

# H2I2: Hybrid High-precision in-vivo imaging in Particle Therapy

Design an innovative integrated delivery and monitoring system for particle therapy

## Current status of progress:

% of deliverables completed so far: ~70%

% of budget (100 kEUR) spent so far: 65%

Any remaining uncertainties w.r.t planned deliverables

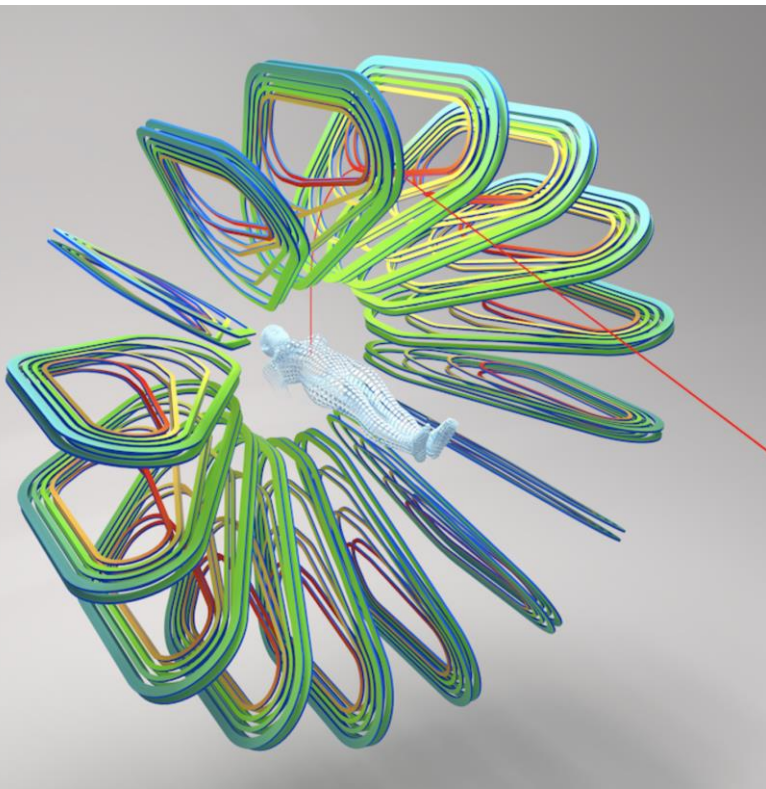
- No
- Yes

## Using students (PhD/MSc/BSc) in the project?

- No
- Yes

## Any interactions with other funded ATTRACT projects so far?

- No
- Yes; (GEMPIX...)



## If your project were to be selected for ATTRACT Phase 2:

**How would your technology scale up to become an industrial product/system?**

Construction of a prototype scalable to an industrial product.

**With who you would need to partner for this to happen? (No names, just profiles of type of organizations)**

Particle therapy facilities and companies that build gantries.

**Have you already discussed this with KT Group?**

Yes

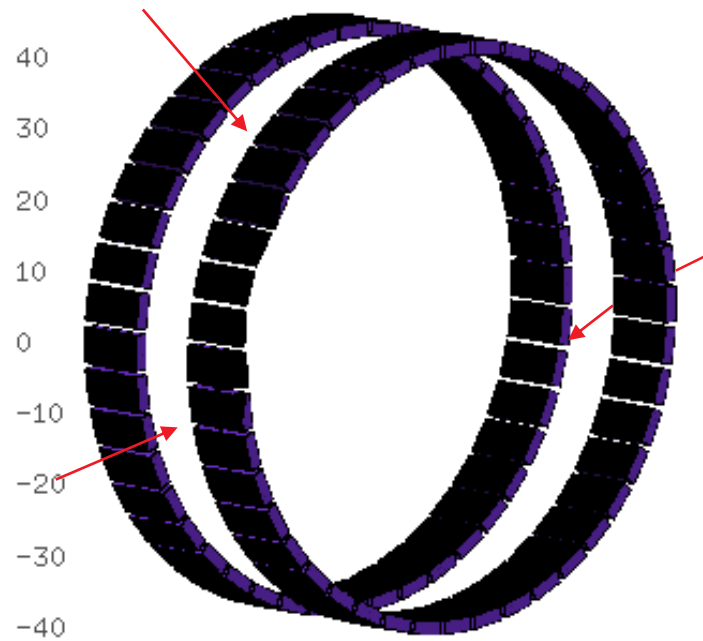
**What applications will you demonstrate with value for science, industry and society? (Examples)**

Science: HTS development; Medicine: faster, cheaper, possibly more effective and precise delivery of particle therapy

**Any comments, remarks or observations you would like to make to CERN?**

Possible extension request due to CoViD-19 (not foreseen until last week)

**Additional slides**

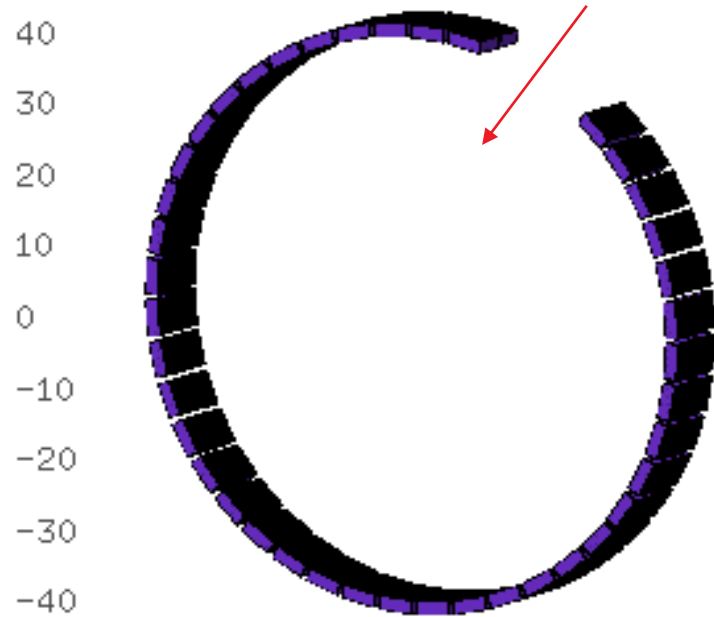


**Proposed geometry 1**

Dual ring open PET test geometry (FLUKA simulation study)

- 80 cm diameter
- 2 rings separated by a gap of width to be decided (optimization study)
- Gantry exit windows contained within the gap length
- Each ring: 44x2 detector modules (176 module tot)
- Each module: 16x16 pixelated LYSO crystals (about 5x5 cm<sup>2</sup>)

# PET geometry study



**Proposed geometry 2**

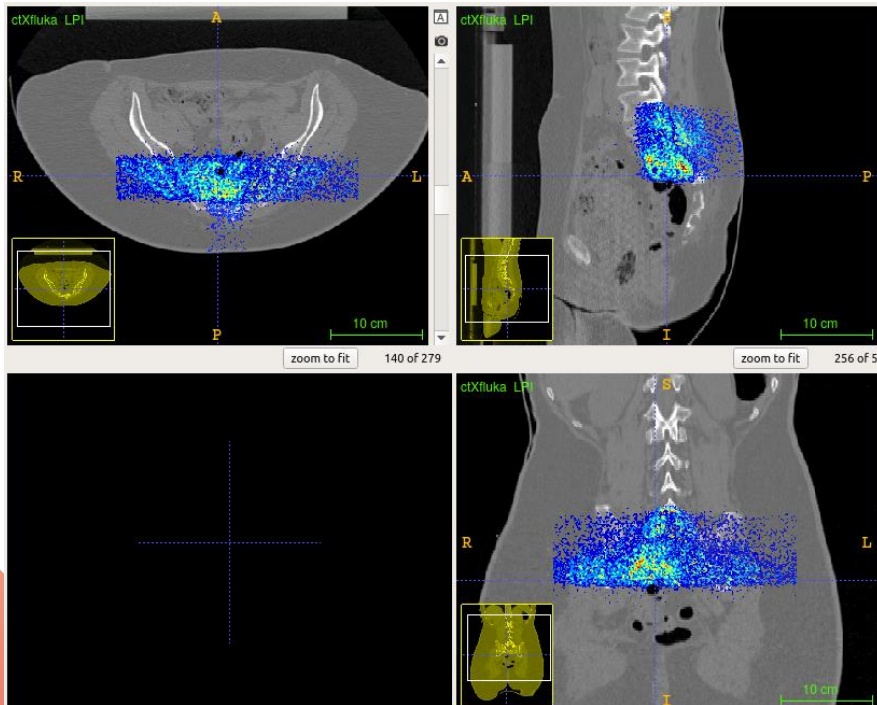
Single ring open PET test geometry (FLUKA simulation study)

- 80 cm diameter
- 1 ring ideally on a moving structure, with an open entry for the beam
- 41x2 detector modules (82 module tot – or more)
- Each module: 16x16 pixelated LYSO crystals (about 5x5 cm<sup>2</sup>)

...image quality assessment under investigation. In the meanwhile...

# Gantry beam simulation

FLUKA simulation of the CNAO horizontal and vertical lines to mimic a possible GaToroid delivery



Prescription: 64 Gy(RBE), 16 fractions, C-12

3 fields:

- Vertical line (couch angle 180)
- Horizontal line (couch angle 180)
- Horizontal line (couch angle 0)

MC truth (i.e. does not take into account image artifacts)

# Compact gantry study and prototyping

- The study of the compact magnet has progressed to consider quench protection and mechanical support
- Prototyping is on-going
  - First test winding completed
  - Conductor and insulation configuration is being tested
  - Conductor procurement for demonstrator has started



Protection circuit for the full toroid

