CNAO

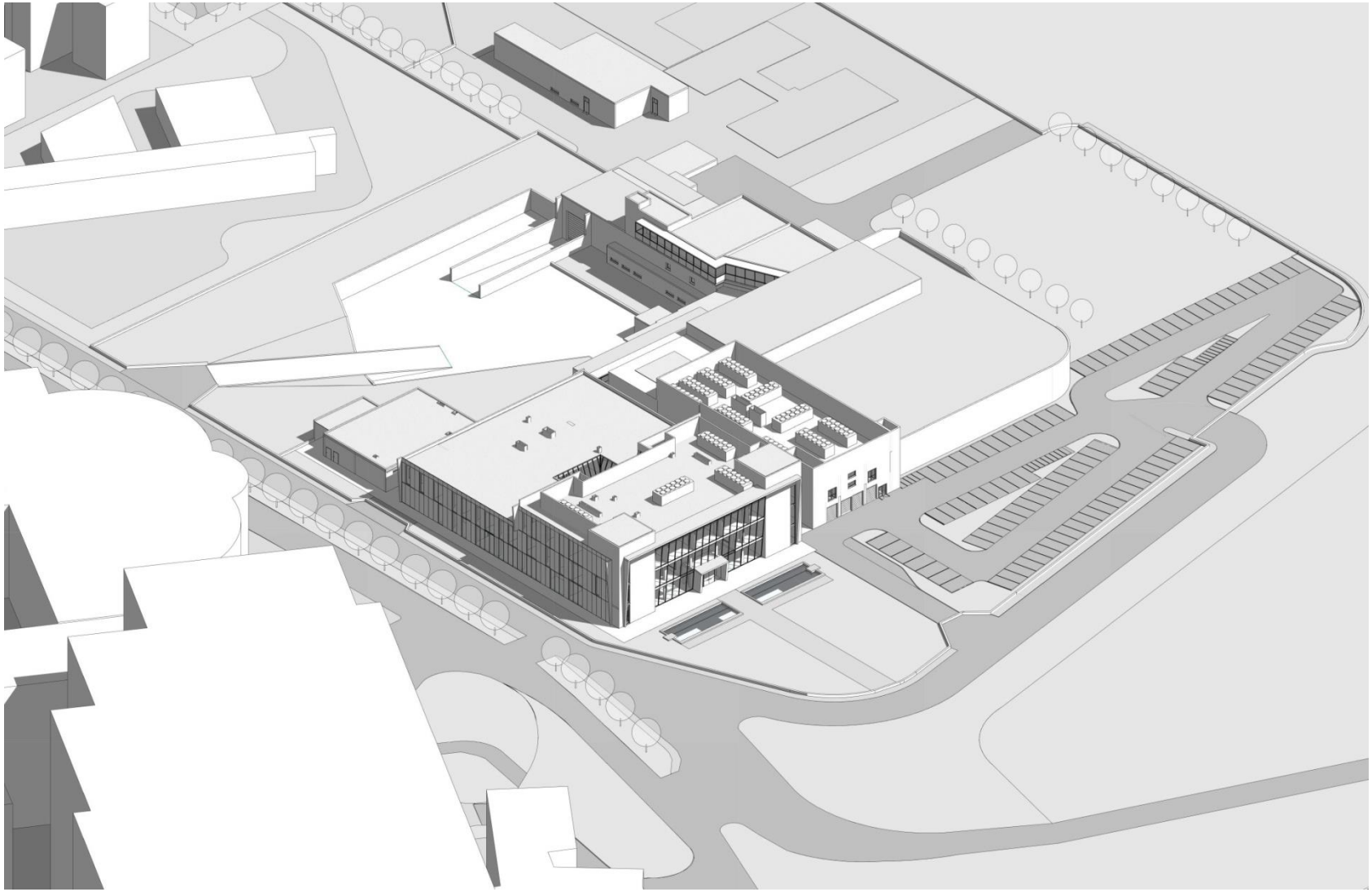
Centro Nazionale di Adroterapia Oncologica

CNAO

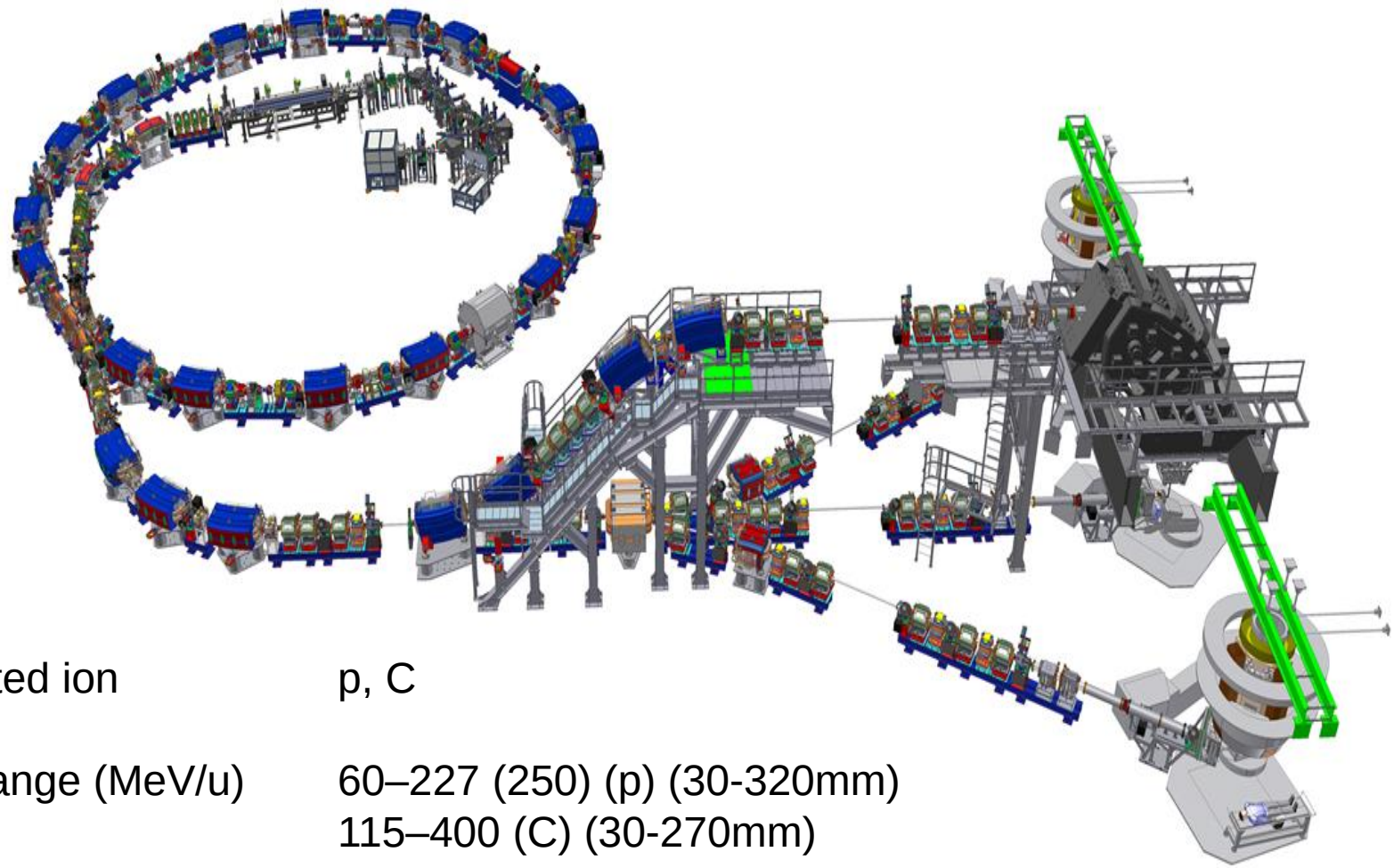
Marco Donetti

PIANOFORTE WP5 workshop - LNS Catania - 29/01/2024

Present layout



CNAO accelerator system



Accelerated ion	p, C
Energy range (MeV/u)	60–227 (250) (p) (30-320mm) 115–400 (C) (30-270mm)

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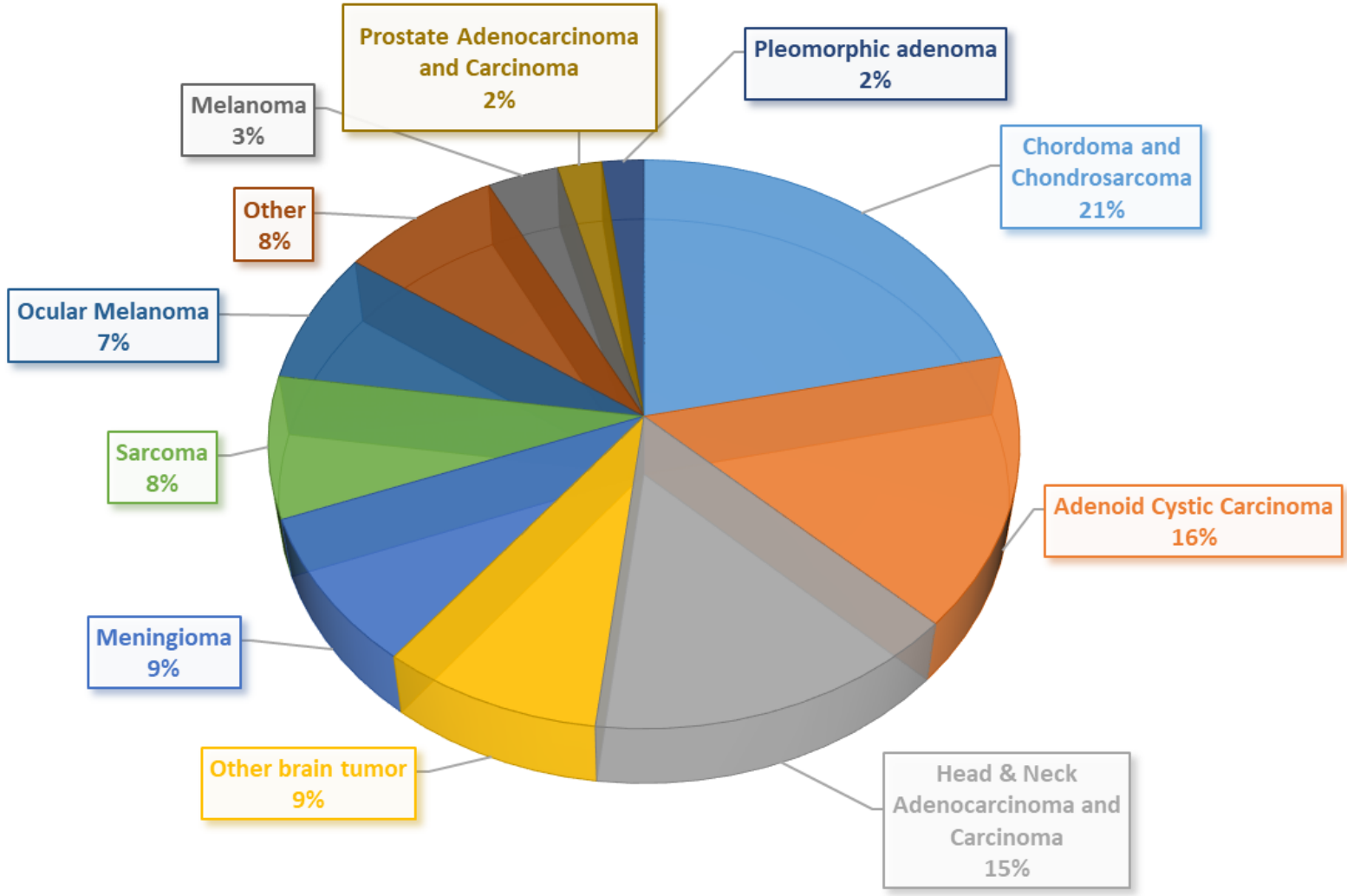
Clinical activities

CNAO: >4700 patients

54% carbon ions– 46% protons



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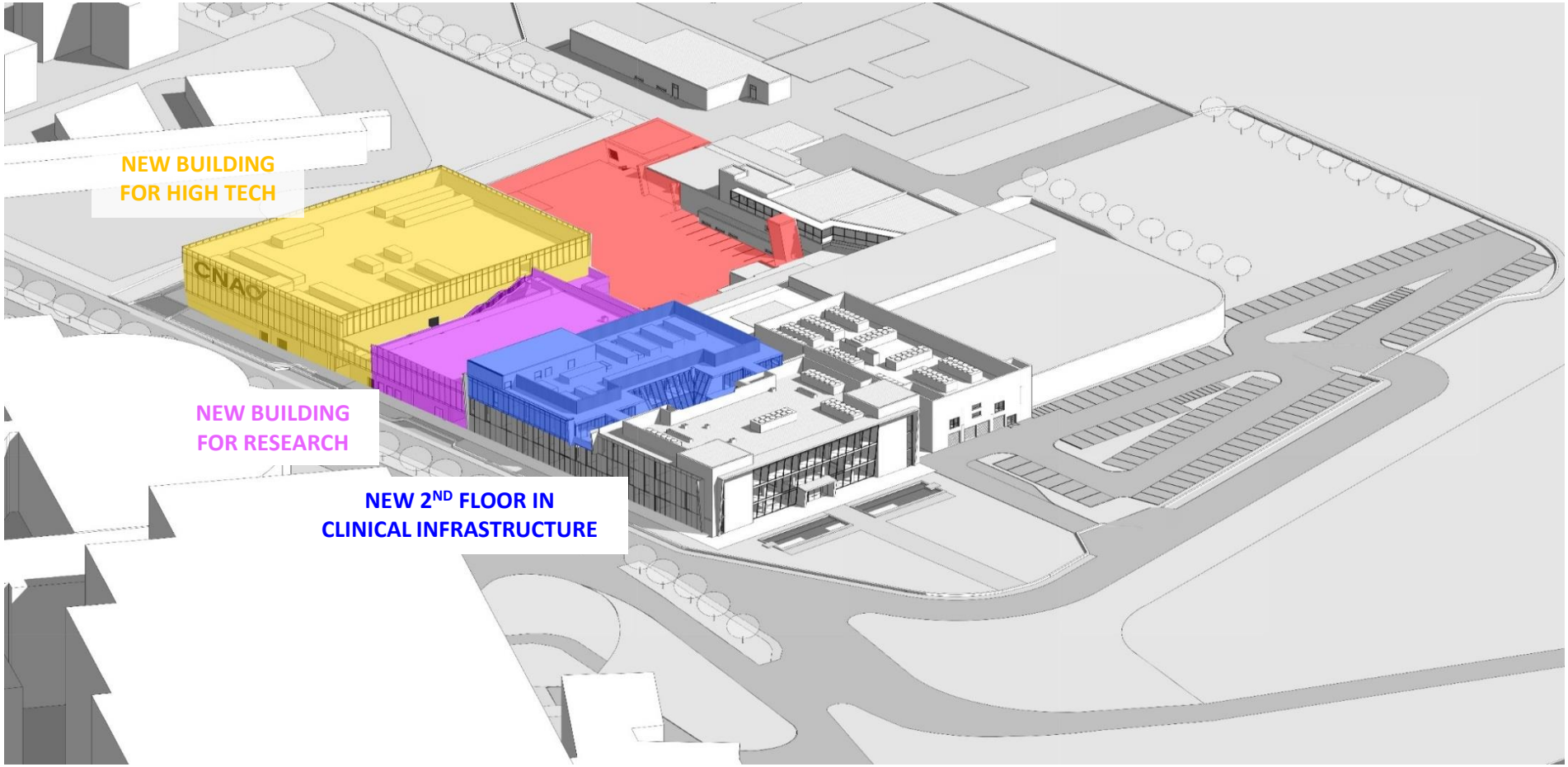
CNAO 2.0


NEW BUILDING
FOR HIGH TECH
CNAO
NEW BUILDING
FOR RESEARCH
NEW 2ND FLOOR IN
CLINICAL INFRASTRUCTURE

New modalities

BNCT
Boron Neutron Capture Therapy

Proton single room facility

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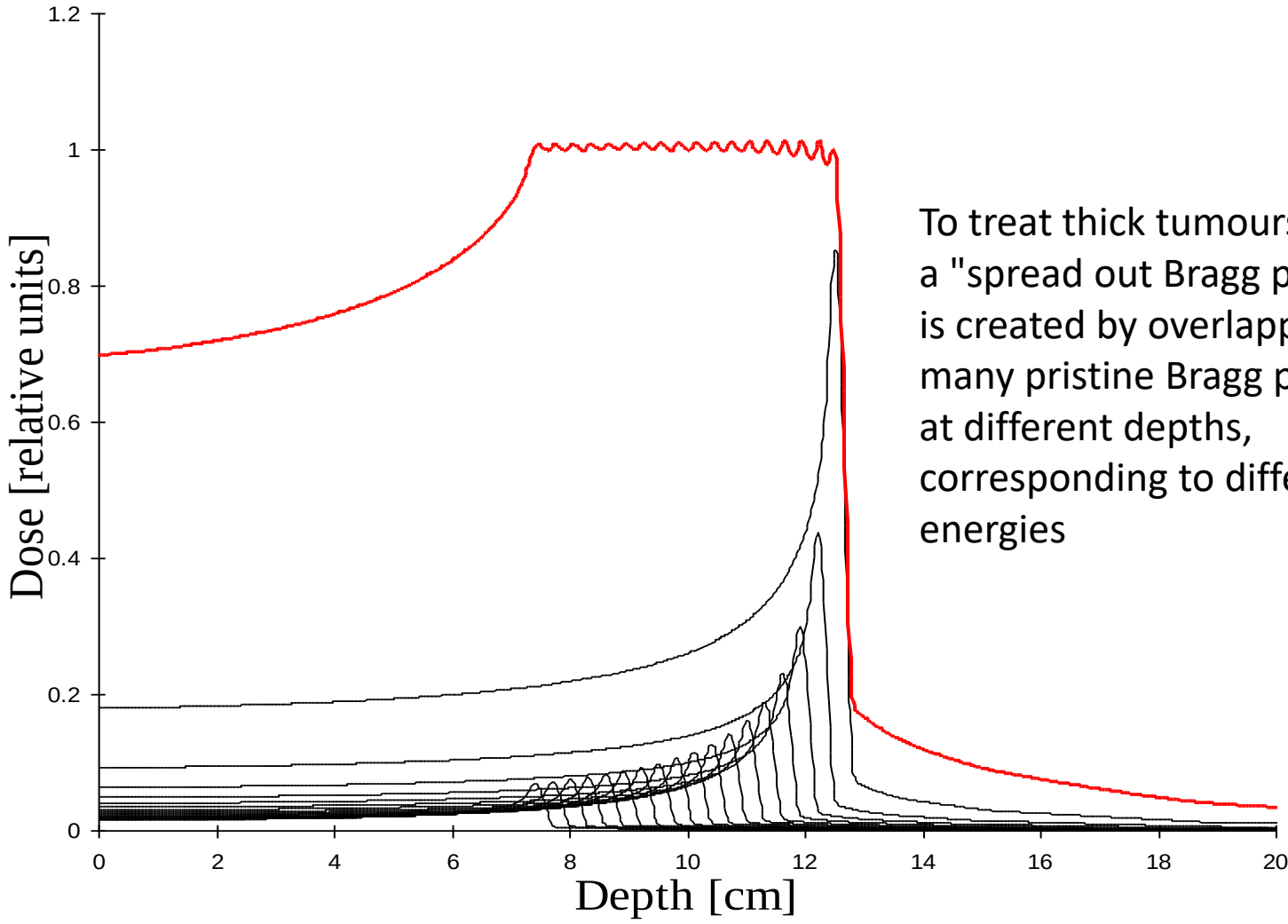
Spread Out Bragg Peak



To treat thick tumours a "spread out Bragg peak" is created by overlapping many pristine Bragg peak at different depths, corresponding to different energies

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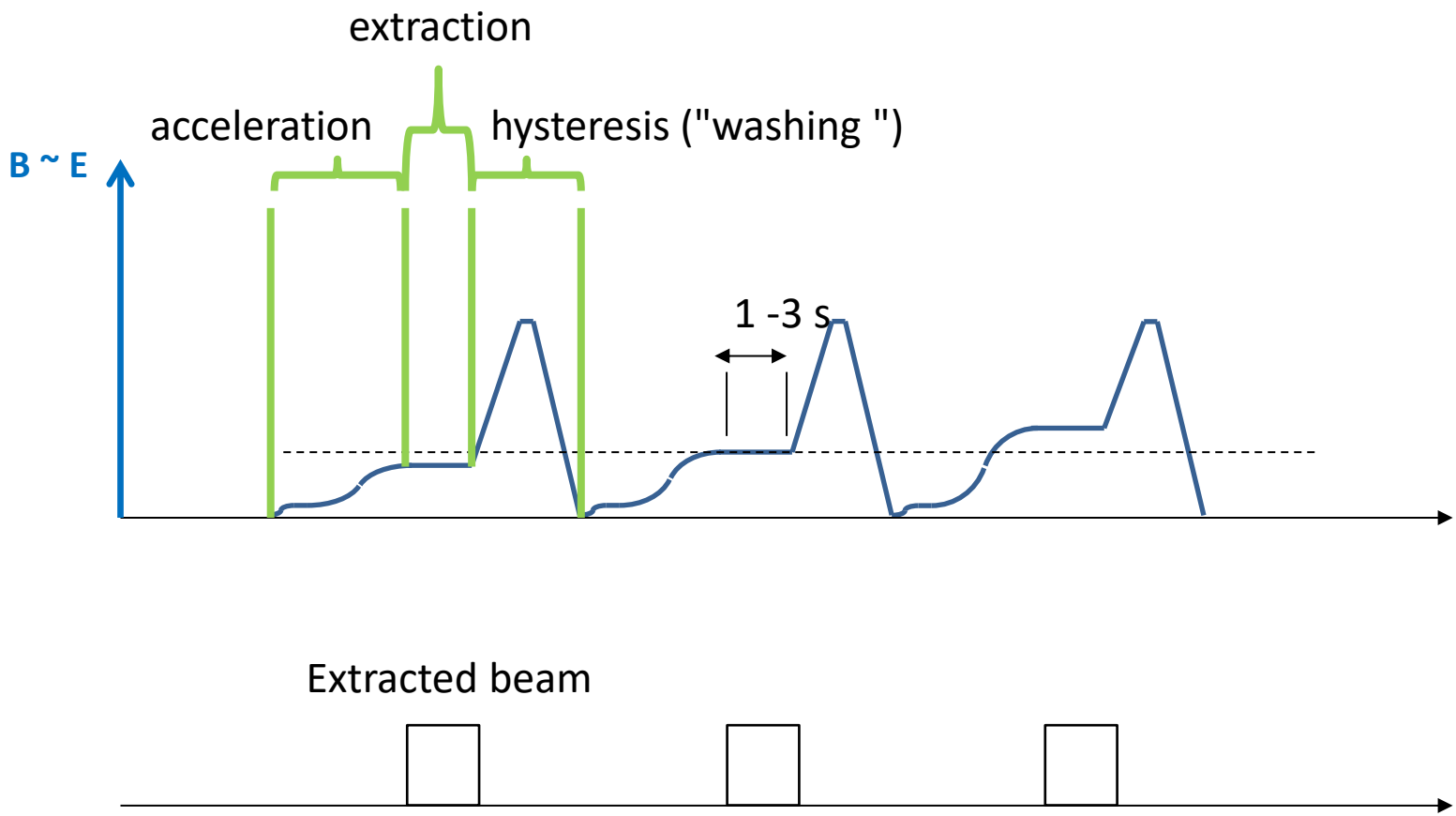
Treatment execution



Research at CNAO

- Besides clinical activity, CNAO has also research as institutional purpose.
- Many reasearch activities on technical, preclinical and translational subjects
- Typical research subjects carried out at CNAO are aimed at improving treatment
  - Improving the understanding of biological mechanisms
  - Improving the knowledge of basic physical processes
  - Improving the technical performance of the accelerator system
  - Improving the technical performance of the dose delivery
  - Providing new types of radiation (new weapons to the clinician)
- Collaborations with many institutions

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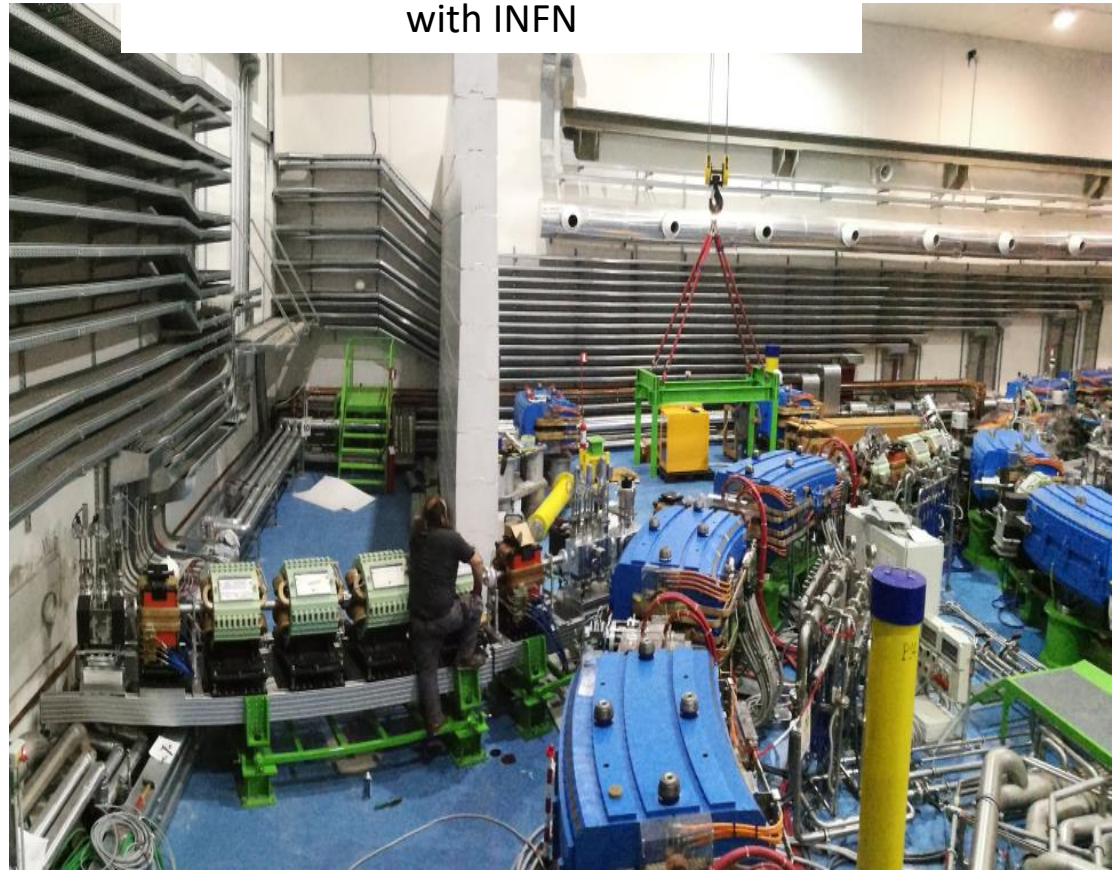
The CNAO experimental facility: a unique opportunity to perform research activities at 360°

For researchers a dedicated experimental irradiation room is available, using the CNAO beams, in time slots not impacting on patients treatment, but specifically devoted to research purposes: i.e. some night shifts (22:00 - 4:00) during the week and some full shifts (8h) during weekends.

Developed and built in collaboration with INFN



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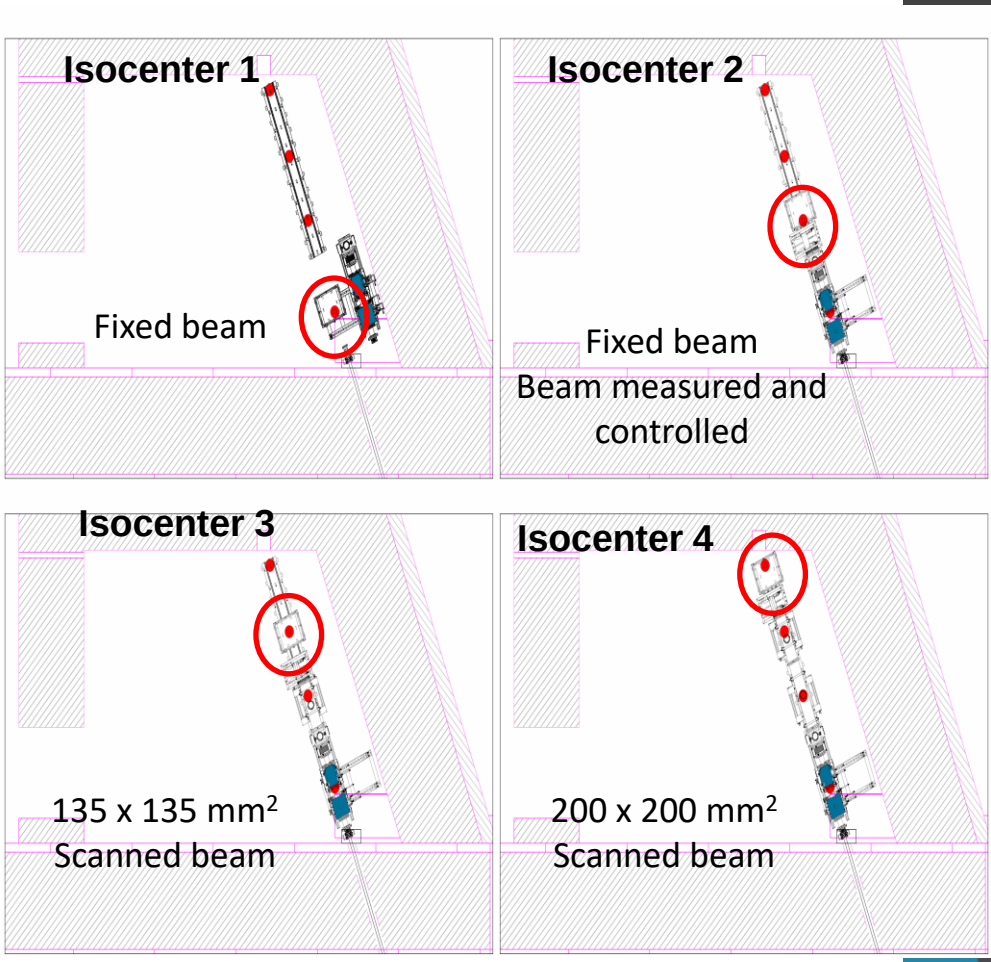
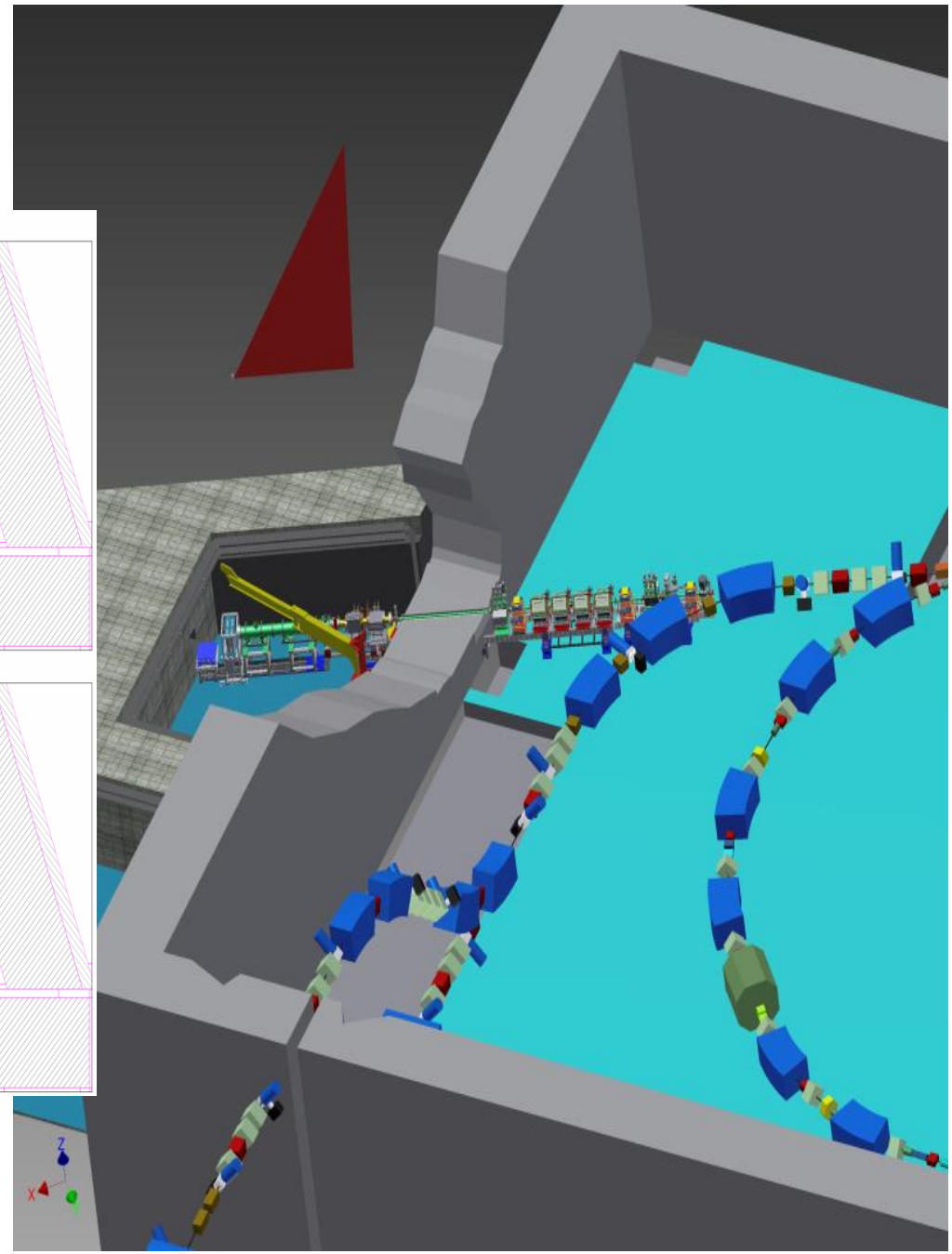
CNAO radiobiology laboratory

Biological laboratory with all the necessary equipment including biological laminar flows, incubators, centrifuges, fluorescence microscope, cell counters is provided. Furthermore, in the next 2 years the research area will be expanded and rooms dedicated to microscopy, cell handling, cytology/histology and small animals preparation will be accessible

Experimental room





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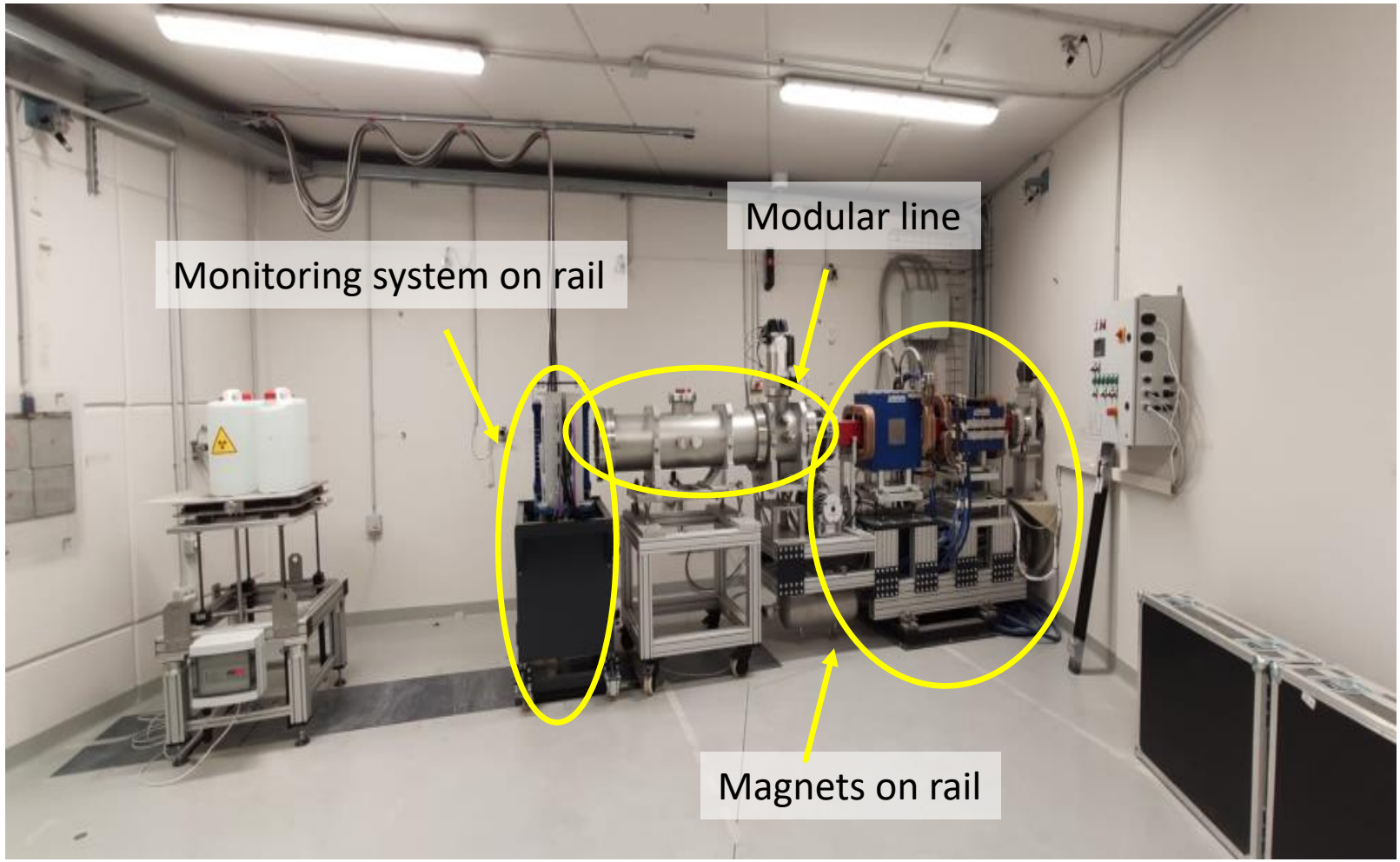
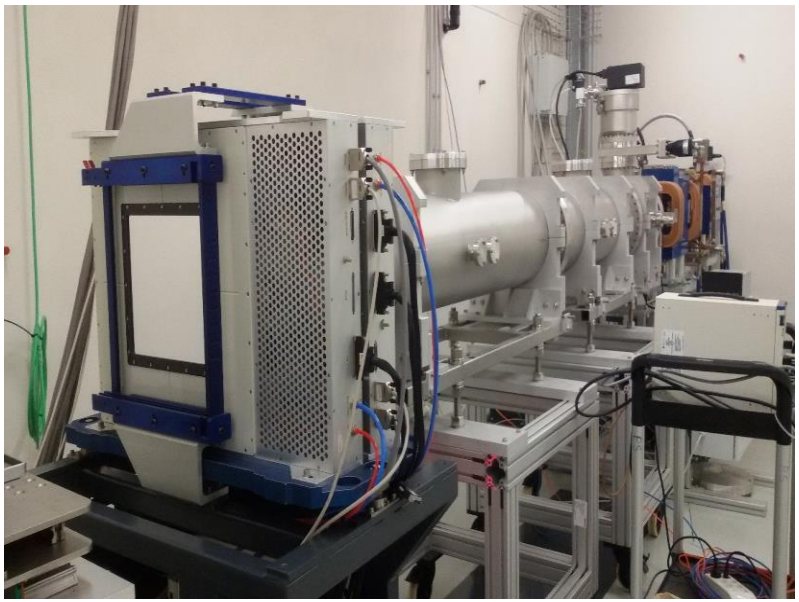
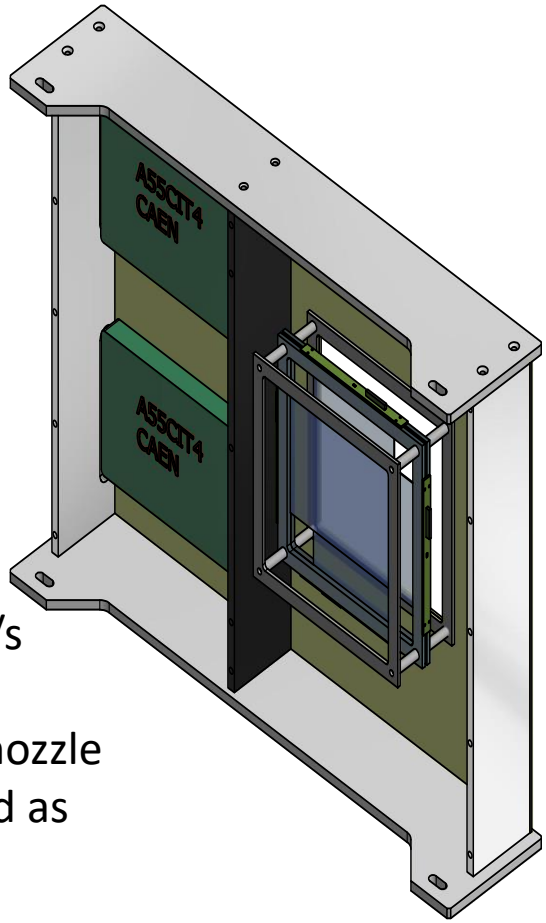
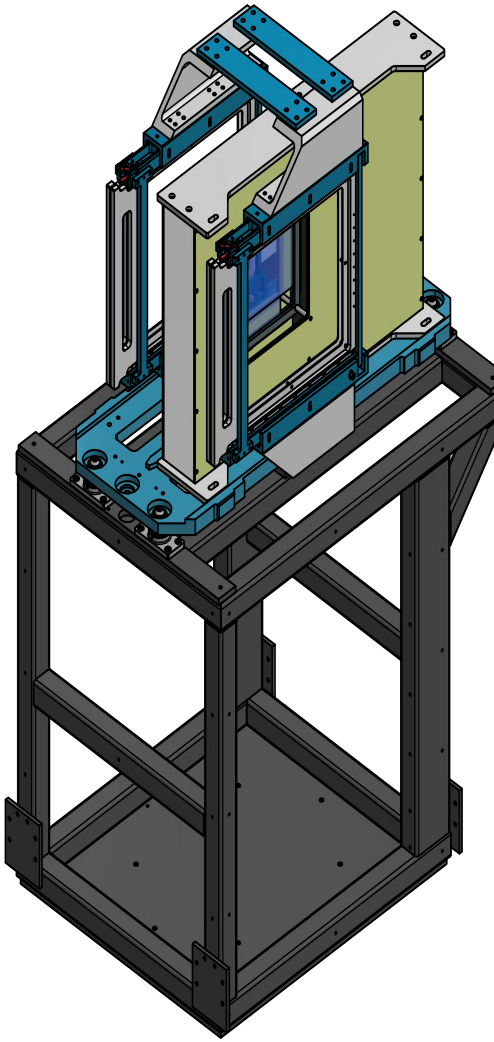
XPR components



Low intensity Monitor for XPR







Monitor for intensities up to 10^5 – 10^6 part/s
It measures intensity, position and size
It can replace one of the DDS boxes in the nozzle
It can work both as standalone detector and as DDS monitor for low intensity “treatments”
128 + 128 scintillating fibers 1 mm wide
Commercial boards (CAEN) based DAQ

Collaboration with INFN Roma - SBAI

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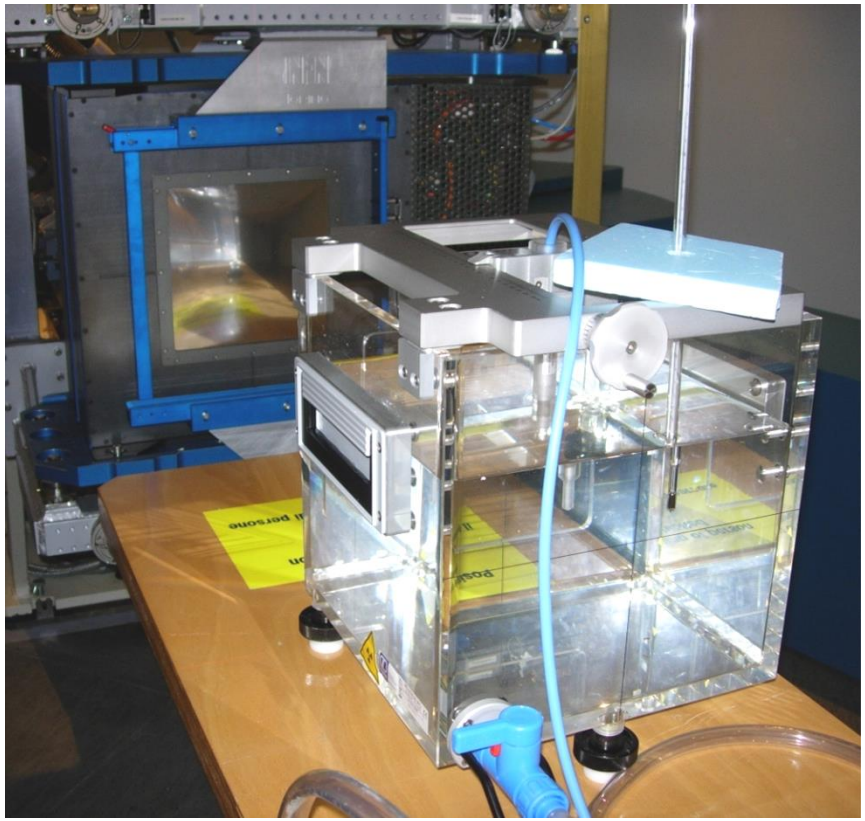
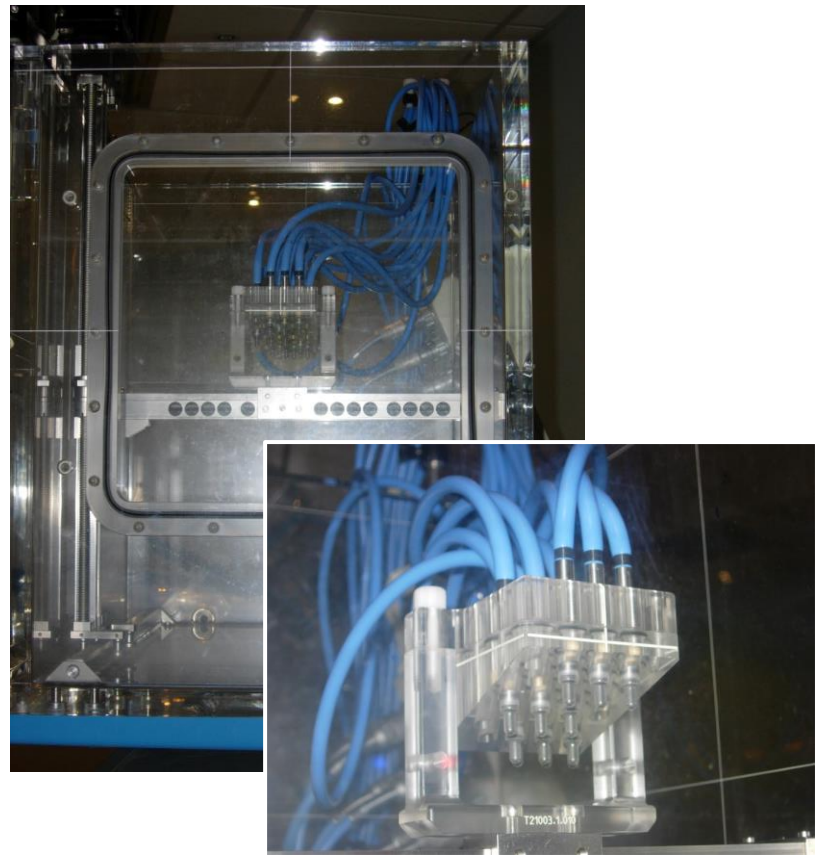
Beam characterization (Dose to water)

IAEA TRS 398 (2000)





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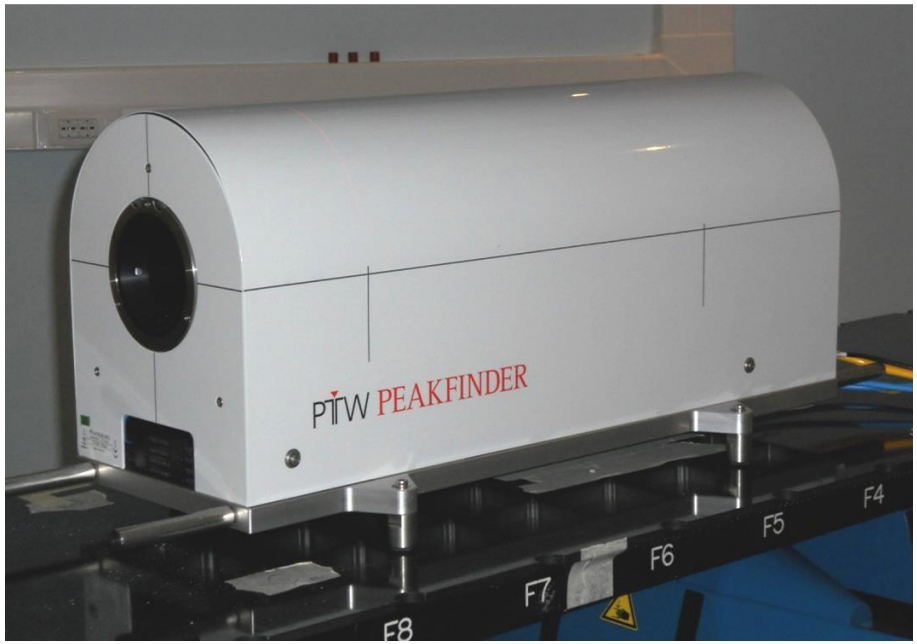
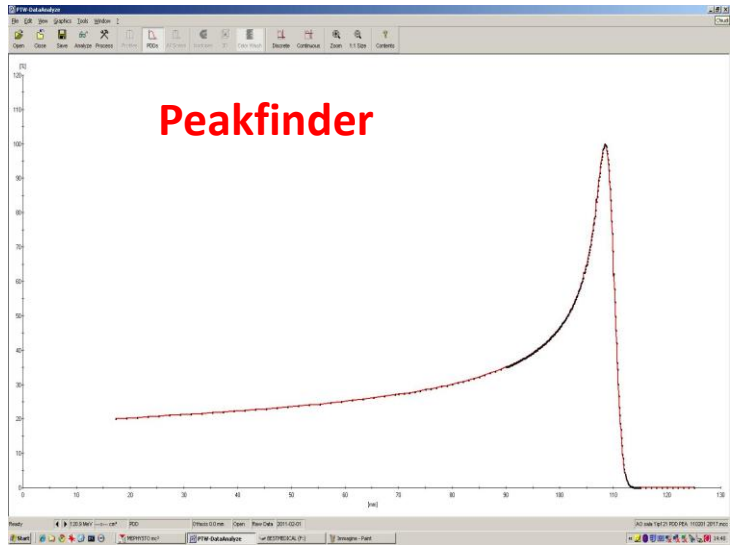
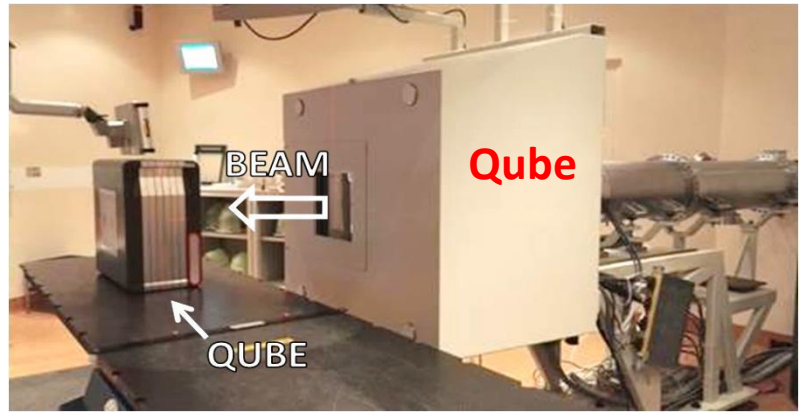
Beam characterization (dose vs depth)

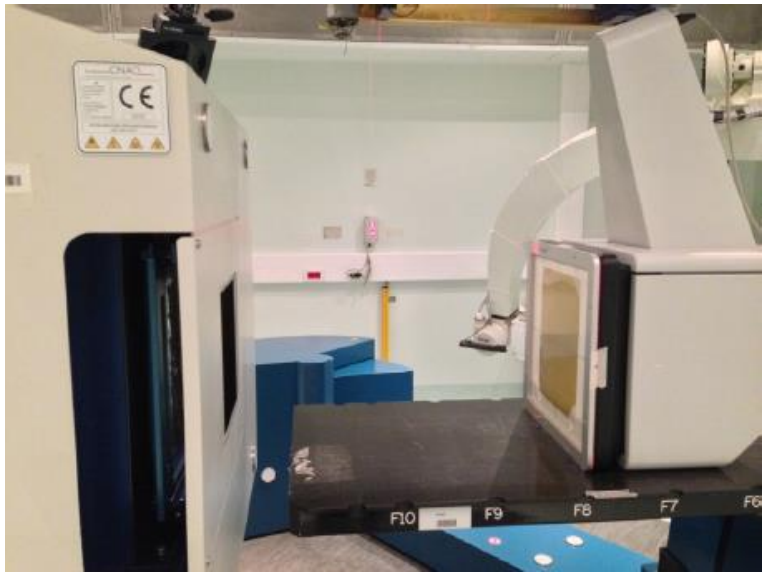


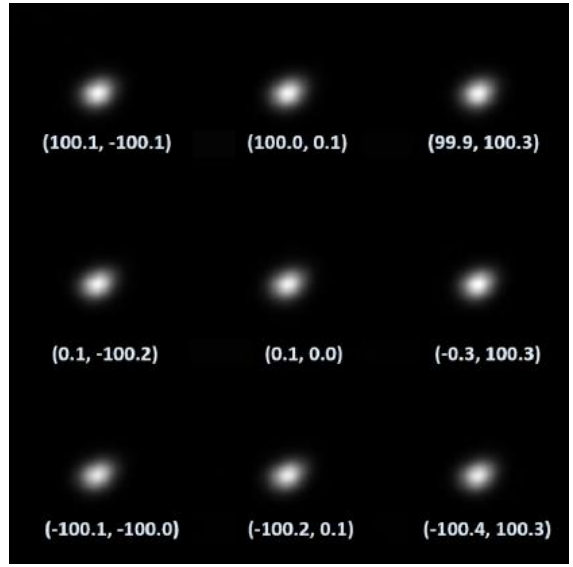




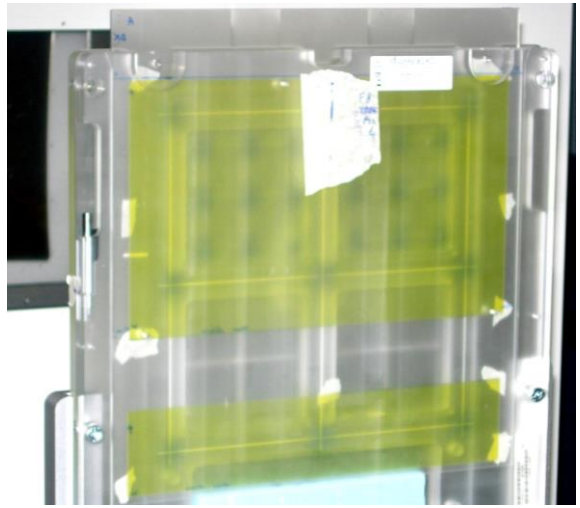
Beam characterization (shape and position)

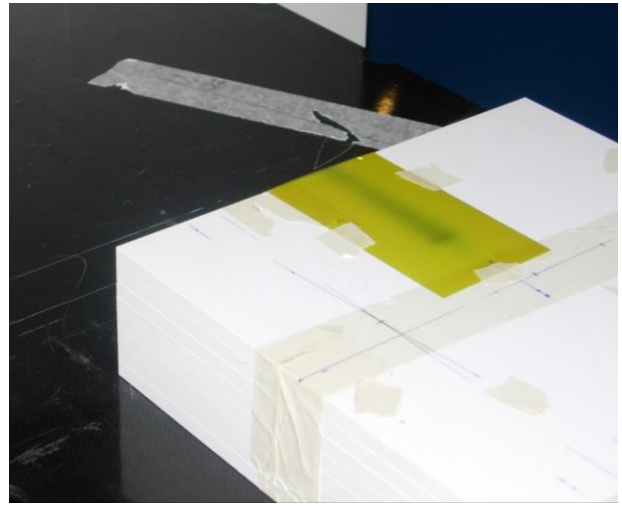
Lynx





EBT3





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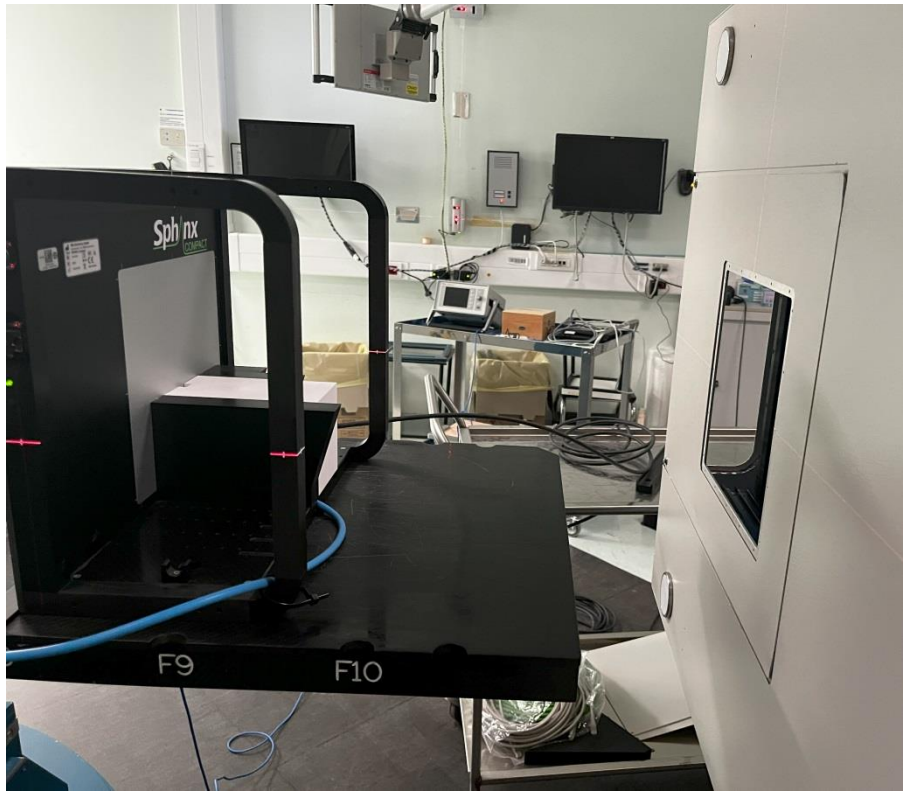
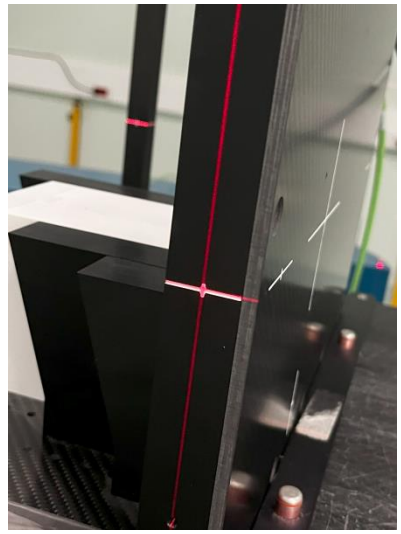
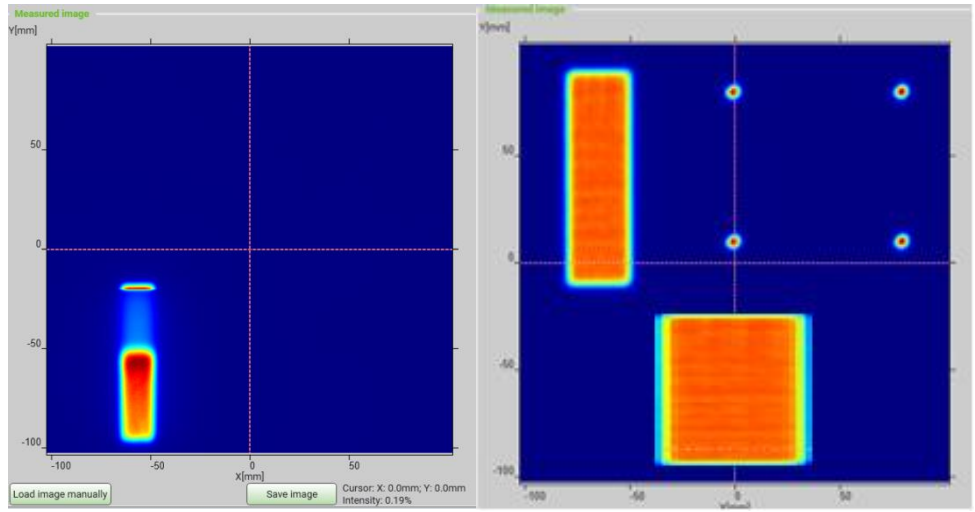
Beam characterization (Daily QA)





Sphinx Compact

Currently used for Daily QA



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Thank you for your attention