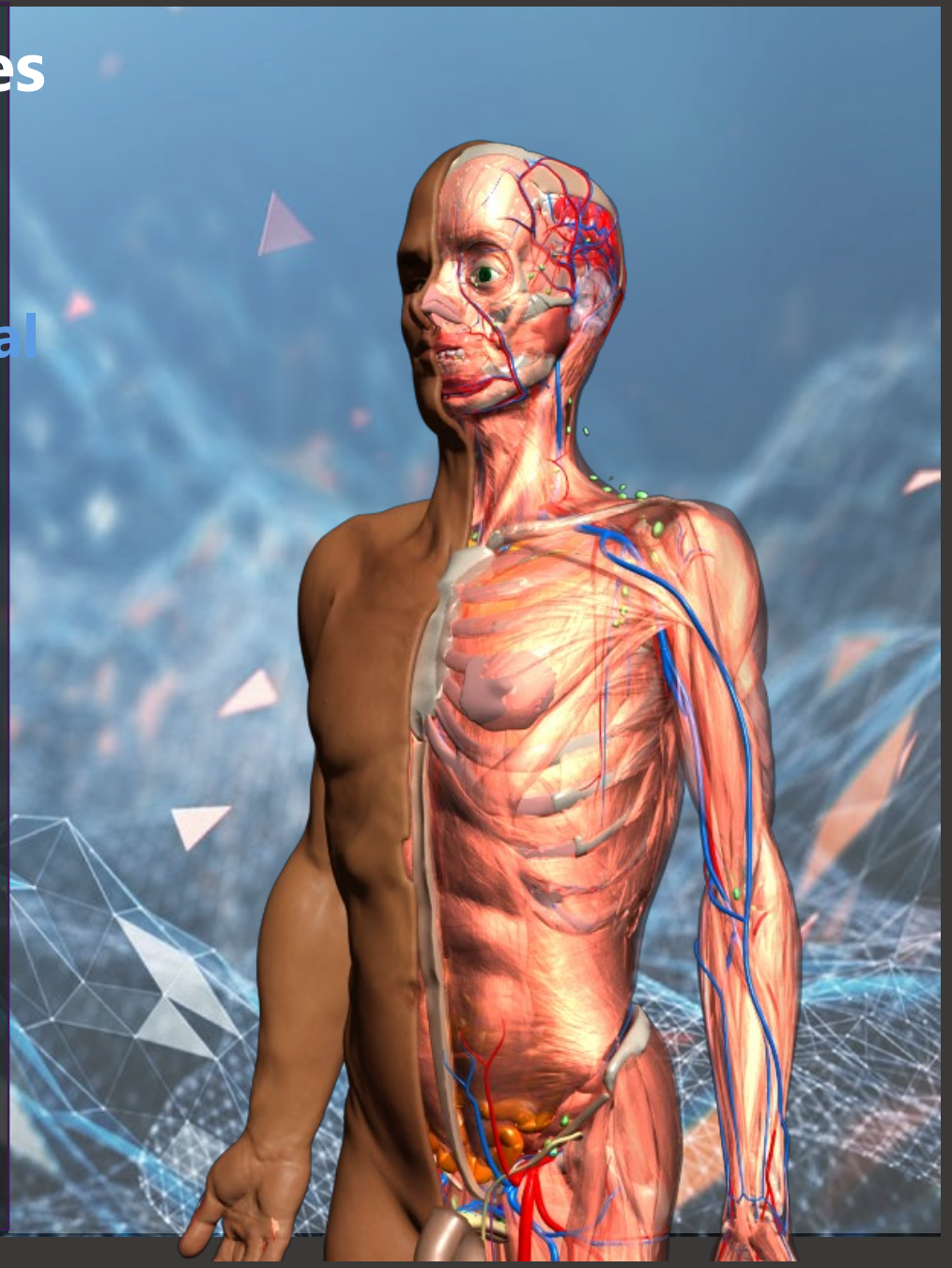


PODIUM: Personal Online DosImetry Using computational Methods

- Euratom project: CONCERT 2nd Call
- 24 months, 2018-2020
- 7 partners: SCK•CEN (Belgium), UPC (Spain/Catalunya), HMGU (Germany), LU (Sweden), PHE (UK), EEAE (Greece), SJH (Ireland)
- Improve occupational dosimetry via an online dosimetry application using computer simulations: without the use of physical dosemeters
- Apply and validate the methodology for two situations where improvements in dosimetry are urgently needed: neutron workplaces and interventional radiology

FEASIBILITY STUDY

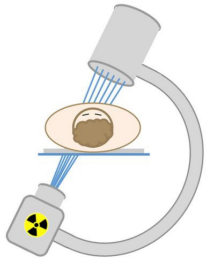
Exploiting most advanced technologies



Dose Simulations Input

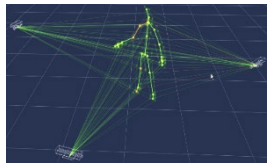
Motion Tracking

Staff movement monitoring and Radiation field mapping

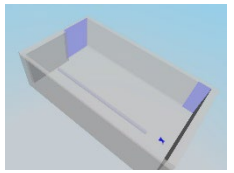


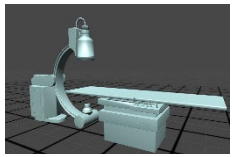
Radiation Source Input

Motion Tracking Input



Geometry Input



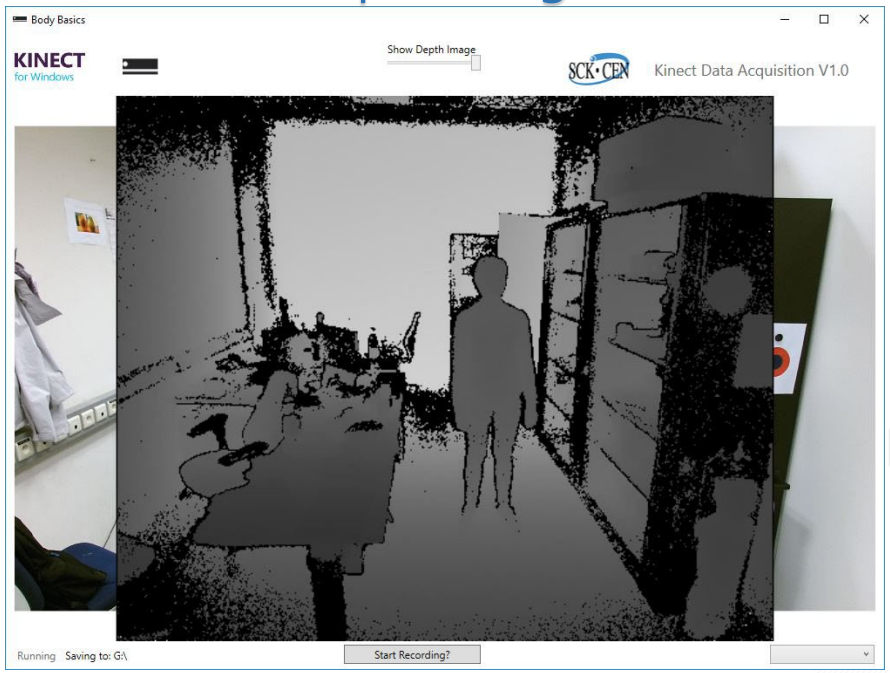


Dose Calculation

Staff Motion Tracking

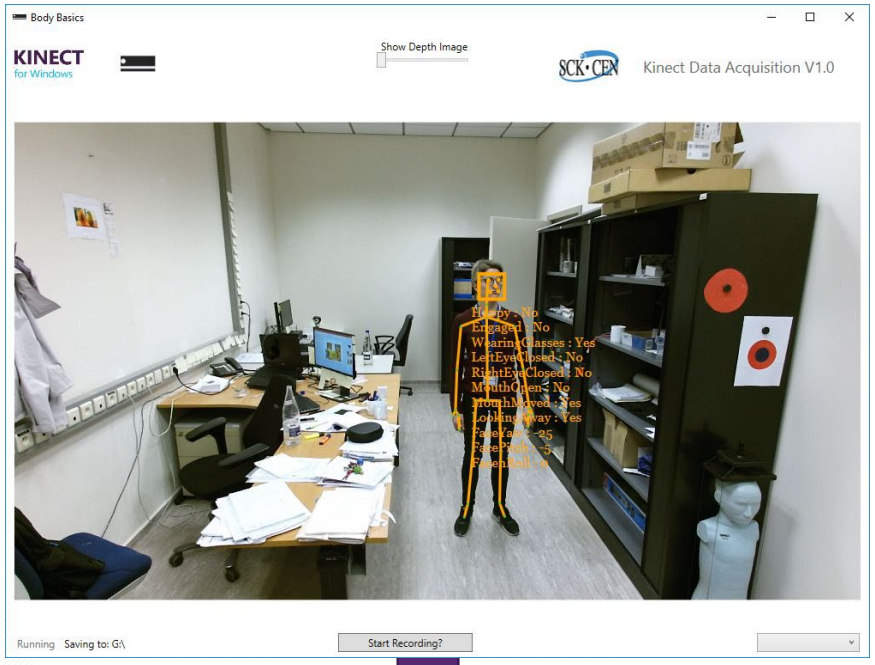
Tracking system based on single depth camera

Depth Image



Real-time processing

Skeleton Tracking



Storing XYZ coordinates or send to a cloud

RAF: Realistic Anthropomorphic Flexible Phantom

- Polygonal Mesh Boundary Representation
- Organ and tissue masses adjusted according to ICRP 89
- Computational model with 2900 tissues segmented
- Dosimetric validation in comparison with ICRP 116

Development and Validation of the Realistic Anthropomorphic Flexible (RAF) Phantom

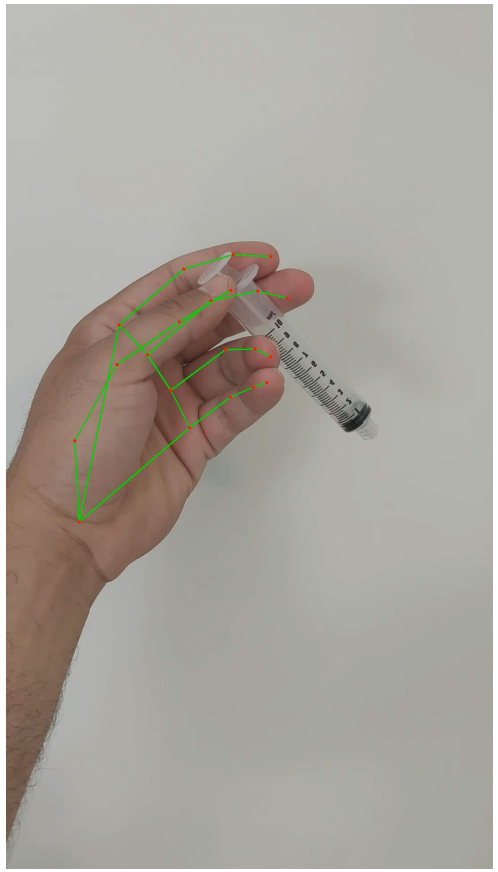
Lombardo, Pasquale A.; Vanhavere, Filip; Lebacq, Anne L.; Struelens, Lara; Bogaerts, Ria

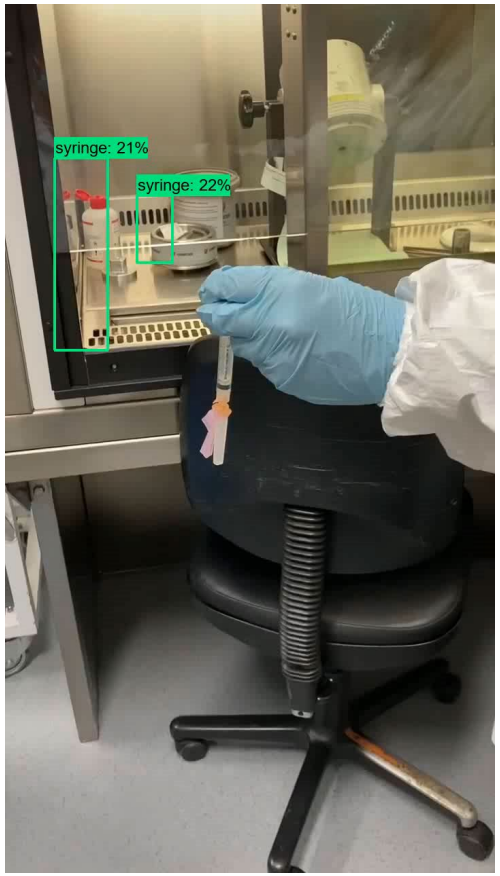
Health Physics, Volume 114 (5) – Jan 1, 2018

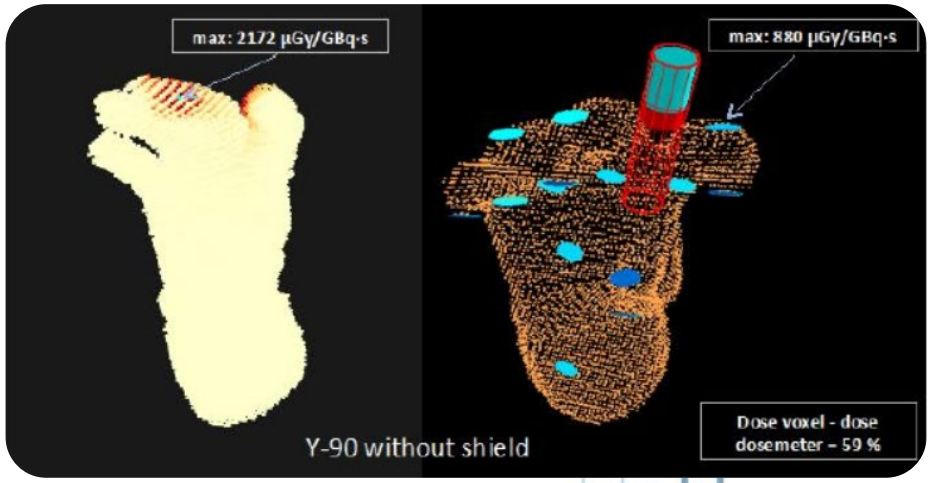
PODIUM Team

PODIUM is part of the CONCERT project. This project has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 662287.

Why improve dosimetry service for **nuclear medicine** staff?

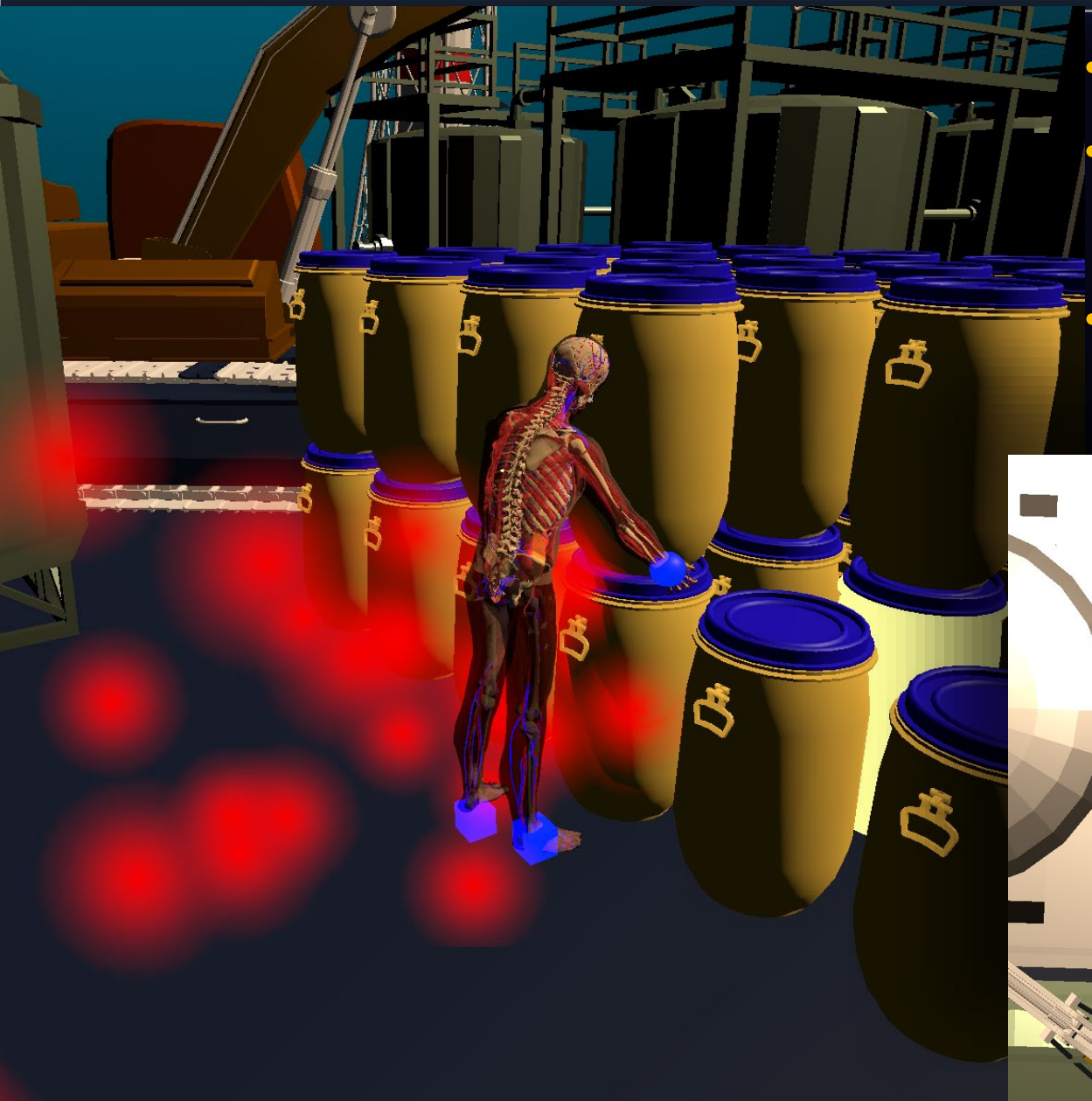






This project has received funding from the Euratom research and training programme 2019-2020 under grant agreement No 945196

ALARA planning and training tool



- **Accurate** MC simulations using flexible phantoms
- **Planning and analysis** dosimetry tool visualizing data in Virtual Reality environment
- **Neural Network** based framework for optimizing dose calculations