



From MEDICIS to MEDICIS-Promed

MEDICIS-Promed Summer School
Pavia, Italy
4-9 June 2017





CERN MEDICIS

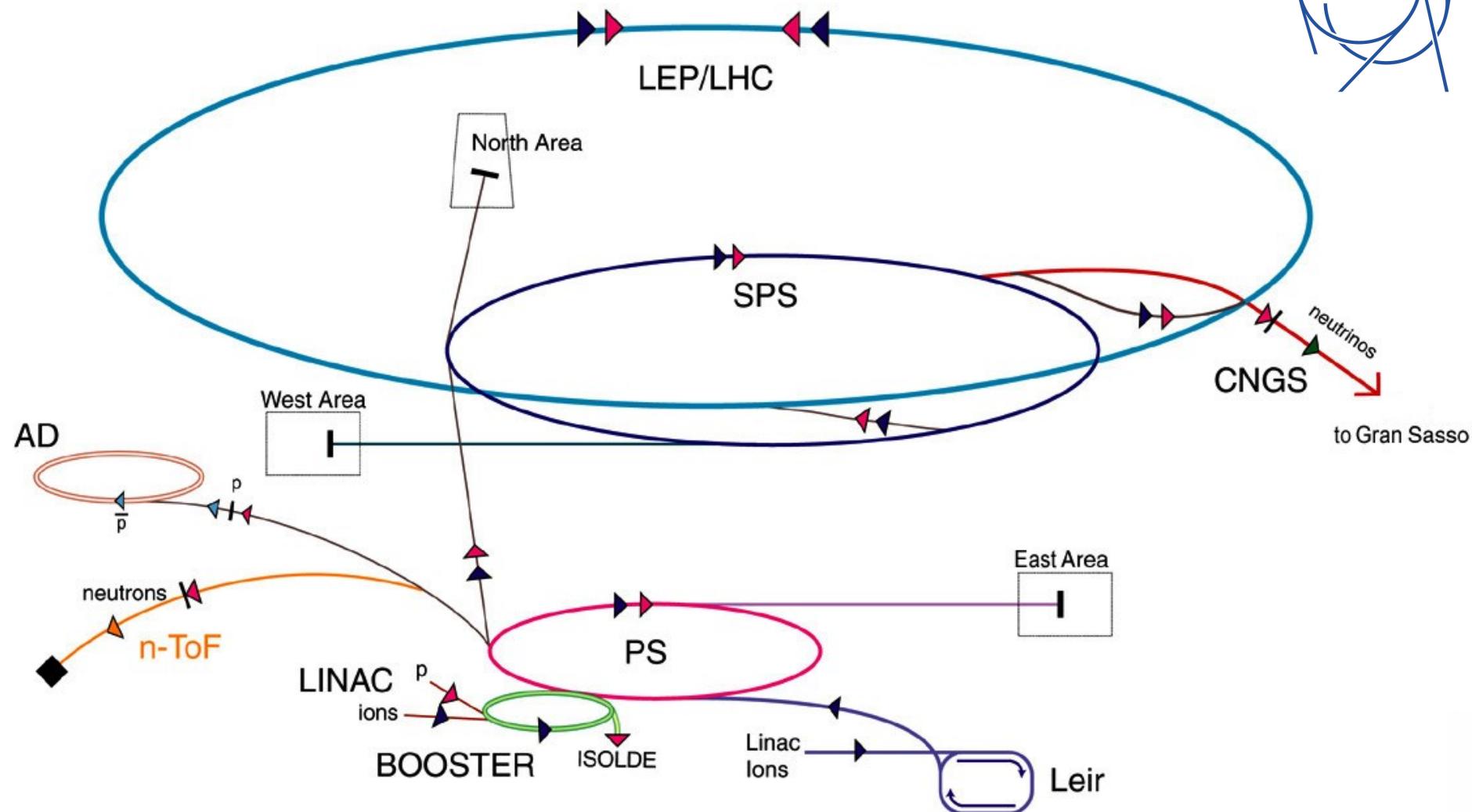
MEDical Isotopes Collected from ISolde

CERN ISOLDE

Medical isotopes

CERN MEDICIS

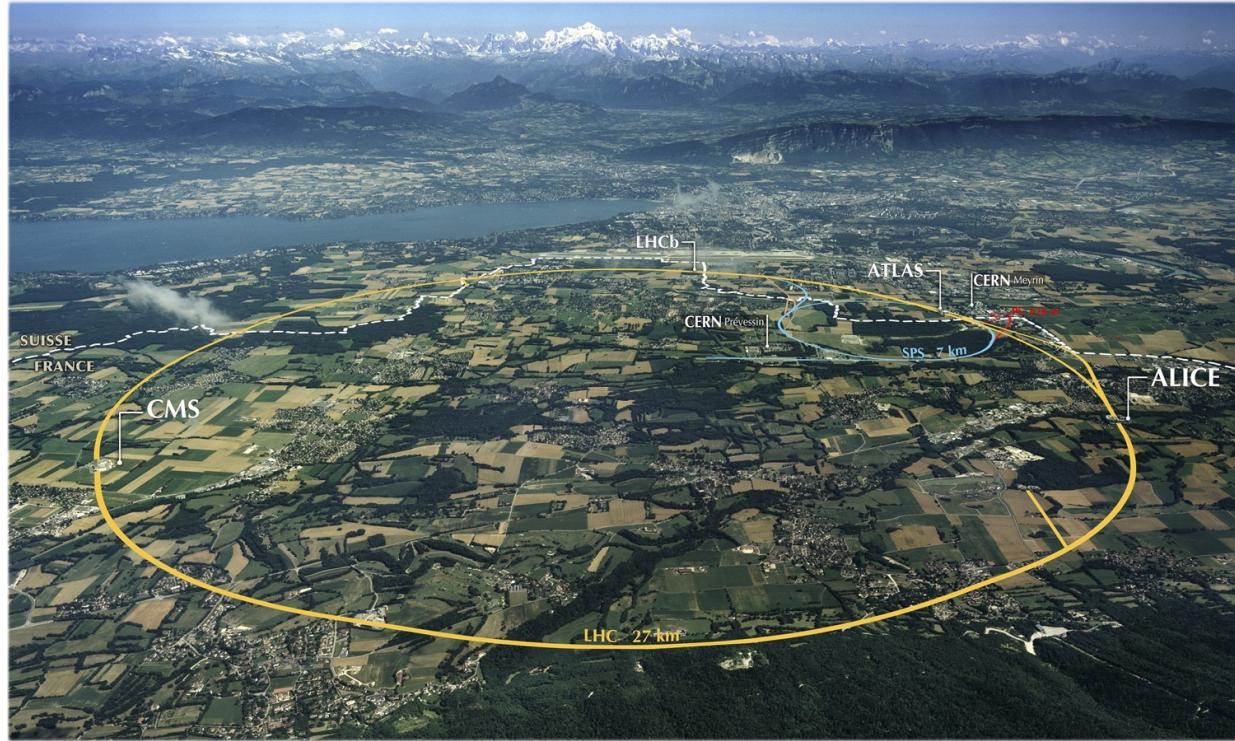




- ▶ p (proton)
- ▶ ion
- ▶ neutron
- ▶ \bar{p} (antiproton)
- ▶ \bar{p} (antiproton)
- ▶ proton/antiproton conversion
- ▶ neutrino

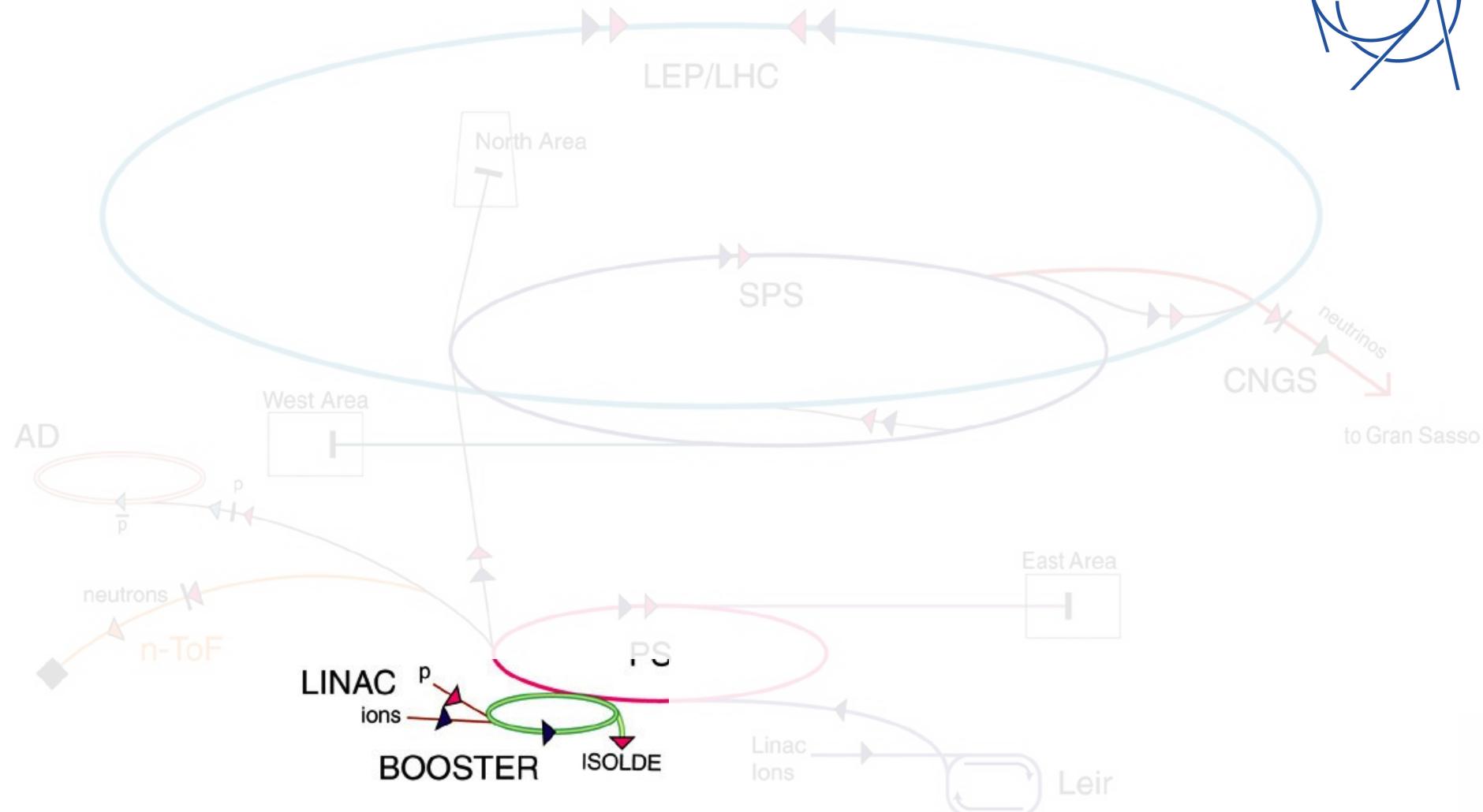
AD Antiproton Decelerator
 PS Proton Synchrotron
 SPS Super Proton Synchrotron

LHC Large Hadron Collider
 n-ToF Neutron Time of Flight
 CNGS Cern Neutrinos Gran Sasso

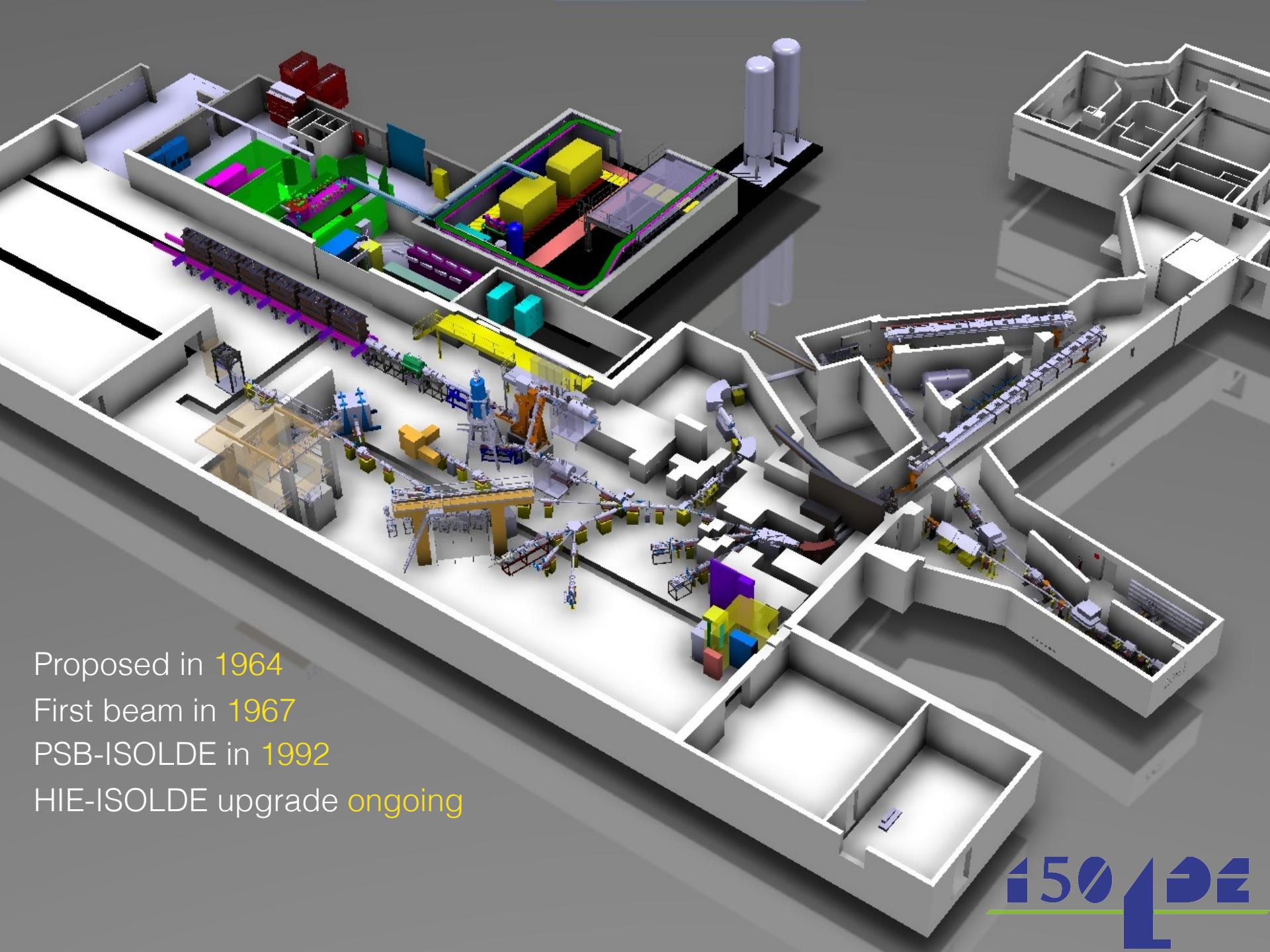


CERN

European Organisation for Nuclear Research



- ▶ p (proton)
 - ▶ \bar{p} (antiproton)
 - ▶ ion
 - ▶ neutron
 - ▶ $\rightarrow \leftrightarrow$ proton/antiproton conversion
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Proposed in 1964

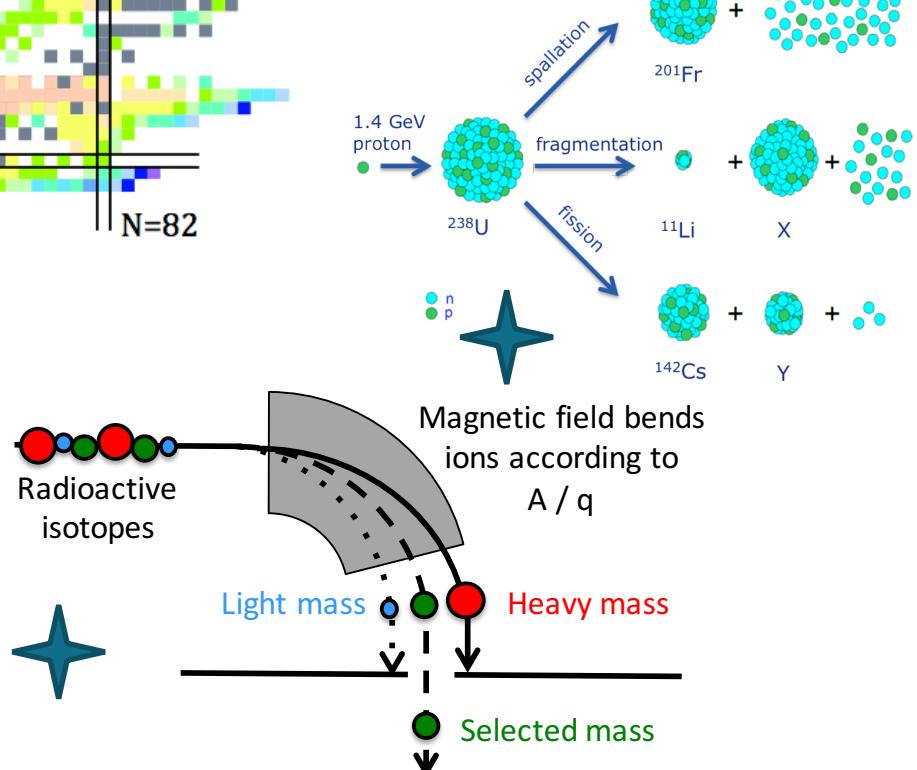
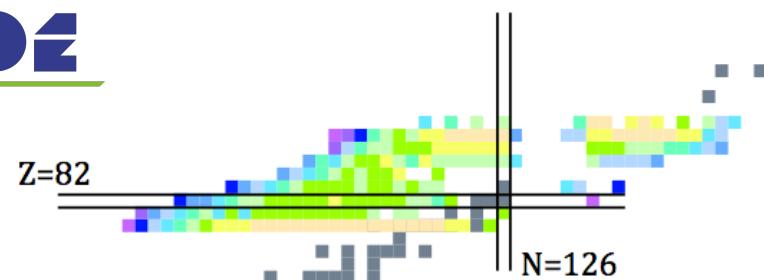
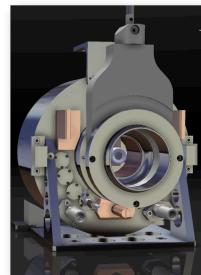
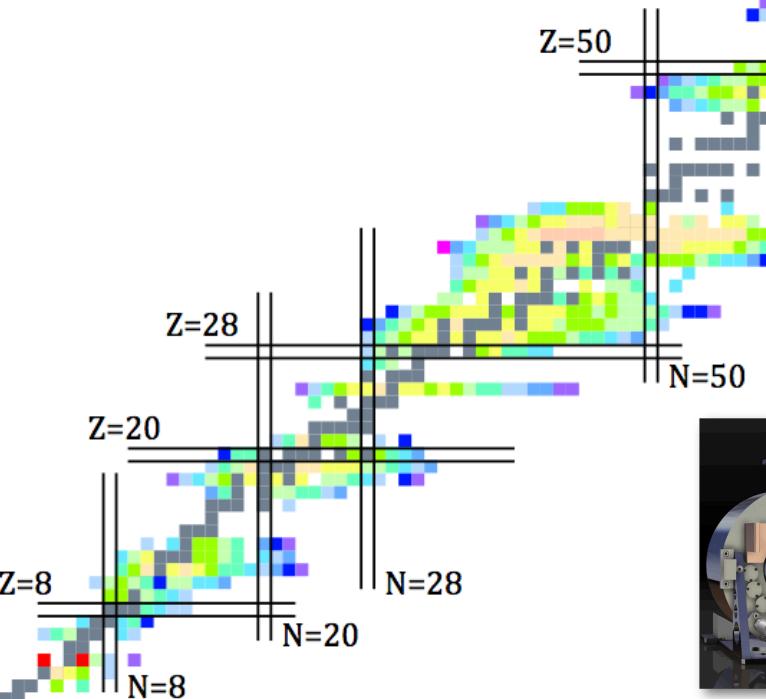
First beam in 1967

PSB-ISOLDE in 1992

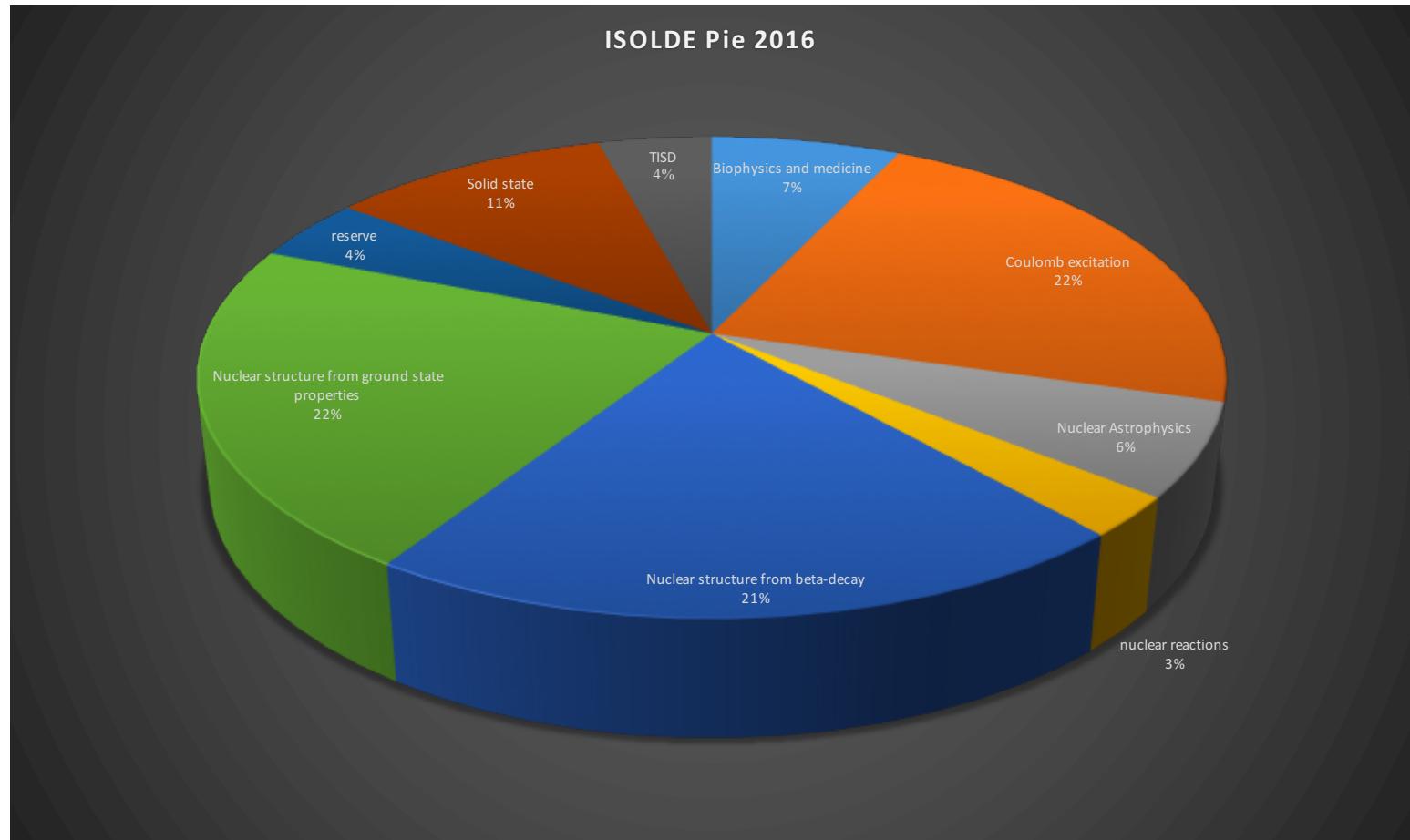
HIE-ISOLDE upgrade ongoing

The ISOL technique

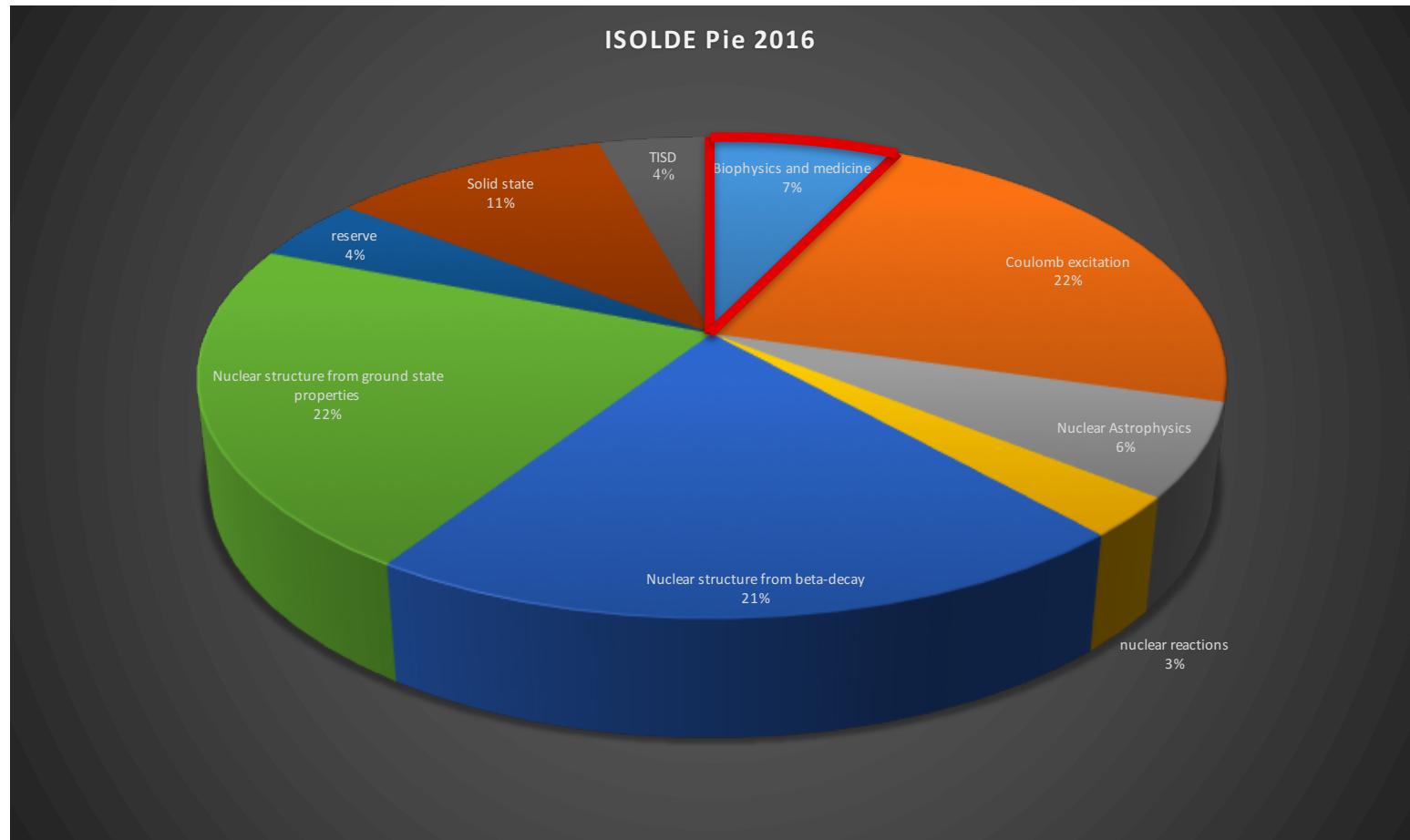
A wide catalog of radioisotopes at our disposal, available in relatively pure and carrier-free conditions.



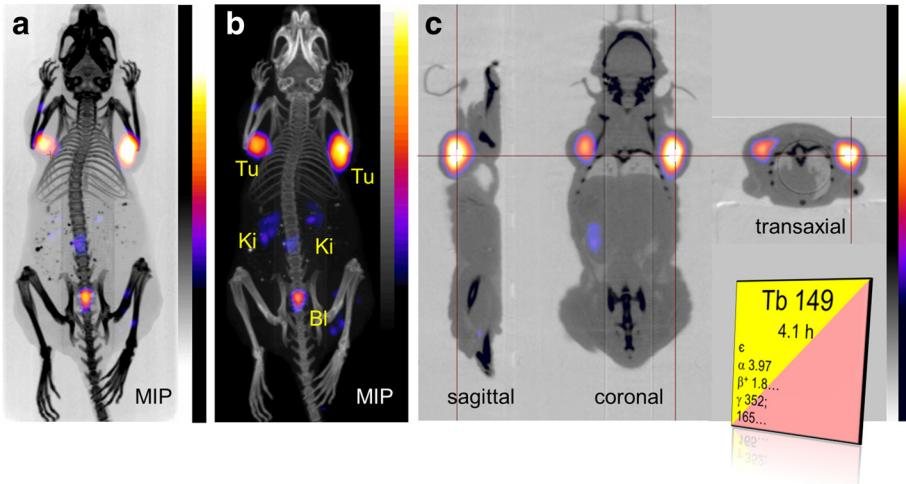
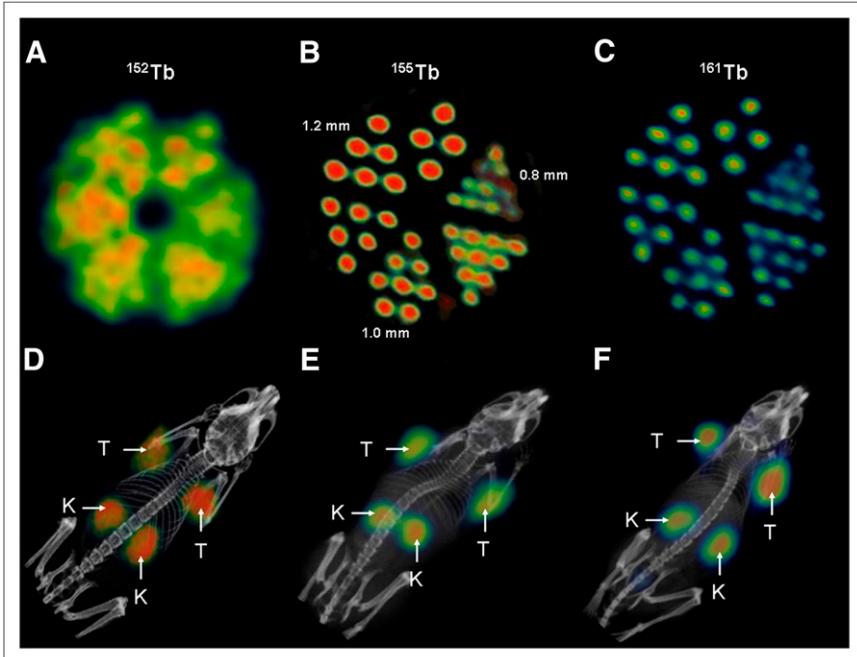
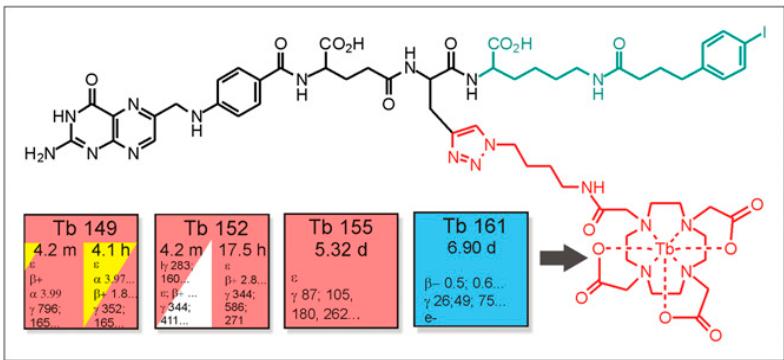
ISOLDE scientific programme



ISOLDE scientific programme



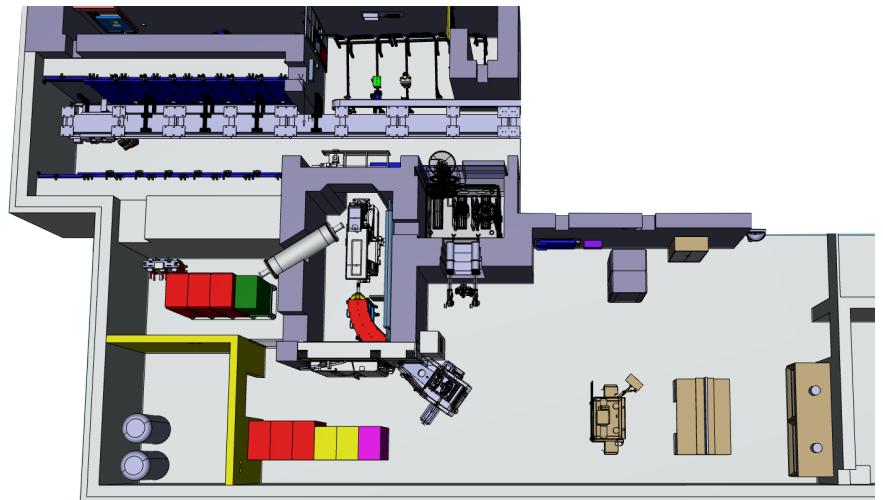
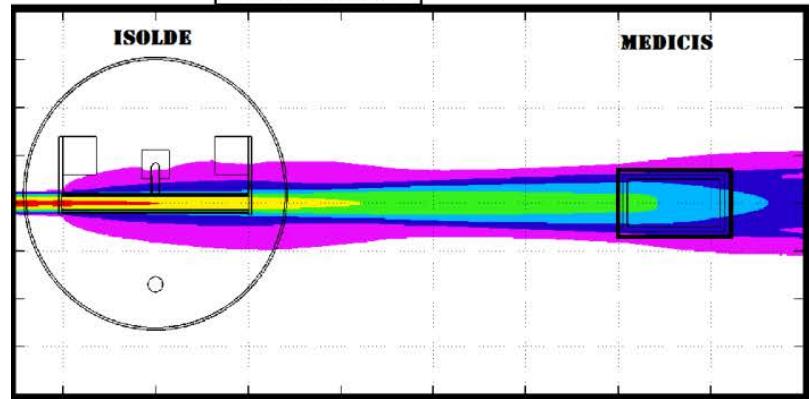
Tb research at PSI



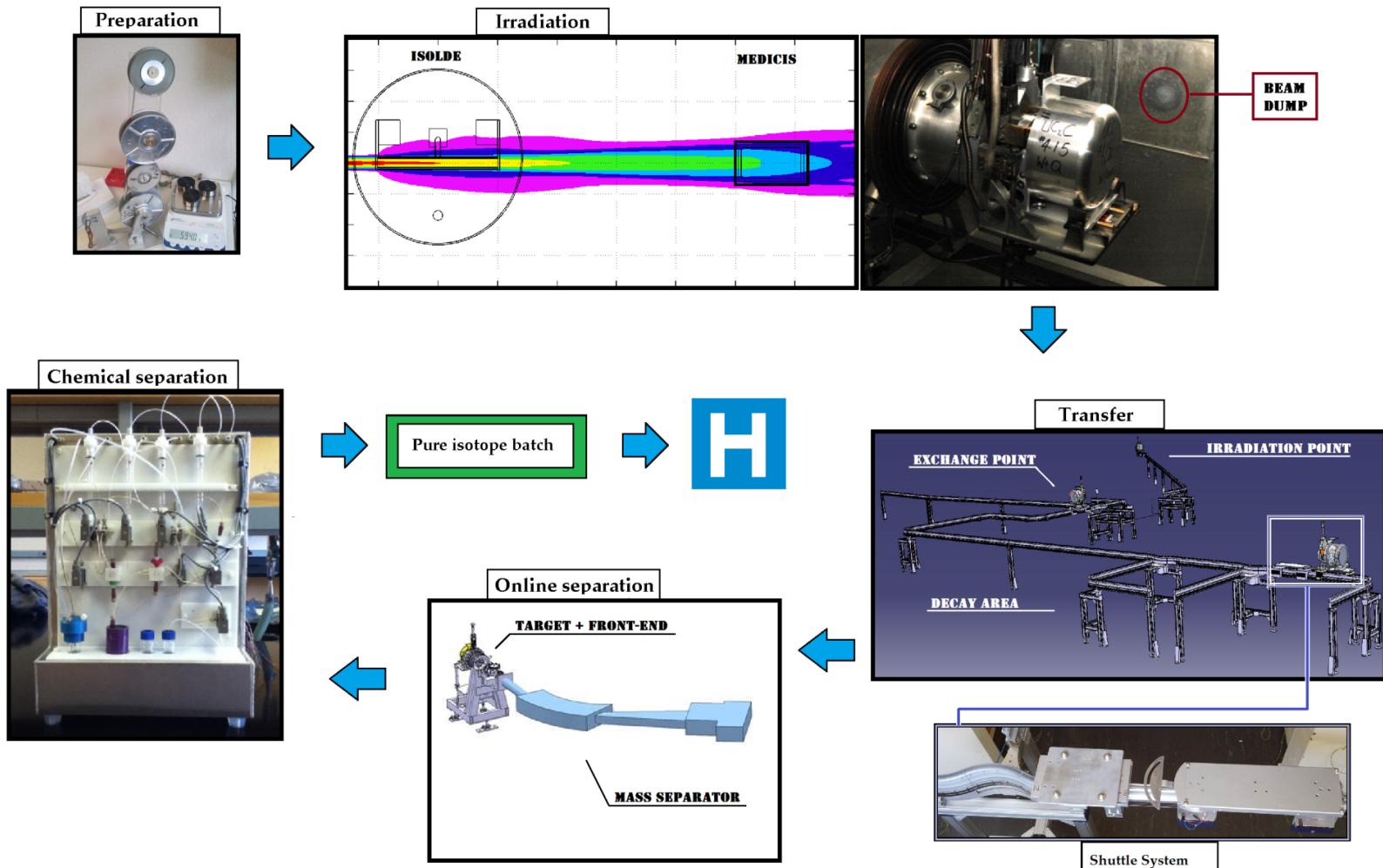
This work is based on 2 possible collection periods at ISOLDE each year and is highly held back by the availability of the radioisotopes.

Free beam for “free” radioisotopes at CERN

- 80% of the proton beam goes through the ISOLDE target unaffected
- That beam is then sent onto another target
- The target can be removed from the target area towards a Class A laboratory
- An off-line separator is used to extract radioisotopes of interest



CERN MEDICIS from A to Z



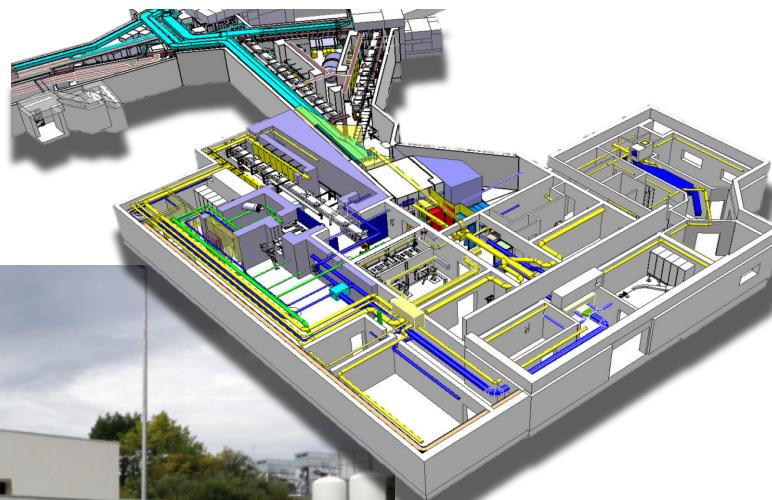
MEDICIS timeline



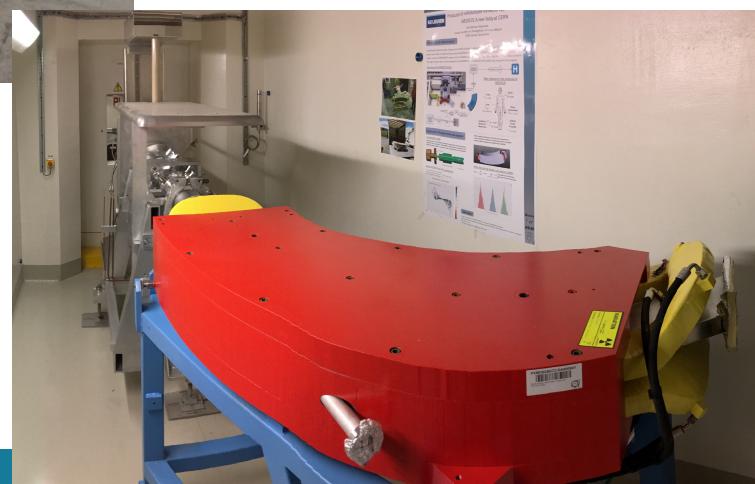
Ground breaking
3 Sept 2013



Building delivered
15 Oct 2014



Separator installed
10 March 2017



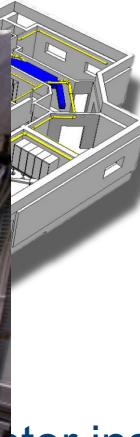
MEDICIS timeline



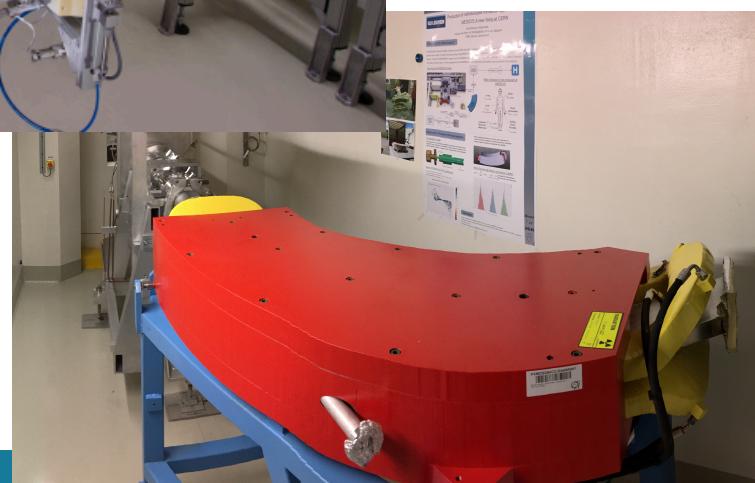
Ground breaking
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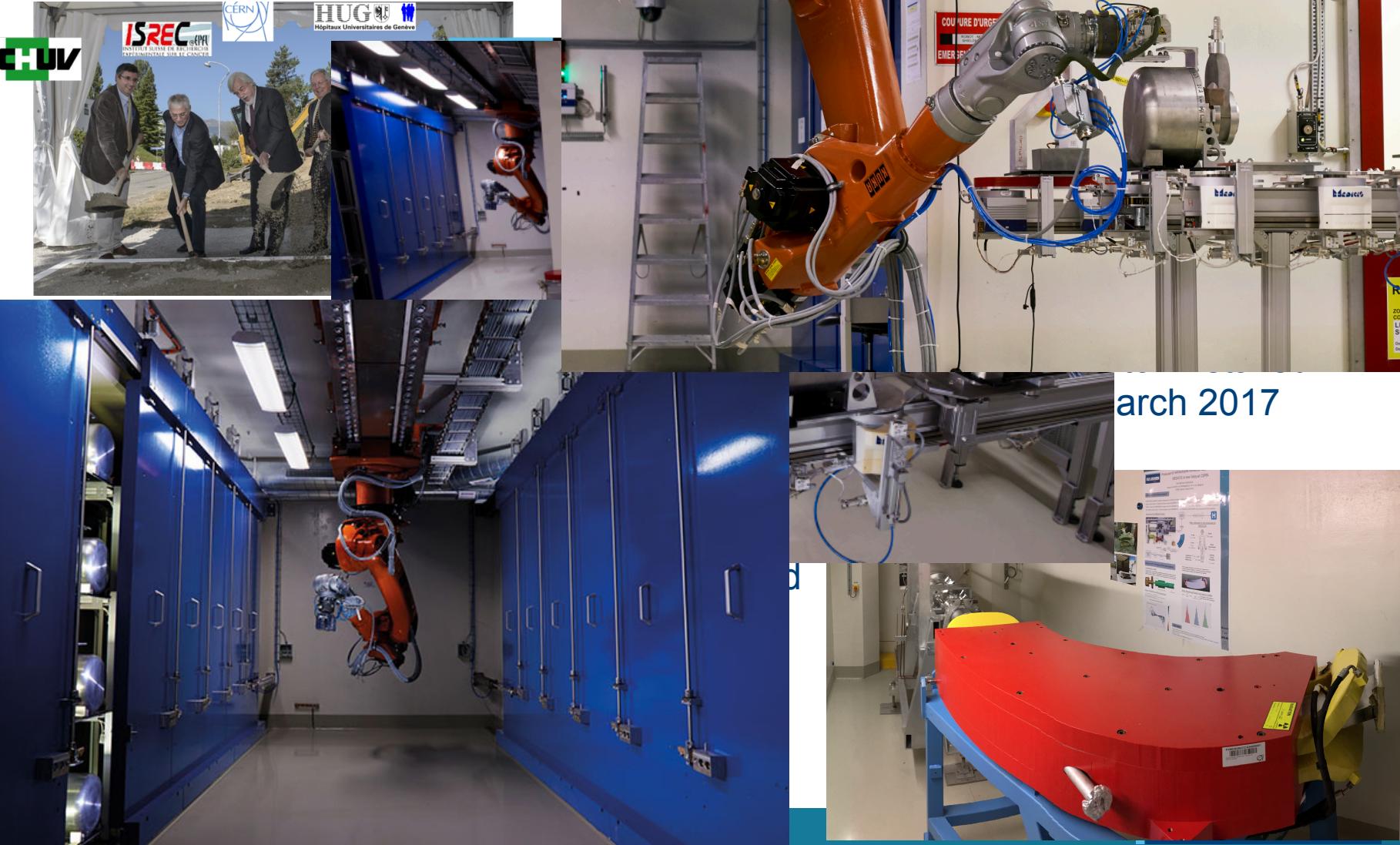
Accelerator installed
March 2017



MEDICIS timeline



MEDICIS timeline



MEDICIS timeline



Commissioning planned
for the summer of 2017!

March 2017





MEDICIS-Promed

MEDICIS-PROduced radioisotope beams for MEDicine

Network

Research

Training

MEDICIS-Promed

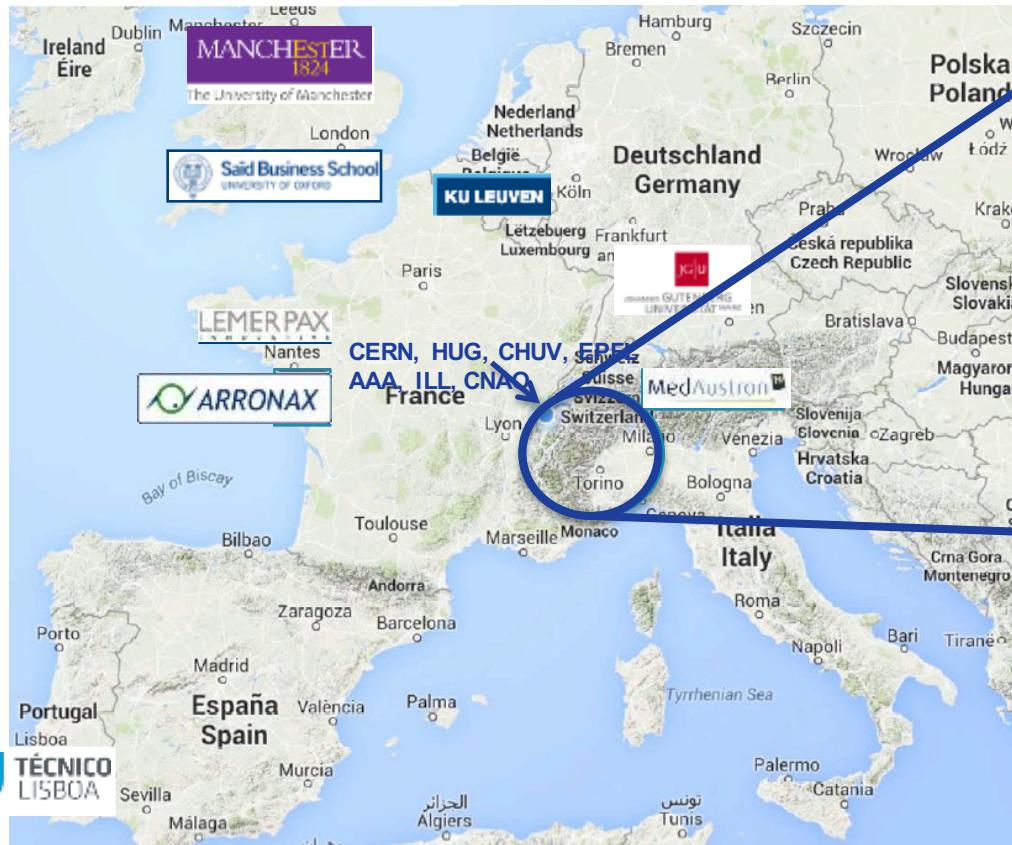


Horizon 2020
European Union funding
for Research & Innovation

- A **Marie Skłodowska-Curie Innovative Training Network** coordinated by CERN under Horizon2020
- Bringing together academia, industry and the medical world
- Training **15 Early Stage Researchers (ESR)** for the development of new medical applications and accelerator technologies



MEDICIS-Promed network



MEDICIS-Promed research

Production & mass separation of new radioisotopes

Half-lives, decay branches, decay energies, ...

Properties

Theranostic radiopharmaceuticals imaging & treatment

Production

Personalised medicine

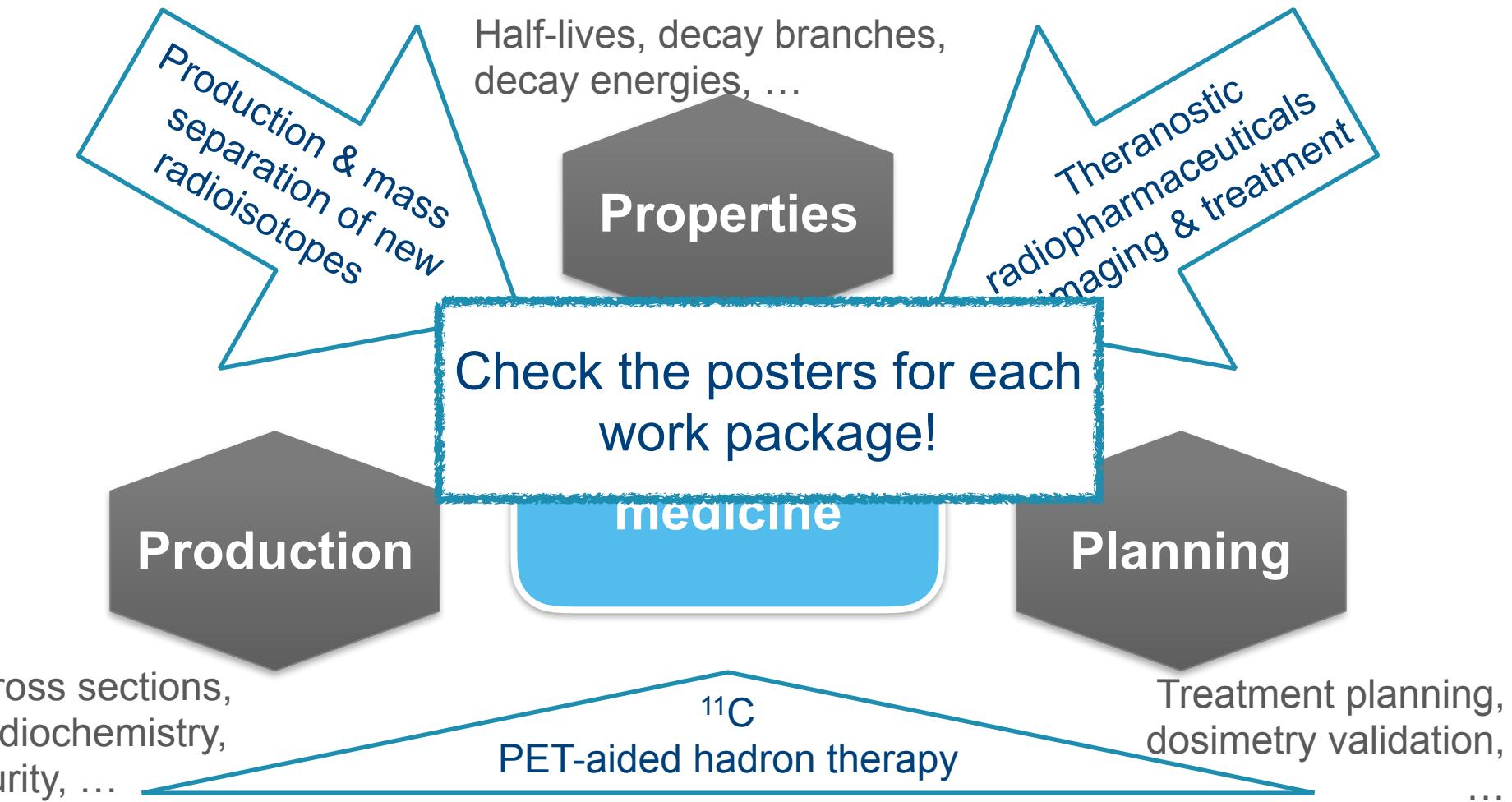
Planning

Cross sections, radiochemistry, purity, ...

^{11}C
PET-aided hadron therapy

Treatment planning, dosimetry validation, ...

MEDICIS-Promed research



MEDICIS-Promed trainings

- Feb 2016: Kick-off week in CERN and in the Alps
- Sept 2016: General Training on Advanced Materials in Manchester
- **June 2017: Summer School on PET-aided hadron therapy in Pavia**
- Sept 2017 Specialised Training on Radioisotope production in Leuven
- 2018: Summer School on Radioisotopes for Medicine in Lisbon
- 2018: Specialised Training on Radio-Imaging in Geneva/Lausanne

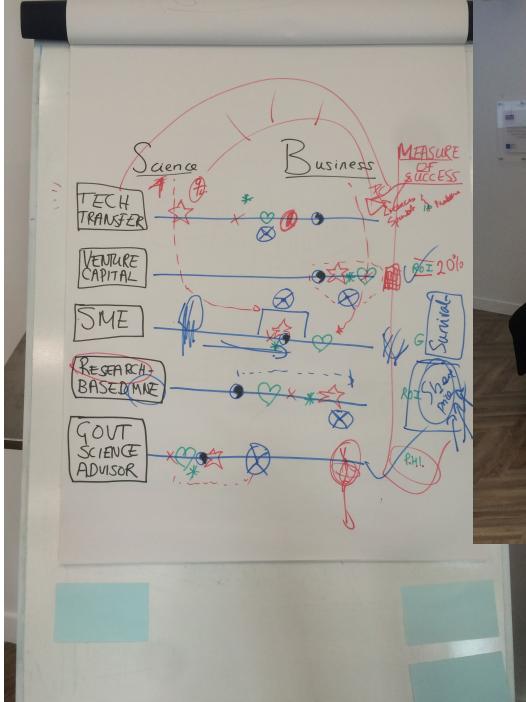


MEDICIS-Promed trainings

- **Academic training:** lectures and hands-on activities to study the production, handling, and use of radioisotopes, including concepts from nuclear physics, material science, radiochemistry, medical imaging, ...
- **Transferable skills:** lectures, workshops, and panel activities on the following topics: presentation skills, business & innovation, entrepreneurship, investment, institutions, impact, ...
- **Networking:** A unique opportunity to interact with top researchers in your field and link with other young researchers with similar interest!

MEDICIS-Promed trainings

- Academic trainings to study the production



Find your field and link with similar interest!

- Hands-on use of physics,



Top

MEDICIS-Promed Label

- Offer a label to PhD candidates participating in our events and sharing our interest
 - ▶ Strong research programme in a topic of interest to the members and partners of MEDICIS-Promed
 - ▶ Secondment to a different type of institution (minimum 3 months)
 - ▶ Participation at events recognised by the Training Office
 - ▶ Career Development Plan in line with MEDICIS-Promed, including academic training and transferrable skills
- 2 students already subscribed and a few more have expressed interest

Summer School 2017 Pavia, 4-9 June 2017



Summer School: Lectures

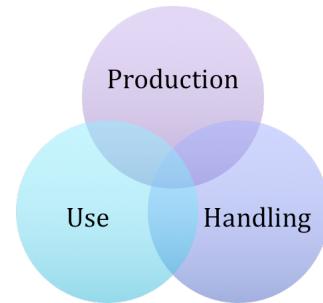
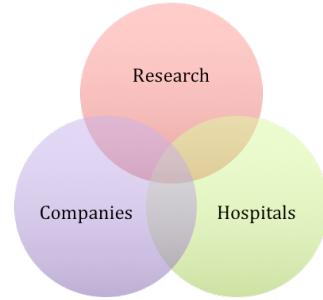
- **Monday:** Ion sources for radioactive beams by F. Wenander (CERN)
- **Tuesday:** Treatment planning by E. Sterpin & C. Deroose (UZ Leuven) & Accelerated radioactive beams by L. Penescu (Abstract Landscapes)
- **Wednesday:** PET session by D. Tuch () and F. Haddad (ARRONAX/Subatech), & Health Economics by M. Johannesma (CZ) and B. Ramaekers (Maastricht University Medical Center)
- **Thursday:** Radiobiology by A. Facoetti (Pavia) and C. Mancini (Roma) & Imaging by G. Dedes (Munich)

Summer School: Lectures

- **Monday:** Ion sources for radioactive beams by F. Wenan Deroose
- **Tuesday:** (UZ Leuven) 'Guided Reflexion'. This is the moment when YOU take the lead and confront the lecturers in order to bring new knowledge to your research topic. L. Peneschiaddad
Deroose
L.
I.
- **Wednesday:** (ARRO) + Final closing discussion on Friday Johann morning Univers
- **Thursday:** Radiobiology by A. Facoetti (Pavia) and C. Mancini (Roma) & Imaging by G. Dedes (Munich)

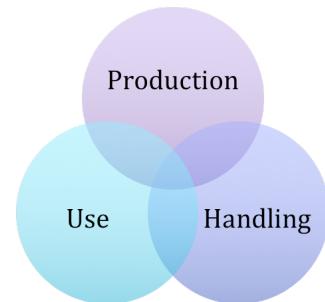
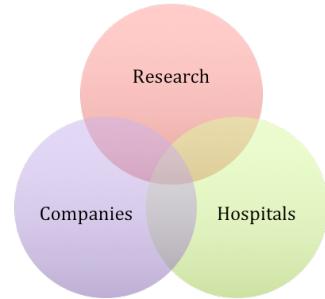
Summer school: Guided reflexion

- **2 participants** are chairing the reflexion
 - ▶ They give a short summary of each talk (1 min)
 - ▶ They present the impact that the content may have on their research, or their research topic
- Starting with those participants, go around and discuss the impact of the presentation
 - How might we...
 - Problems > Progress > Plan
 - Co-creating a solution
- Friday => Drawing the supply chain together



Summer school: Guided reflexion

- **2 participants** are ~~Volunteers needed!~~ reflexion
 - ▶ They give each talk (1 min)
 - ▶ They present what the content may have on their research topic
- Starting with these participants, go around and discuss the impact of the presentation
 - How might we...
 - Problems > Progress > Plan
 - Co-creating a solution
- Friday => Drawing the supply chain together



Summer School: Practical Sessions

- **Monday:** FLUKA workshop: introduction to simulations with FLUKA and hands-on work for the simulations of activities related to your research, be it radioactive beam production or treatment planning. Introduction and guidance by A. Mairani (CNAO).
- **Tuesday:** Workshop on how to design a PET-isotope-based hadron therapy centre. Working together to solve all the aspects of the question, from the science to the patient handling, from conceptual ideas to generating funding. Guidance by L. Penescu (Abstract Landscapes)
- **Thursday:** Poster session, together with OMA. Showcase your work and learn from the others as well! Networking is at your fingertips!

Summer School: Public Lectures

- **Monday:** MEDICIS-Promed open lecture by K. Noda (NIRS) on Carbon ion hadron therapy
- **Tuesday:** OMA open lecture by M. Pullia (CNAO)
- **Wednesday:** MEDICIS-Promed open lunch seminar by S. Myers (ADAM) on ADAM and Entrepreneurship Success
- **Thursday:** OMA open lecture



Summer School: Extra Activities

- **Sunday:** CNAO visit & Welcome Reception
- **Tuesday:** Supervisory Board (pass on any remarks to your representative, Vadim)
- **Wednesday:** Visit of Pavia
- **Thursday:** Gala dinner
- **Friday:** Wrapping up and group reporting
- **Saturday:** Visit of the Trento Proton Therapy Centre

This research project has been supported by a Marie Skłodowska-Curie Innovative Training Network Fellowship of the European Commission's Horizon 2020 Programme under contract number 642889 MEDICIS-PROMED





Enjoy the school!

Thierry, Cristina, Monica, and myself are at your disposal during the whole week...