

Scientific visit at the SCK CEN

11th-15th March, Mol, Belgium

I visited Filip Vanhavere's research group at the SCK CEN in Belgium between the 11th and 15th of March in 2024. During this time, I had the opportunity to learn a lot about Monte Carlo radiation transport simulations in the context of interventional radiology.

On my first day, after my arrival, security check and safety briefing, I was kindly introduced to the Monte Carlo simulations performed within the PODIUM project. The PODIUM project was funded by the European Union and aimed to identify and solve problems in radiation protection of interventional radiology staff for human medicine. As part of this project, the researchers realised that the use of dosimeters was not sufficient to estimate the organ doses of employees. They therefore wanted to introduce a dosimeter-free method for radiation monitoring, known as computational dosimetry. For this approach, they developed a Monte Carlo simulation for various backend implementations such as PHITS or Geant4. As I am currently using Monte Carlo simulations based on Geant4 to generate data for my PhD thesis, these insights have already helped me a lot.

Coincidentally, my visit to SCK CEN was even enhanced on my second day, as some other members of EURADOS from Spain and England arrived for a visit for the remainder of the week. The reason for their visit was to learn how to model RAF phantoms using Blender and TinyCAD and then load them into Geant4. So from the third day onwards, I occasionally attended the EURADOS group courses to learn more about the simulations and share my own experiences. Outside of this course, I was kindly supported in implementing the knowledge I had acquired. Specifically, I was helped with two things: First, in developing a method to estimate the statistical error of my simulations considering the spatial resolution of my voxelised fluences. Secondly, with runtime optimisations of the Monte Carlo simulation itself. I was supported with the knowledge of which parameters and physical effects are useful for this particular application and which effects can be neglected. My visit ended with this result on Friday the 15th, the last day of my visit. All in all, this visit helped me a lot with my own research and I will stay in contact with the members of this working group to continue learning from them.