



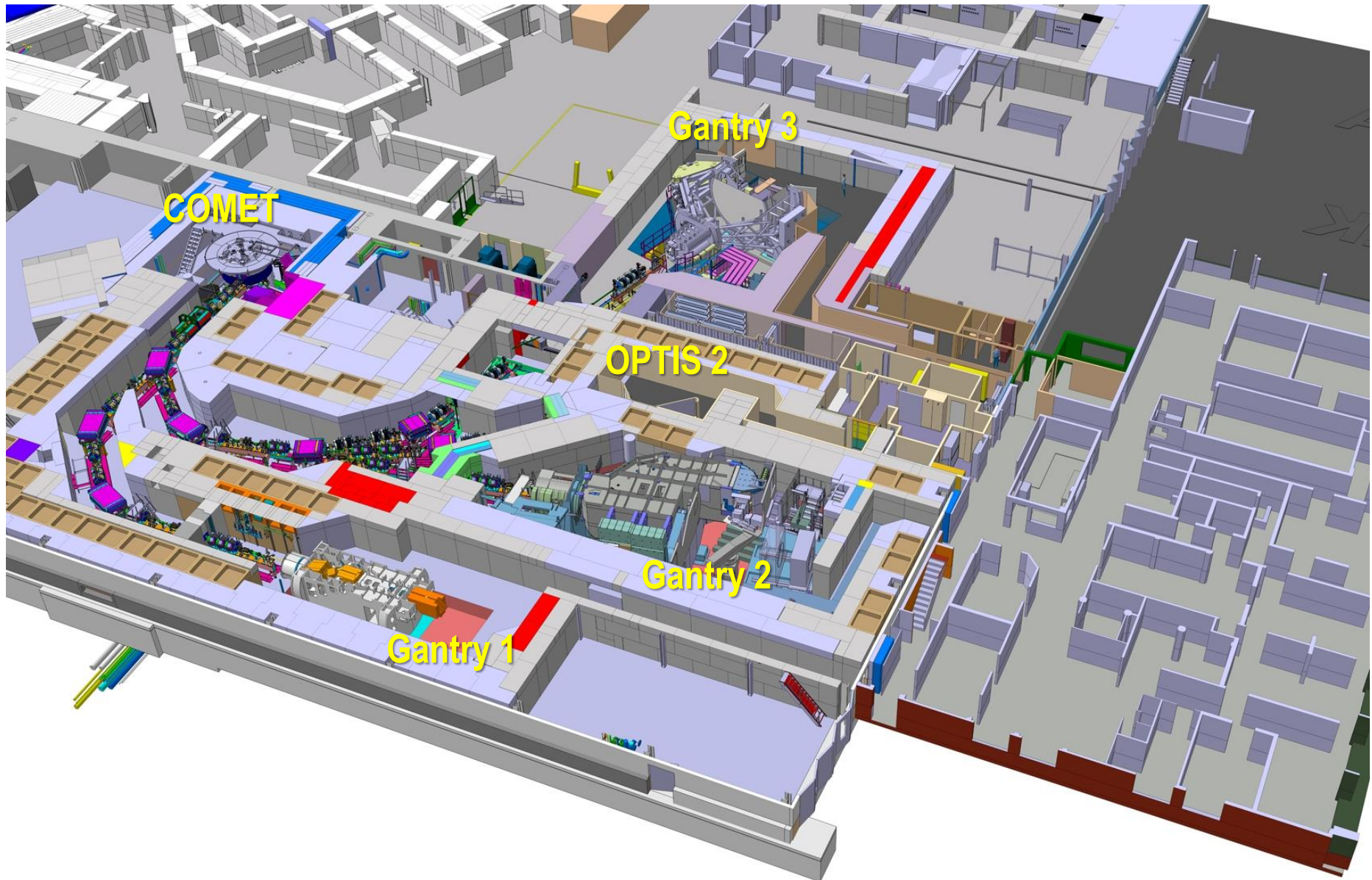
Proton Therapy at PSI

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Paul Scherrer Institute

PSI Workshop: Superconductivity and other new Developments in Gantry Design
for Particle Therapy

19 September 2015

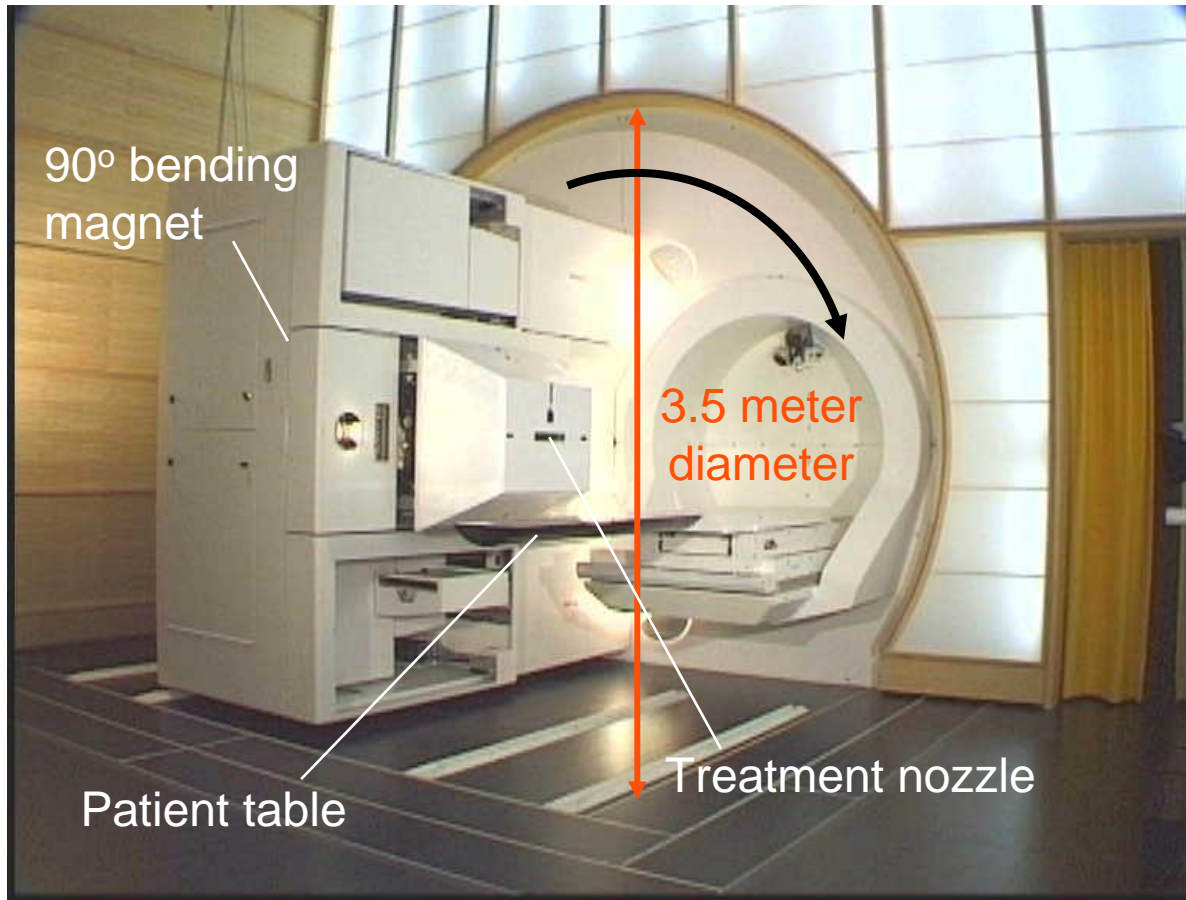


A success story ...

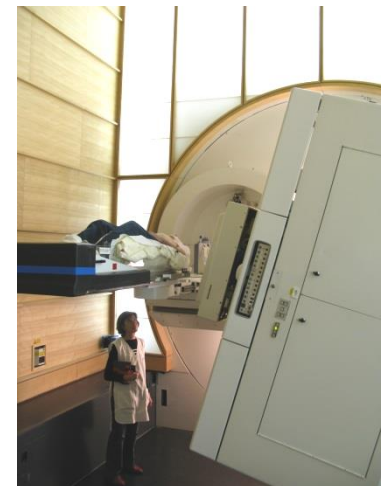


- Eye irradiations of uveal melanomas at PSI since 1984 with more than **6500 patients** treated
- Upgraded facility (OPTIS2) in operation since February 2010
- Typically 4.8 patients a day, ~200-220 a year
- Tumour control rate of 98%!

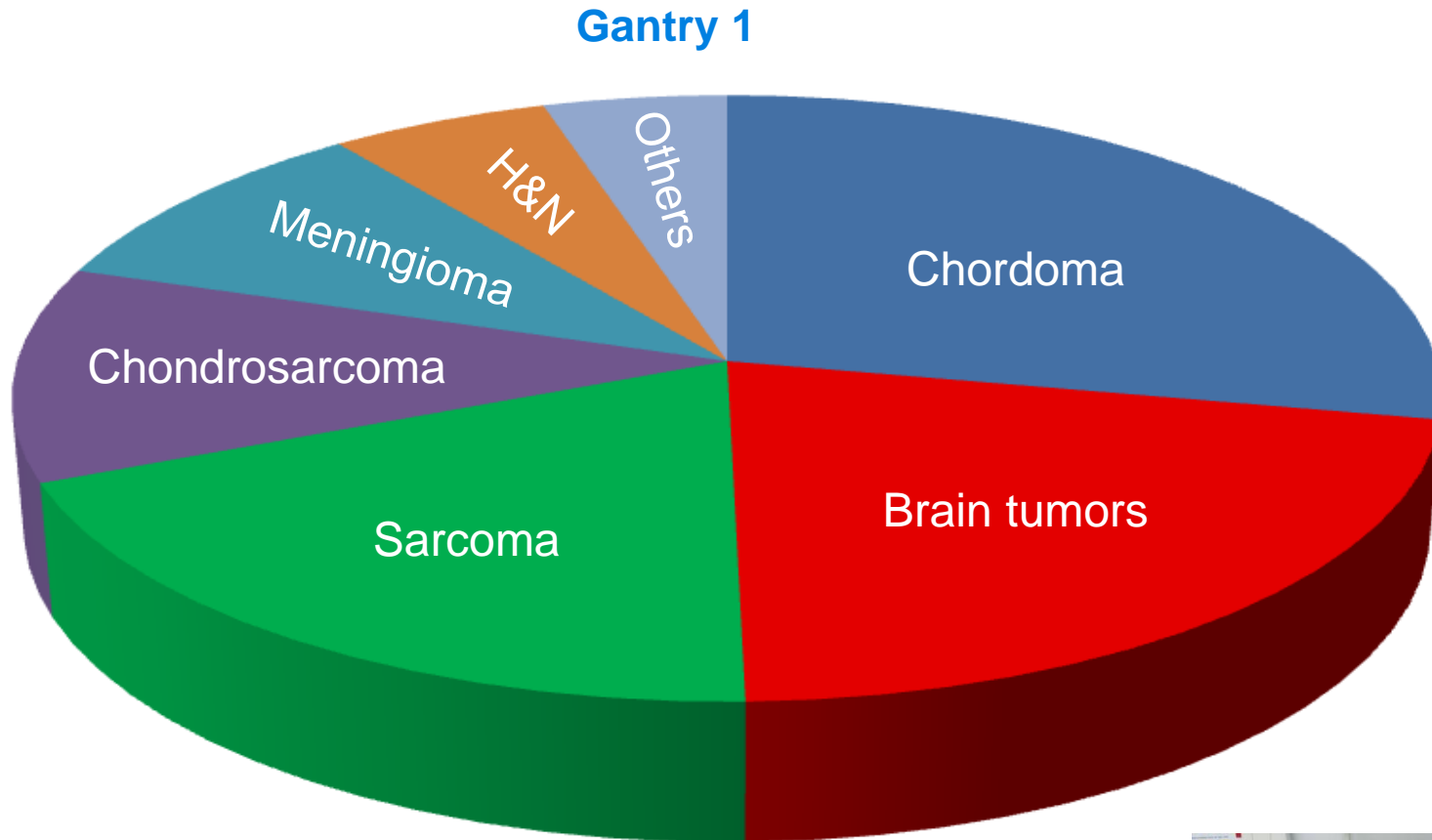
Gantry 1



- 3.5m diameter, eccentric gantry
- +/-180 degree rotation
- Start of patient treatment 1996
- 16-18 patients a day, 120 per year
- **>1000 patients treated**



Treatment of deep seated tumours



1044 patients treated, 394 of them children

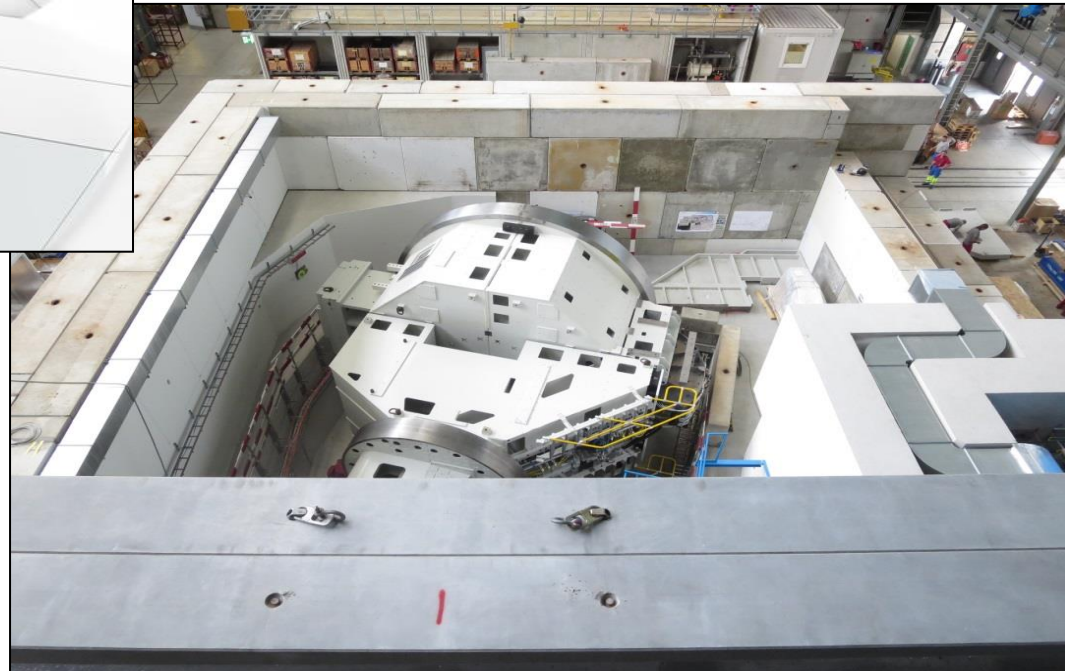


Gantry 2



- 7m diameter
- Fast, 3D scanning (e.g. ~80ms energy changes)
- In-room CT imaging and in-line X-Ray imaging
- First patient, November 2013
- Currently 4.5 patients a day, but this will increase
- **39 patients** treated by end of August 2015

... and now Gantry 3



A Varian PROBeam PBS Gantry

2x Siemens Somatom CT-on-rails



Siemens Aera 1.5T



Cone-beam CT on Gantry 3

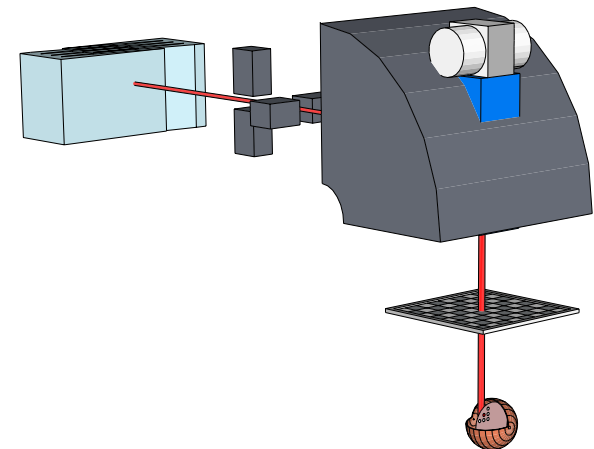
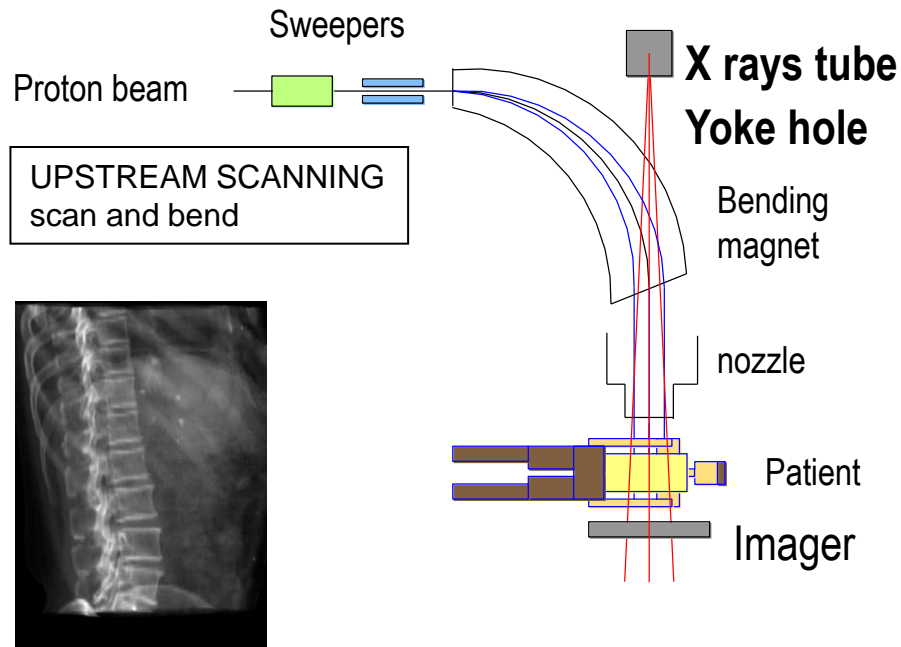
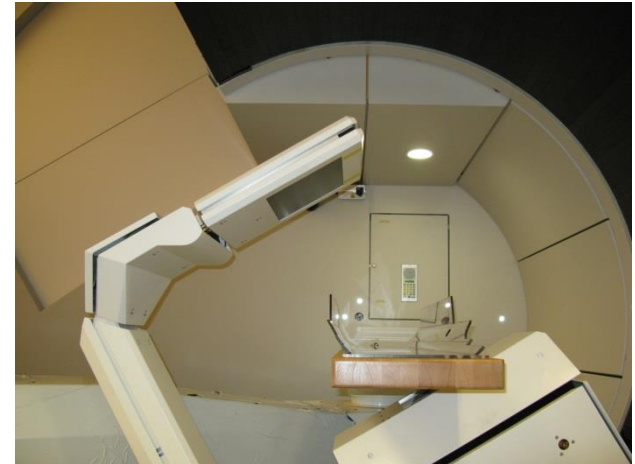
BEV imaging - equivalent to portal imaging with photons

- Large field-of-view (26 cm x 16 cm)
- Not masked by equipment or collimators in the beam path

QA control of patient positioning, gating and (slow) tracking

- scanning + pulsed X-rays

Fluoroscopy mode



Gantry 1



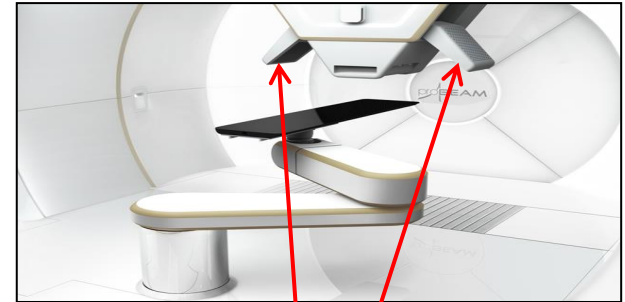
- **Out-of-room** patient-positioning with CT
- Automatic patient transporter

Gantry 2



- **In-room** patient-positioning with CT
- 2D/2D or 3D/3D matching

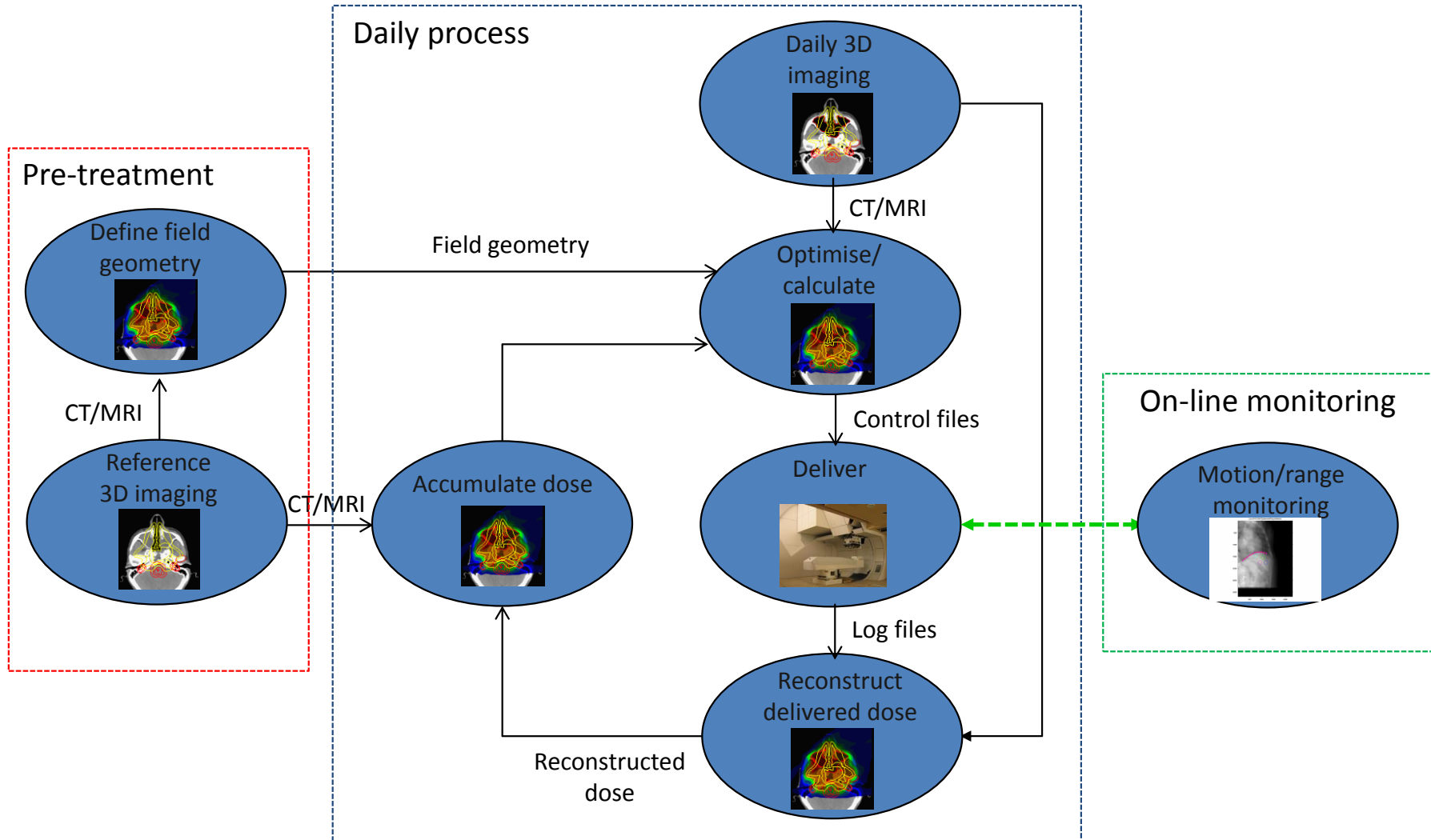
Gantry 3



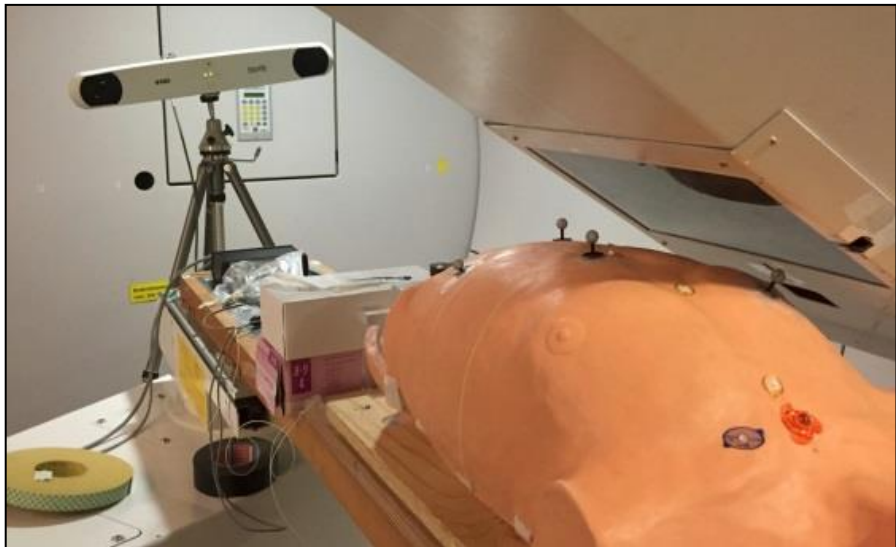
Orthogonal x-ray imaging

- **In-line** patient-positioning
- Orthogonal planar x-rays images or CBCT

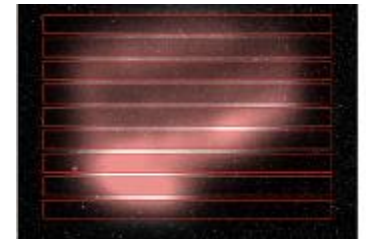
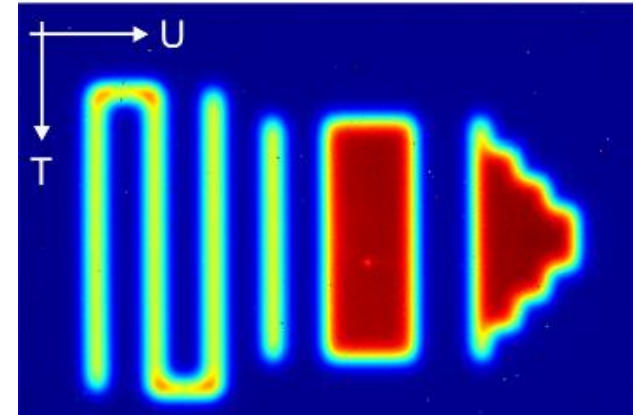
Daily Adapted Proton Therapy



Imaging



Advanced scanning



- Repainting
- Continuous scanning
- Respiratory gating
- Breath-hold

- Proton therapy has been delivered at PSI for more than 30 years
- > 7500 patients have been treated in total
- PSI pioneered the technical implementation of PBS, and has nearly 20 years of clinical experience with this approach
- This success is the result of close collaborations between clinicians, accelerator, beam-line, detector and medical physicists and expert technical support staff



Thank you