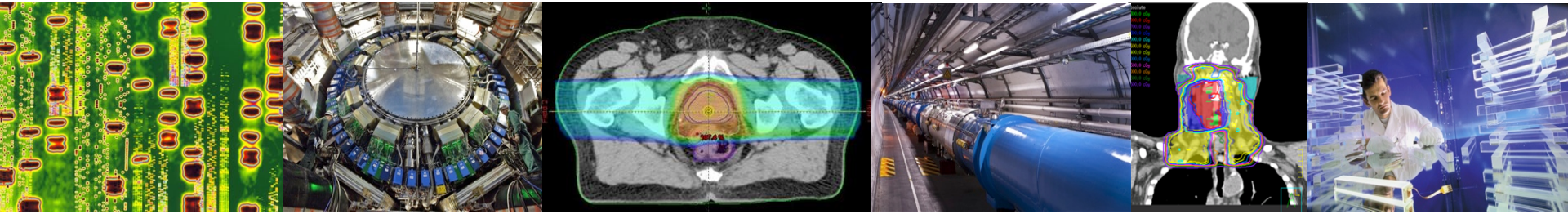


ENLIGHT EU Projects
&
CERN initiatives

Manuela Cirilli – CERN

ENLIGHT

CERN

European Network for Light Ion Hadron Therapy

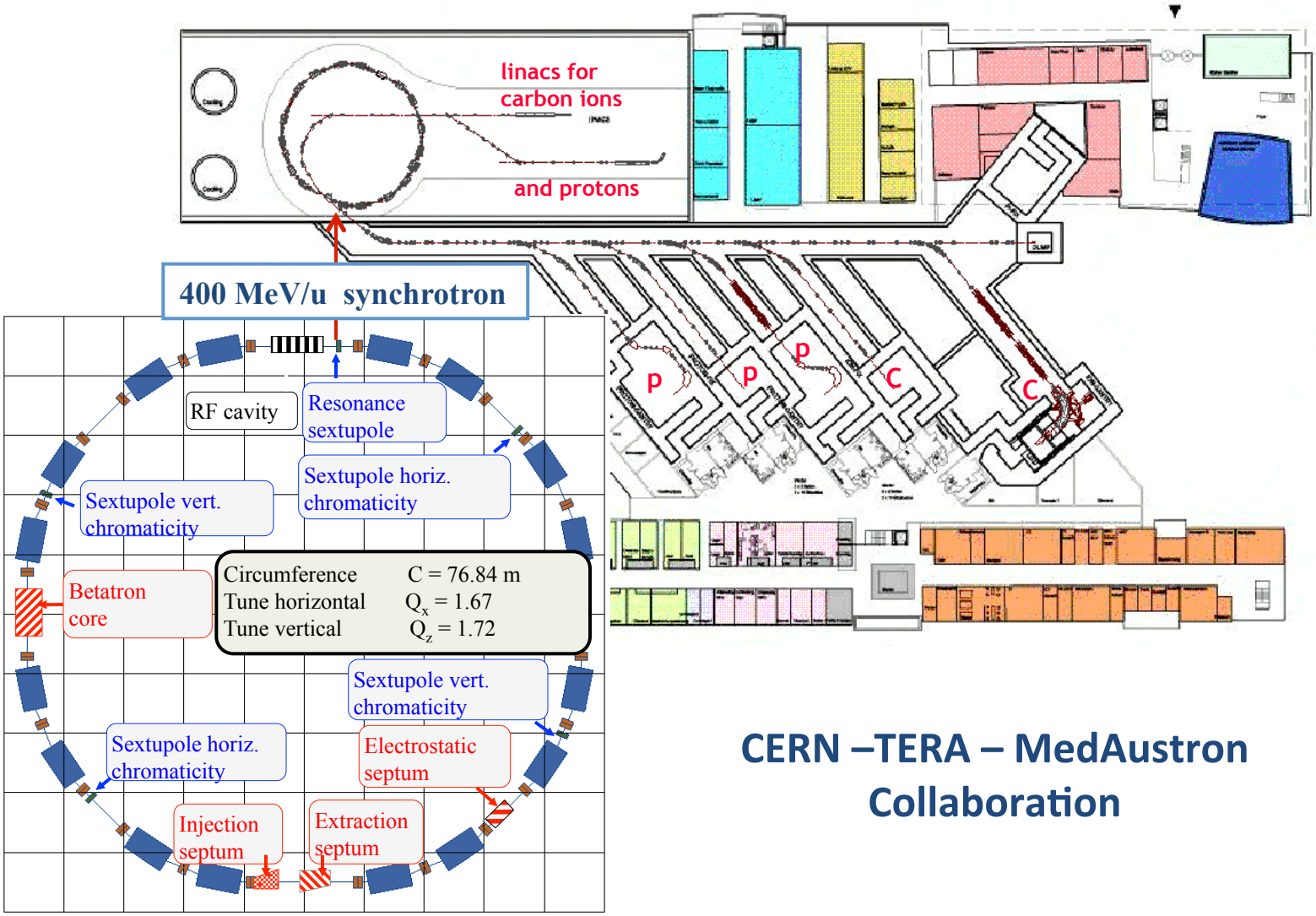
Since 2002

- Create common multidisciplinary platform
- Share knowledge
- Share best practices
- Harmonise data
- Provide training, education
- Identify challenges
- Innovate
- Lobby for funding

Since 2006: co-ordinated by Manjit Dosanjh, CERN's Life Sciences Advisor

PIMMS 1996 – 2000

Proton Ion Medical Machine Study



CERN –TERA – MedAustron Collaboration

The ESTRO HT group

- In 2000 the PIMMS study was presented in Vienna.
- The ESTRO HT group was proposed for creating a joint platform covering the different aspects of heavy ion therapy
  - Aim at closer European cooperation…..
- ESTRO HT Group met on the occasion of Med AUSTRON international advisory board meeting in 2001.

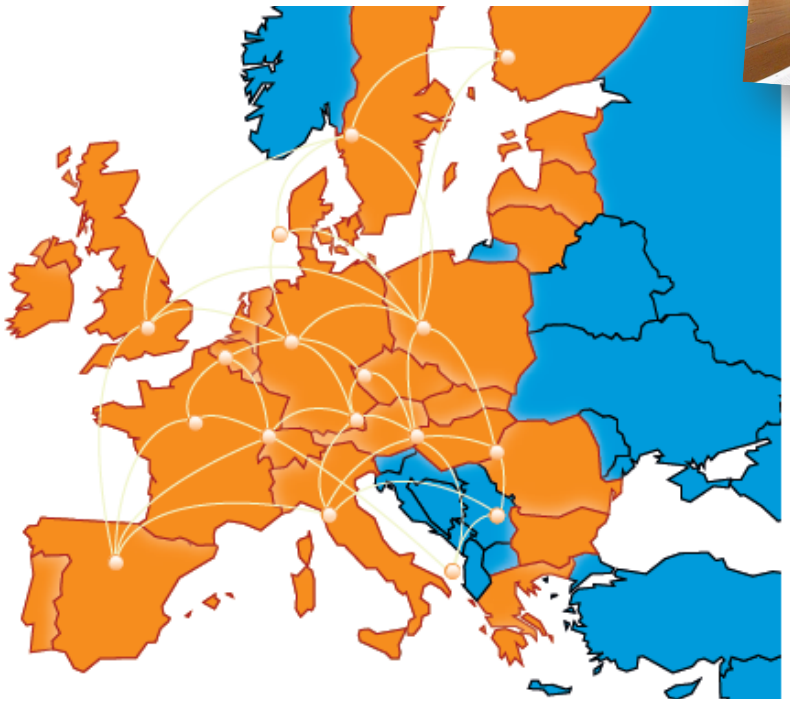
Jean-Pierre Gerard (President of ESTRO) &

Germaine Heeren (ESTRO)

were key in catalysing this process

The birth of ENLIGHT

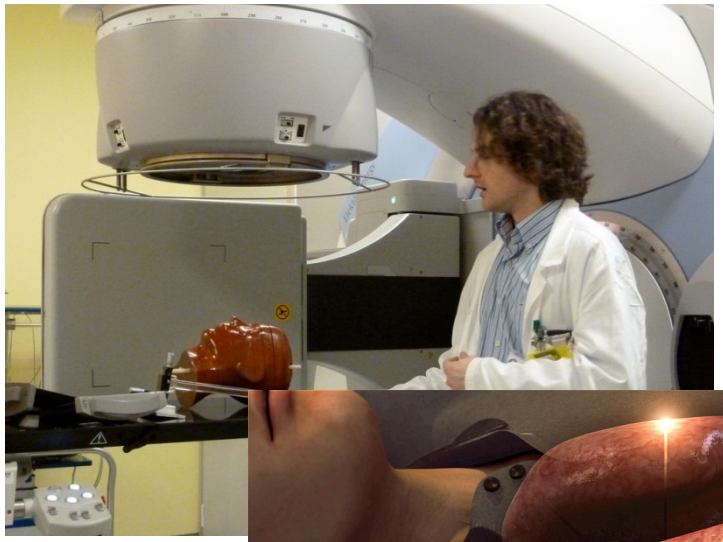
- February 2002: launched @ CERN
- 2002 – 2005: funded by the EC

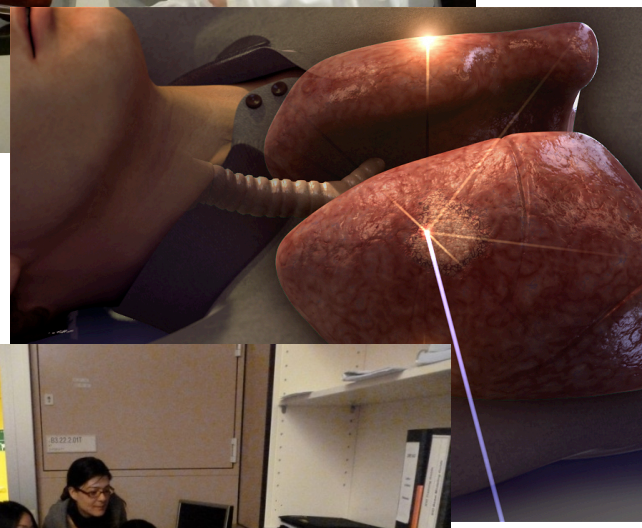


- Coordinate European research in hadron therapy
- Catalyse collaboration

The ENLIGHT Network

- Brings together experts from different backgrounds
- Promotes the sharing of knowledge and expertise
- Trains young researchers
- Identifies challenges
- Develops strategies to secure the funding for future projects
- Implements actions to meet future requirements in particle therapy





Challenges

- Multidisciplinary and cutting-edge technologies
- Clinical Studies
- Epidemiology
- Radiobiology
- Treatment planning
- Adaptive ion therapy and treating of moving organs
- Novel imaging PET/other detector systems
- Study for compact gantry designs
- Cheaper, compact facilities
- Differing needs of the collaborators
- …..

ENLIGHT ++

- In 2006 became
  - More than a network….research
  - More countries, more institutions
- Community decided the network had to continue even without EC funding
- Develop strategies for securing the funding for specific projects under the umbrella of ENLIGHT, along two major axes
  - Research in areas needed for highly effective hadron therapy
  - Networking, to establish and implement common standards and protocols for treating patients

EC funded projects

PARTNER

2008-2012

- Marie Curie Initial Training Network
- 12 institutions
- 29 trainees
- 5.6 M Euros

ULICE

2009-2014

- Infrastructures for hadron therapy
- 20 institutions
- 8.4 M Euros

ENVISION

2010-2014

- Medical imaging for hadron therapy
- 16 institutions
- 6 M Euros

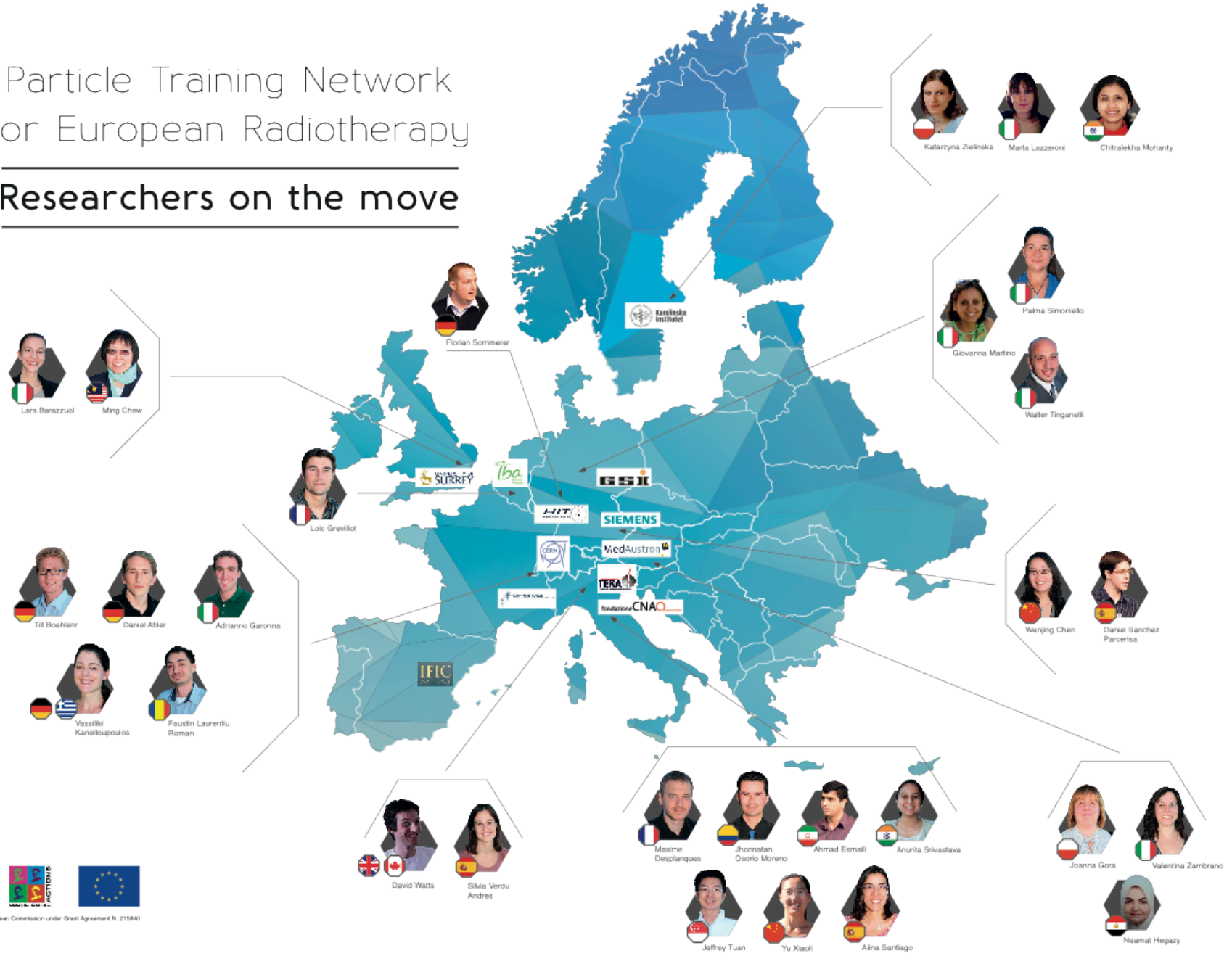
ENTERVISION

2011-2015

- Marie Curie ITN
- 12 institutions
- 16 trainees
- 3.8 M Euros

Particle Training Network for European Radiotherapy

Researchers on the move

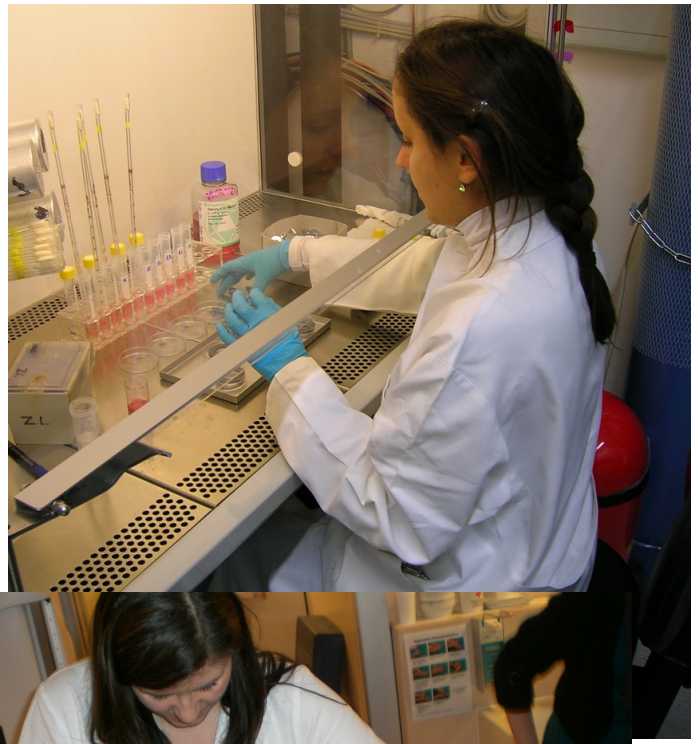


PARTNER

PARTNER is funded by the European Commission under Grant Agreement N. 215840

Training training training

- Common training
  - Both scientific & soft skills
- WP-specific training
  - Scientific/technical
- Individual training
  - Tailored to fit the career development path of each researcher
  - Language courses

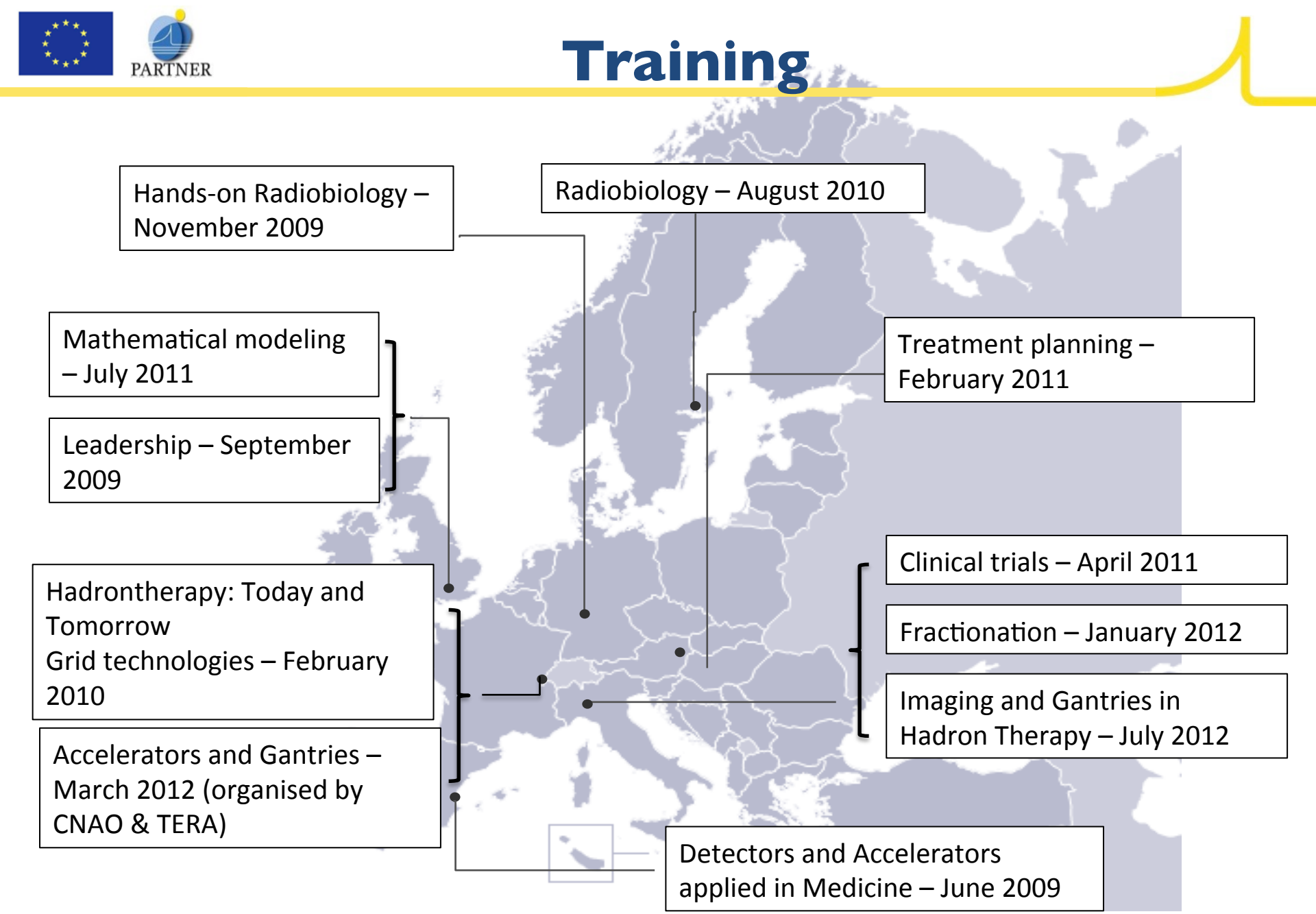


Training training training

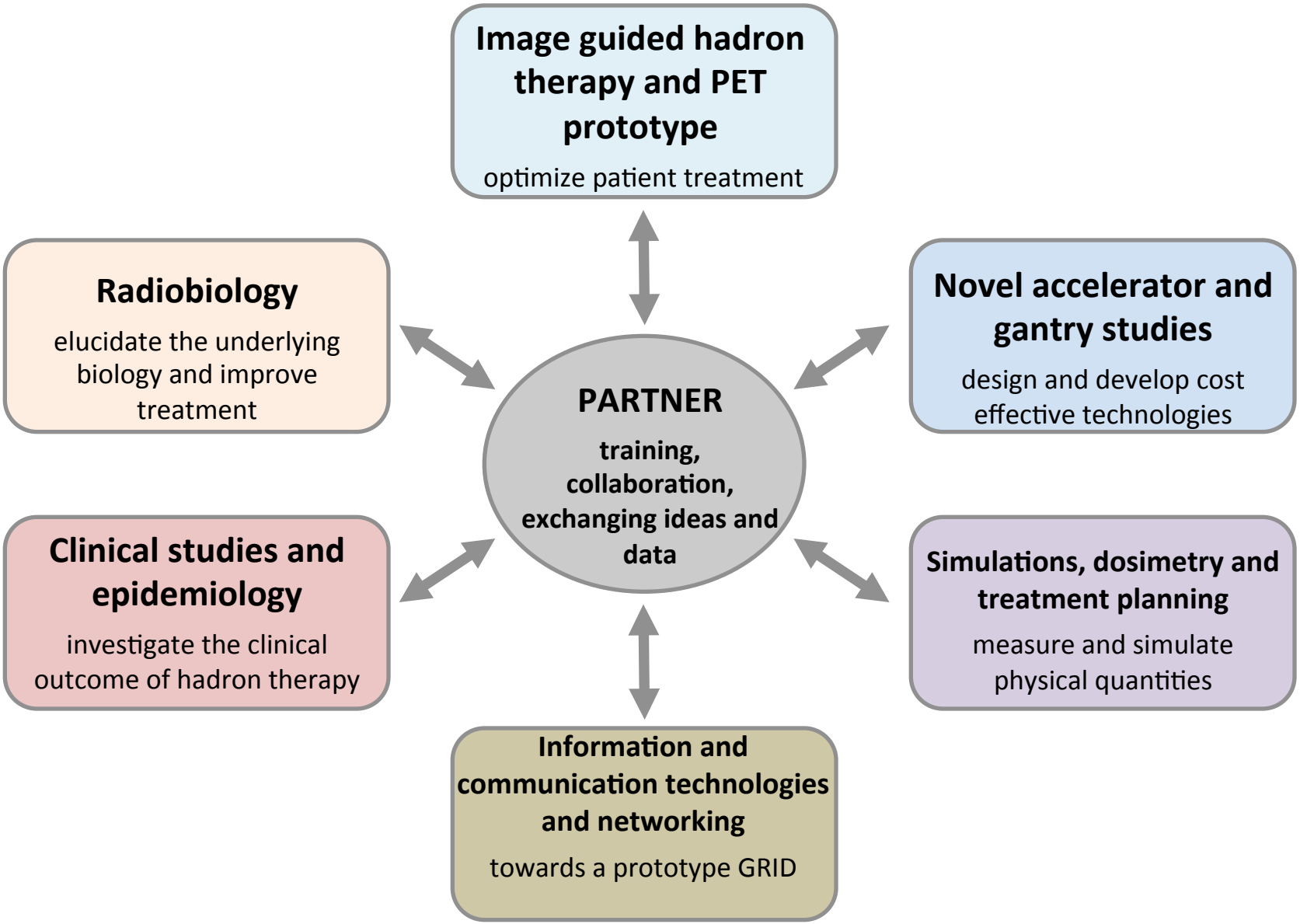
Complementary training for career development

- Teamwork
- Leadership
- Negotiation
- Research Planning
- Project management
- Report writing
- Presentation and Talking to Media

Training


Hands-on Radiobiology – November 2009
Radiobiology – August 2010
Mathematical modeling – July 2011
Leadership – September 2009
Treatment planning – February 2011
Hadrontherapy: Today and Tomorrow
Grid technologies – February 2010
Clinical trials – April 2011
Fractionation – January 2012
Imaging and Gantries in Hadron Therapy – July 2012
Accelerators and Gantries – March 2012 (organised by CNAO & TERA)
Detectors and Accelerators applied in Medicine – June 2009

Training & research

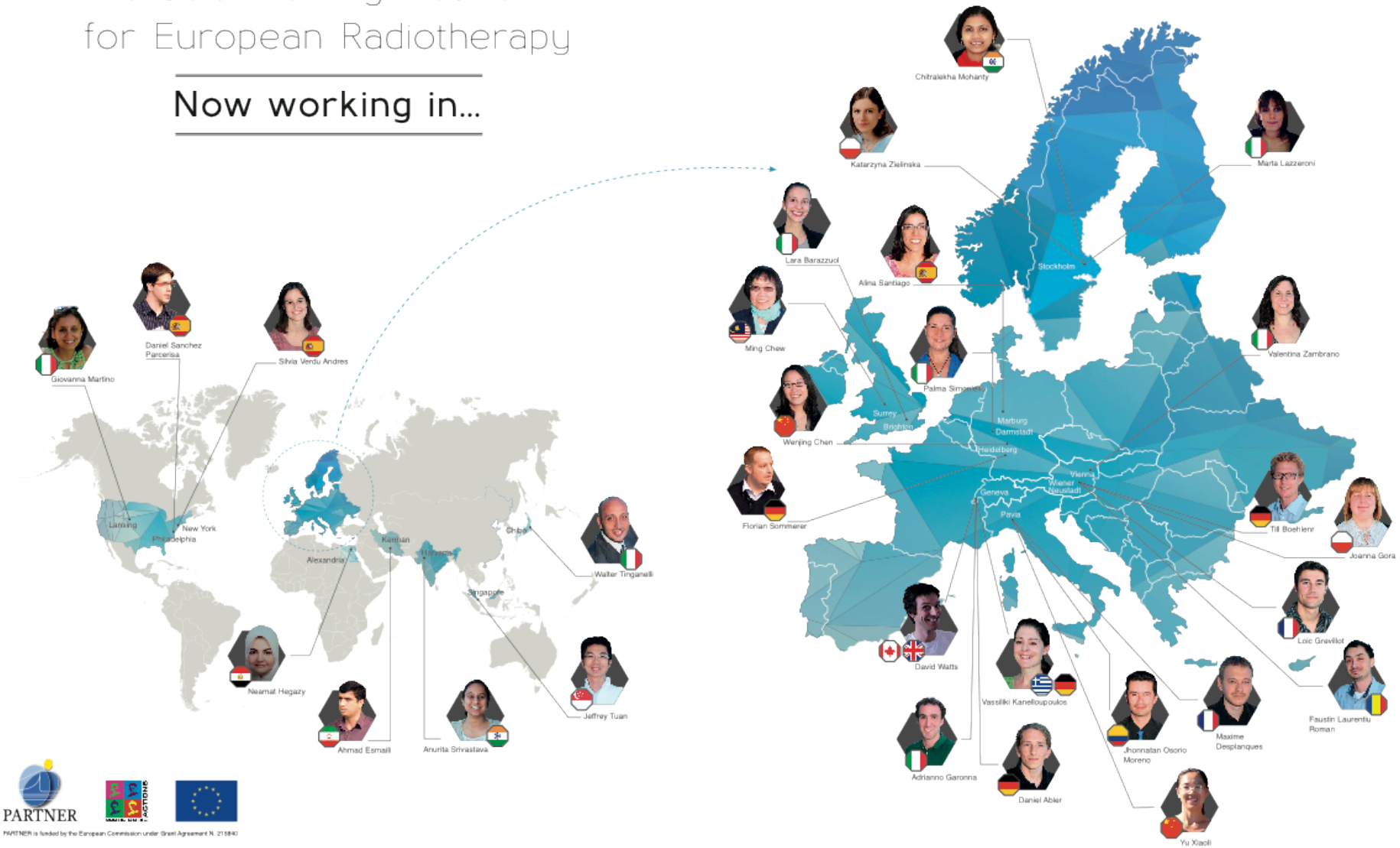


JOURNAL OF RADIATION RESEARCH

PARTNER (Particle Training Network for European Radiotherapy)
Vol.54, No.S1, July 2013

Particle Training Network for European Radiotherapy

Now working in...



PARTNER

PARTNER is funded by the European Commission under Grant Agreement N. 215840

ULICE

Union of Light Ion Centres in Europe

- Transnational Access
- Joint Research Activities
- Networking Activities
- 18 research institutes

  + 2 industrial partners (Siemens and IBA)

ULICE

- Transnational access to beam time at HIT and CNAO successfully implemented
  - 20% of the 1200 patients treated at HIT until end of 2012 come from outside Germany
  - ULICE Review Committee and consensus group selects research proposals for beam time & gathers expertise to define and establish clinical trials
    - PANDORA trial started recruiting patients

ULICE

- New gantry design being finalized
- Database for clinical, physical, biological data
- Training courses at HIT and CNAO
  - For physicians and physicists already working in hadron therapy
  - For physicians, physicists, biologists who want beam time for their experiments

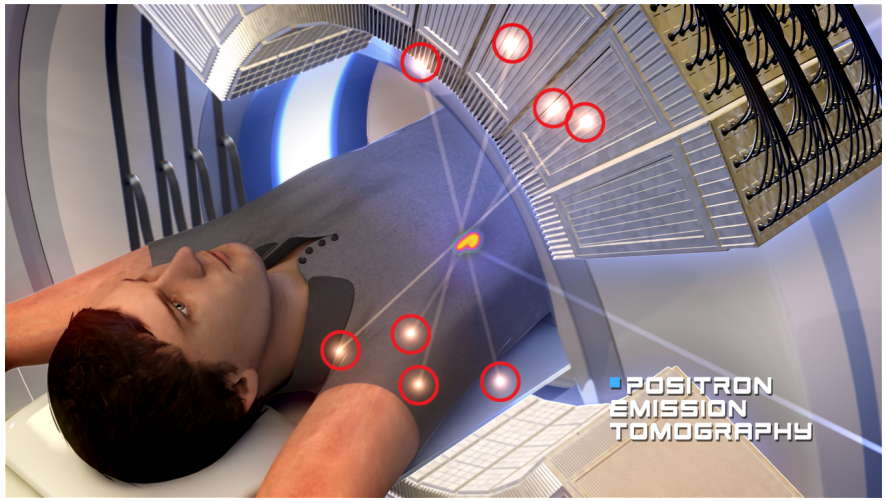
- Extended by 1 year till August 2014
- Selected for CORDIS "Results in brief"

European Novel Imaging Systems for Ion Therapy

- Imaging secondary particles to improve dose conformality of proton and ion therapy
- 16 research institutes + 1 industrial partner (IBA)

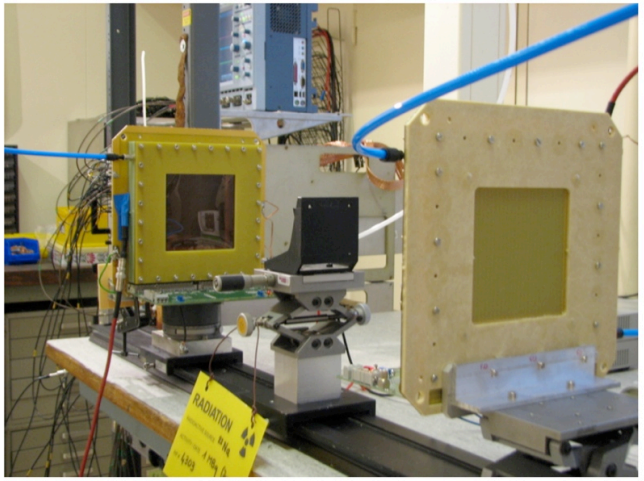
Project structure

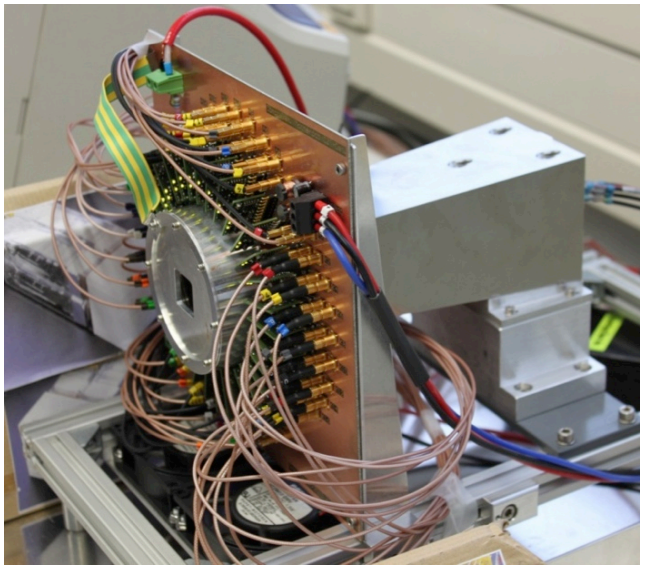
- Two complementary tomographic approaches
  - Time-Of-Flight in-beam PET
    - In-beam single particle tomography (γ, p)
- Moving targets
- In-vivo dosimetry, treatment planning and clinical relevance
- Monte Carlo simulation of in-vivo dosimetry



ENVISION so far

- Project extended by 6 months
  - will finish July 2014
- As of June 2013:
  - More than 50 publications
  - ~100 conference talks and posters
- One global publication being prepared for Medical Physics, Vision 2020
- 3D animation first shown at CERN Open days
- Selected for CORDIS "Results in Brief"





ENTERVISION

Training

Research

ENVISION

ENTERVISION

- Marie Curie ITN for young scientists
  - Uses ENVISION as training platform
- 15 researchers recruited
  - 12 Early Stage, 3 Experienced
  - 9 nationalities
  - From medical physics, engineering, nuclear physics, HEP, biological physics
- 10 research institutes and 1 industrial partner (IBA)

ENTERVISION

ENTERVISION researchers meet and work with the senior scientists of ENVISION, present their research, establish professional relationships

Training training training

- Common training
  - Both scientific & soft skills
- WP-specific training
  - Scientific/technical
- Individual training

Training training training

- Common training
  - Both scientific & soft skills
- WP-specific training
  - Scientific/technical
- Individual training

Looks familiar?

Excellence

- Mid Term Review successfully passed in January 2013
- Chosen as the "gold project" in the advertising campaign of ITNs in Horizon 2020
- EC press release for the CERN visit of the EU commissioner for Education, Culture, Multilingualism and Youth

2012: 10 years of ENLIGHT

>400 members

>150 institutes

>25 countries

Join the network:
cern.ch/enlight

Challenges 10 years later

ENLIGHT so far has been a successful example of collaborative scientific network and of lobbying EU for funding

Still multidisciplinary and cutting-edge technologies + new challenges:

- Clinical trials
- Optimisation of the present facilities to increase patient output
- Cheaper/compact facilities easier to run, cheaper treatment
- Help countries in Europe wanting facilities
- Collaboration outside of Europe: USA, S. Africa, Australia etc
- Heterogeneous network: differing needs and interests
- How to balance between basic research and the clinical needs?
- Many partners. How to collaborate effectively and make progress on the key objectives?

A vision for the future

- To build multi-centre R&D and Education & Training in close cooperation with ESTRO, EORTC, groups……..
- Joint basic and translational biology and physics research …..
- Joint clinical research, hypothesis driven, "patient model"….
- Joint combinations of all of these research activities …
- Joint education and training ++..
- We need young leadership in radiation oncology & hadron therapy!
- We need young visionary people to design and shape our future!
- We need young powerful people to strengthen our interests!
- We need young communicative people who talk and work together!

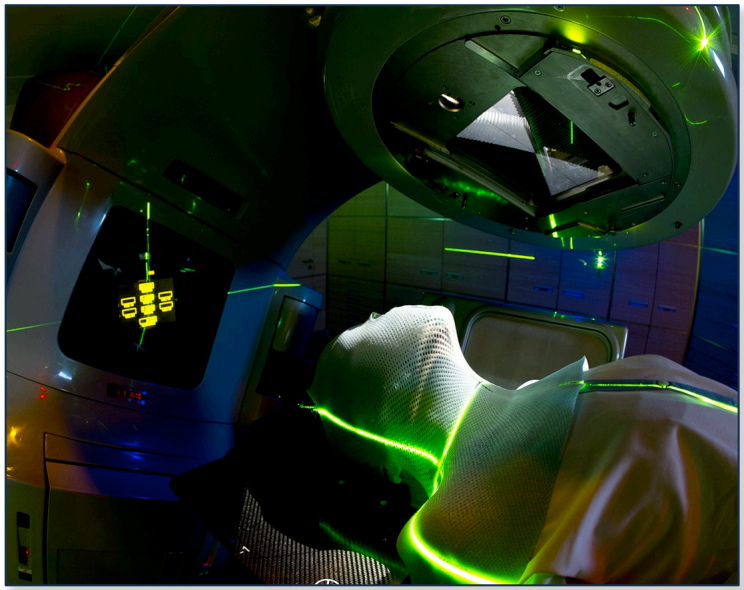
Richard Poetter, MUW, Austria (ENLIGHT 2012 @ CNAO)

Physics for Health

- 2-4 February 2010 @ CERN
- 400 participants
- Four major topics:
  - **Radiobiology in therapy and space**
  - **Detectors and medical imaging**
  - **Radioisotopes in diagnostics and therapy**
  - **Novel technologies**

Physics for Health - motivation

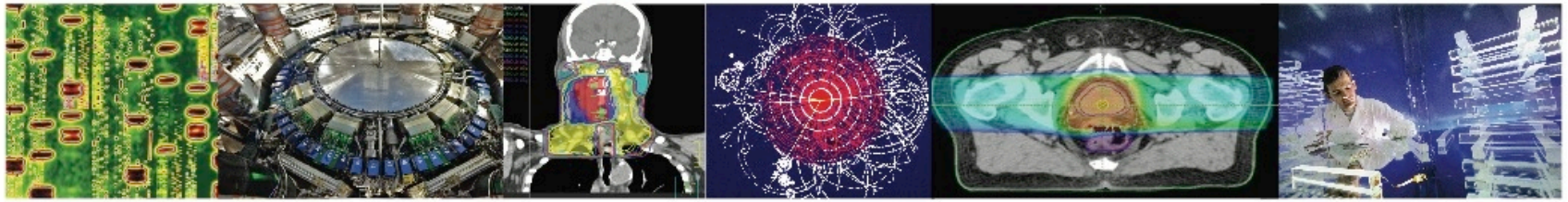
- review the progress in the domain of physics applications for health
- identify the most promising areas for further developments



- explore synergies between physics and physics spin-offs
- catalyse dialogue between doctors, physicists, biologists, medical physicists…

ICTR-PHE 2012

Uniting physics, biology and medicine for better healthcare



International Conference on Translational Research in Radio-Oncology

&

Physics for Health in Europe

Conference chairs: Jacques Bernier (Clinique de Genolier) and Manjit Dosanjh (CERN)

http://cern.ch/ictr-phe12

ICTR-PHE 2012 in numbers

- 5 days programme
  - 2 days physics, 2 days medicin
- Over 600 participants
- Almost 400 abstracts
  - ~ 200 oral presentations
  - ~ 150 posters

From PHE: 3 initiatives for CERN

- Biomedical Facility
  - creation of a facility at CERN that provides particle beams of different types and energies to external users interested in radiobiology and detector development
- Medical Accelerator Design
  - Coordinate an international collaboration to design a new cost-effective accelerator facility, which would use the most advanced technologies
- Radio Isotopes
  - Set up a European user facility network to supply innovative radioisotopes (produced at ISOLDE-CERN, ILL, PSI, Arronax,...) for R&D in life sciences (preclinical and clinical studies)

Why a biomedical facility?

- Much research is still needed to develop the full potential of particle therapy
- Clinical installations cannot offer the necessary beam time and research is not their core mission
- CERN can provide an infrastructure for providing open access to an accelerator facility
- A collaboration of interested groups from the medical, radio-biological, medical physics communities
- Does the Radiosurgery community need access?

Ask the community

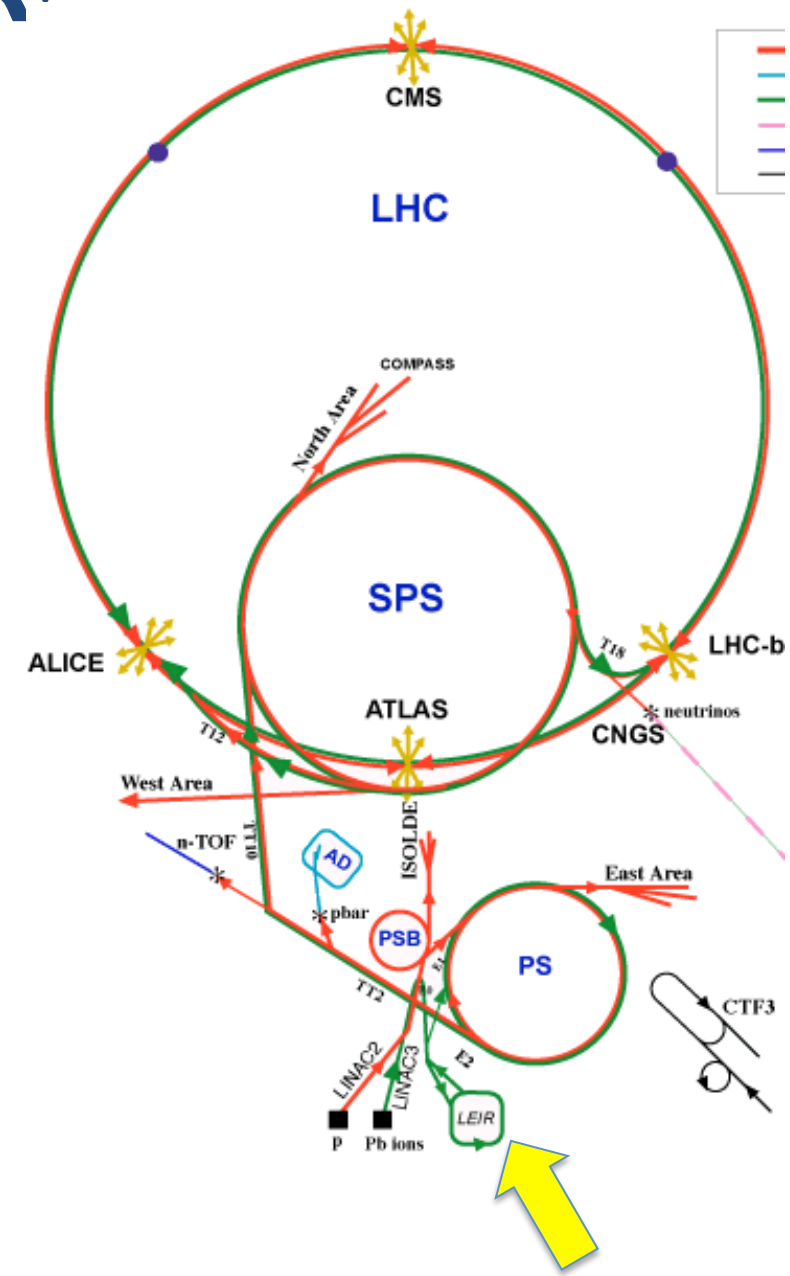
- Brainstorming meeting at CERN in June 2012, attended by more that 200 people from >20 countries, to discuss the need for such a facility

http://indico.cern.ch/conferenceDisplay.py?confId=193910

Adapt CERN's Low Energy Ion Ring (LEIR) to provide suitable beams for biomedical research

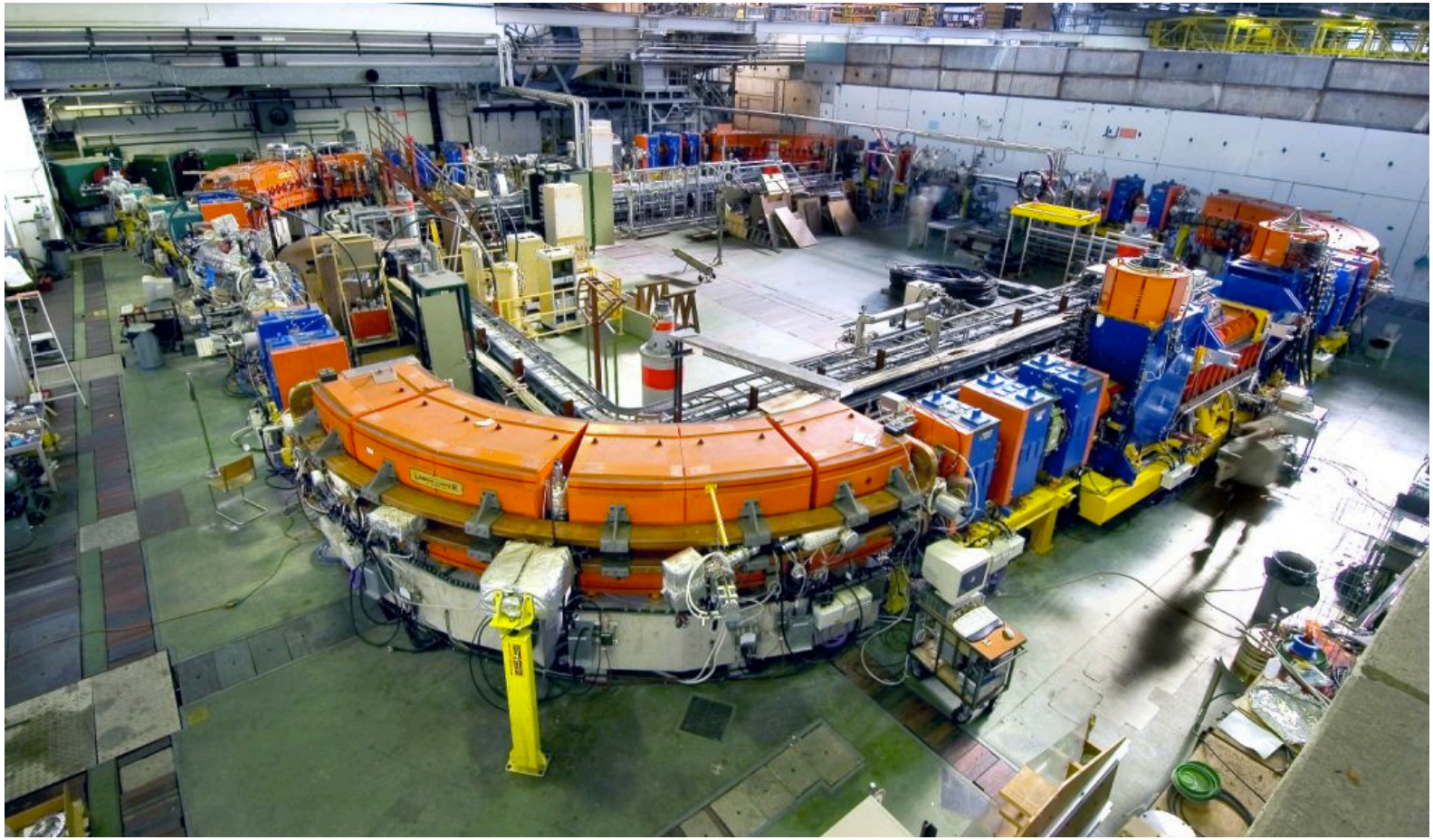
Why LEIR?

- Existing accelerator, maintained for the LHC, used for a few weeks
- Access to a range of particles and beam energies
- Available for over 8 months a year
- Space available in adjacent storage area for installations and bio-labs



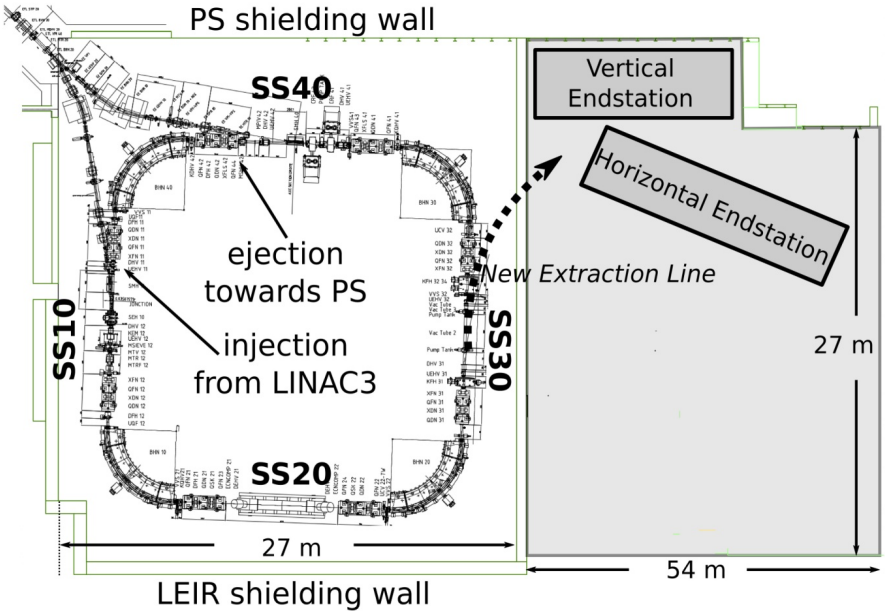
BioLEIR

- basic physics studies
- radiobiology
- dosimetry
- fragmentation of ion beam
- testing and developing detectors



BioLEIR status

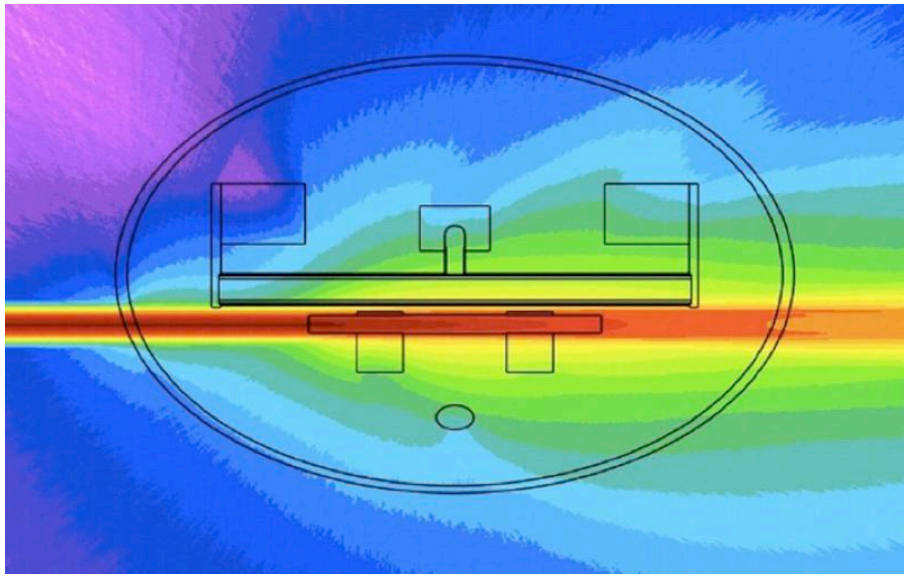
- LEIR can provide ions of interest for biomedical studies up to 430 MeV for fully stripped ^{12}C or ^{16}O ions
- Facility can also be used to test detectors, diagnostics and simulation results
- Study well under way:
  - (Re-)implementation of slow ejection
  - New extraction channel (septa) and transfer line to experiment
  - Radio protection issues (ceiling above LEIR probably required)



A. Garonna et al, Feasibility Study for a Biomedical Experimental Facility based on LEIR at CERN, JRR 54 S1 2013

CERN MEDICIS

- Research facility using a proton beam from ISOLDE
- Produce radioisotopes for medical applications
- Users now:
  - Geneva University Hospital (HUG)
  - Lausanne University Hospital (CHUV)
  - Swiss Institute for Experimental Cancer Research (ISREC)
- More users in the future



Looking forward…

Steve Myers appointed Head of Medical Applications @ CERN

- Bio-LEIR facility: requested by community (>20 countries, >200 people)
- PIMMS-2: second generation facilities
- Medicis (using ISOLDE) for exotic isotopes for future R&D
- Bio-informatics: Grids, data sharing, patient referral…..
- Imaging: Detectors, multimodality, real-time ……

ICTR-PHE 2014

INTERNATIONAL CONFERENCE ON TRANSLATIONAL RESEARCH IN RADIATION ONCOLOGY

PHYSICS FOR HEALTH IN EUROPE