

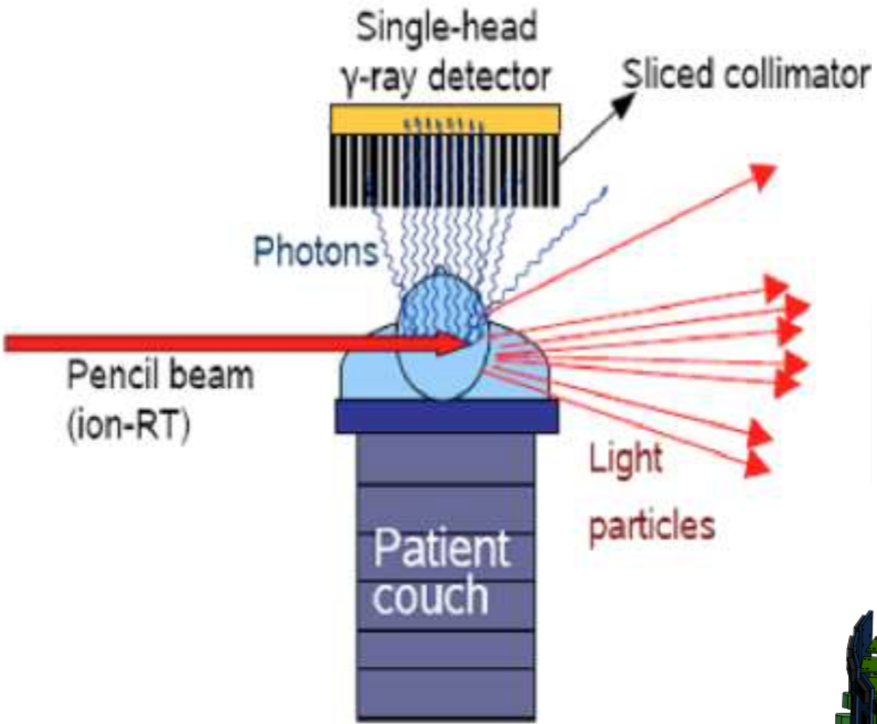
OR-Imag

1. OrthoCT (Orthogonal Computed Tomography for Megavoltage X-Ray Therapy)
2. OPGI (Orthogonal Prompt-Gamma Imaging for Proton Therapy)
 - 2.1 Coaxial detector for detection of forward particles for monitoring proton therapy
3. TPPT (In-Beam TOF-PET for Proton Therapy)
4. TMS (Deep and Whole-Brain Transcranial Magnetic Stimulation)

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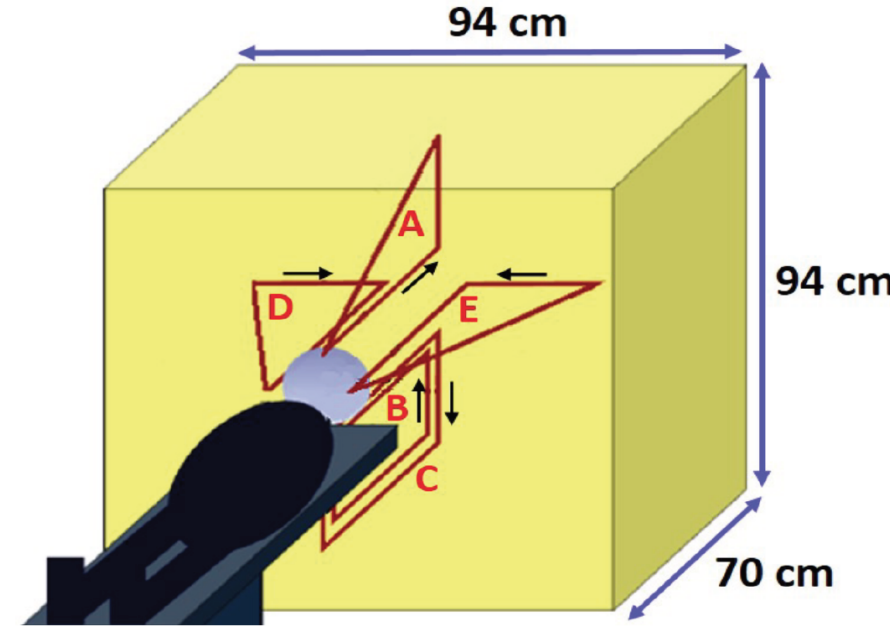
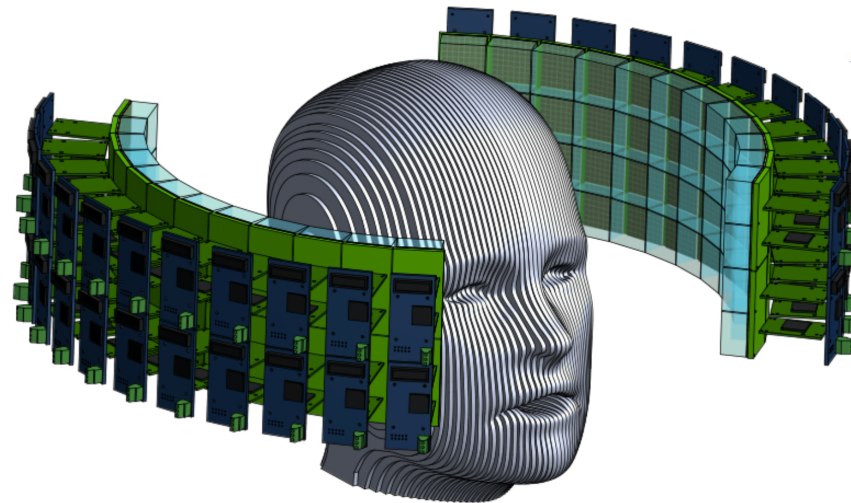


OR Imag: the concepts



OrthoCT and OPGI

TPPT



TMS

OR Imag: small-scale detector for OrthoCT and OPGI

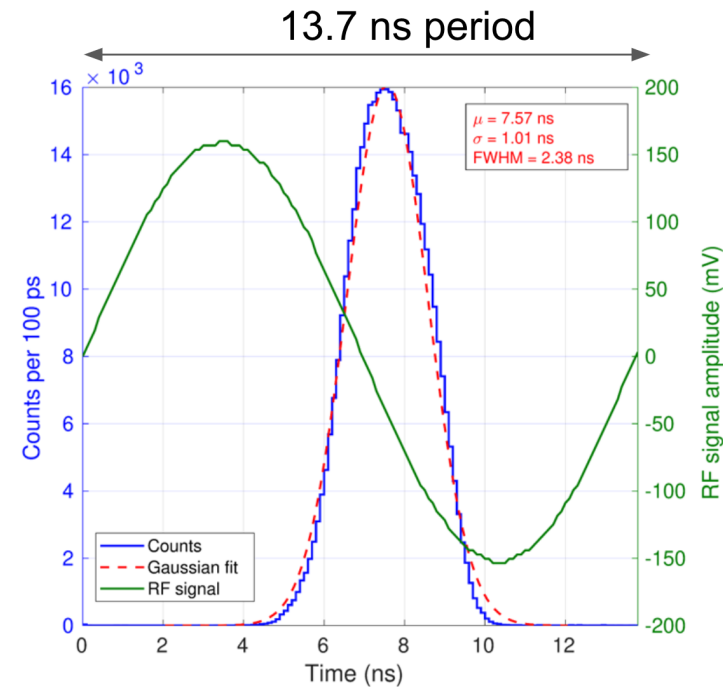
Small-scale OPGI detector (3 scintillator slices, interleaved with 4 tungsten blades) already **tested in-beam** (proton therapy facility at HollandPTC, Delft, The Netherlands).

- Result: lack of shielding due to **contamination** of particles **from the beam window**: **inconclusive Bragg peak profile**.

- To be repeated after new, ongoing **Monte Carlo** is finished (including beam line and its **shielding**)

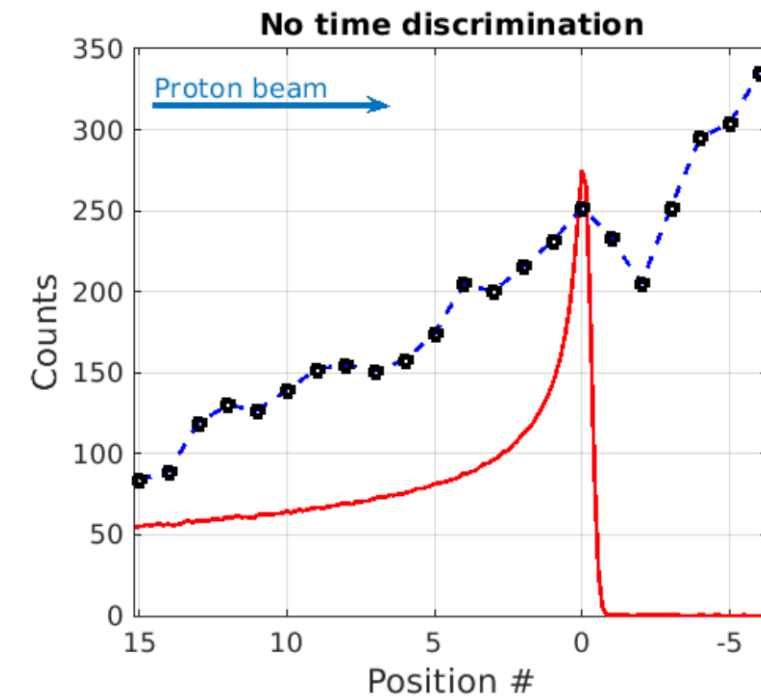
- Completed master/degree theses:

- Gegimma José, 2025
- Maria Coelho, 2025
- José Freitas, 2025
- David Mendes, 2025



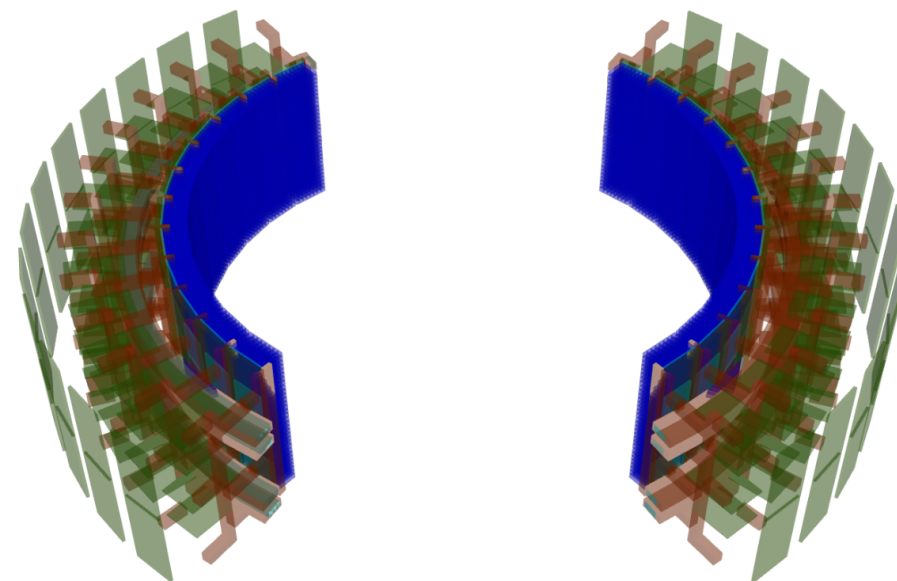
Bunch time spread: 2.38 ns FWHM

New information even for
HollandPTC staff



OR Imag: TPPT

- **TPPT scanner constructed and tested at the MD Anderson Cancer Center (TX, USA)**
 - Characterisation results are being processed (paper to be submitted soon)
 - Our group is in charge of all Monte Carlo simulations
- **Ongoing activities (MC simulations):**
 - Design of an **in-beam PET / PGI** system based on TPPT scanner (startup company is involved)
 - Design of a **flat-panel PET** scanner
 - Optimization of **DoI reconstruction** + experimental validation
- Completed Master thesis:
[Marta Simões, 2025](#)

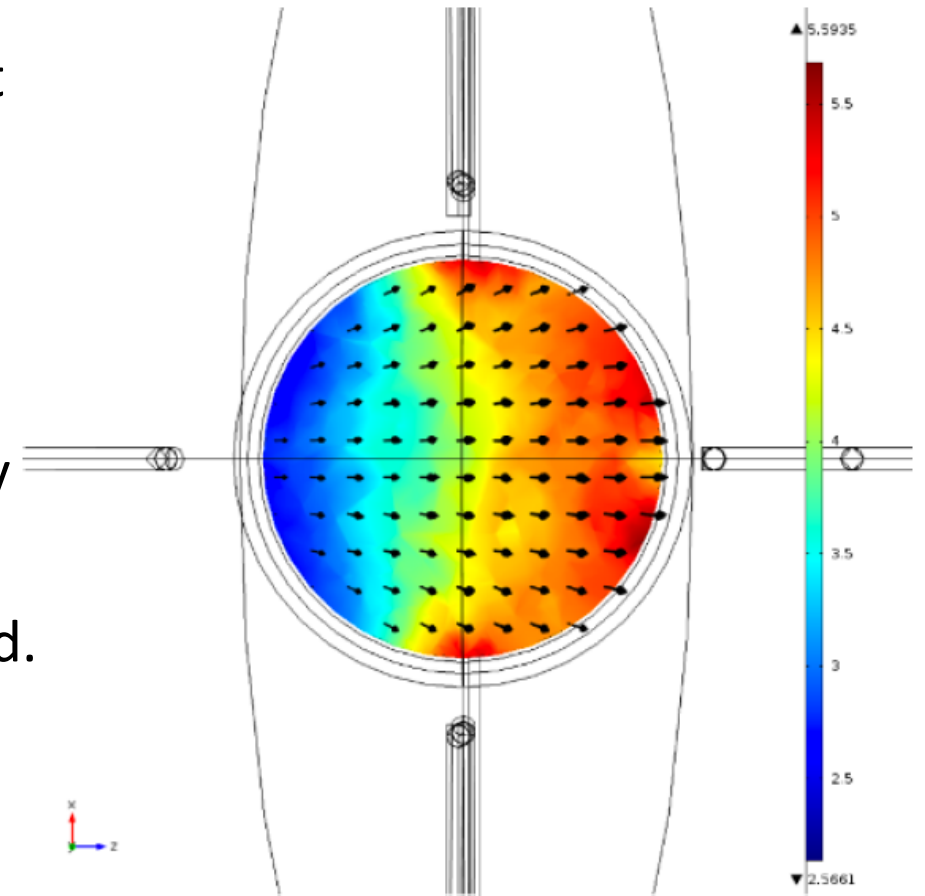


Recent highlights:

- Geant4's UNIFIED model correction suggested:
A. Morozov JINST 20 **2025** P05021
- Ants3 official release:
A. Morozov et al, Comp Phys Comm 318 **2026** 109869

OR Imag: Deep- and Whole-Brain TMS

- **Transcranial magnetic stimulation (TMS)** with **first-time** achievement of **71% relative induction at brain center**, according to simulations with COMSOL Multiphysics AC/DC.
- Plethora of **applications in neurology** (paper to be published under internal revision). Team of epilepsy at Coimbra University Hospitals already contacted and acknowledged potential usefulness in their field.
- Exploratory project **funding applied**, aiming at the construction of an experimental demonstrator.
- Patent to be requested.



(a) Axial view: $\text{Max } \vec{J} = 5.59 \text{ A/m}^2$. $\text{Min } \vec{J} = 2.57 \text{ A/m}^2$.

OR Imaging: SWOT analysis

Strengths

- Deep understanding and practical knowledge of Monte Carlo simulation methods
- Strong expertise in simulations for health applications
- Well developed suit of custom software tools for simulation, optimization and data processing
- Access to the LIP workshop and detector lab for prototype development

Weaknesses

- Small team with little of the FTE of the senior staff allocated for research
- Lack of PhD students
- Absence of a Proton Therapy facility in Portugal or in close vicinity in Spain

Opportunities

- More than ten Charged Particle Therapy facilities to be constructed in Spain in the next 3 to 5 years (**patients 2027**)
- The first Proton Therapy center in Portugal (IPO-Porto) is under construction (**patients 2029**)
- Potential synergies to exploit with other LIP groups (e.g. RADART)

Threats

- Fixed time work contract of one of the key researchers
- Lack of consecutive funding