Union of Light Ion Centres in Europe

http://cern.ch/ULICE

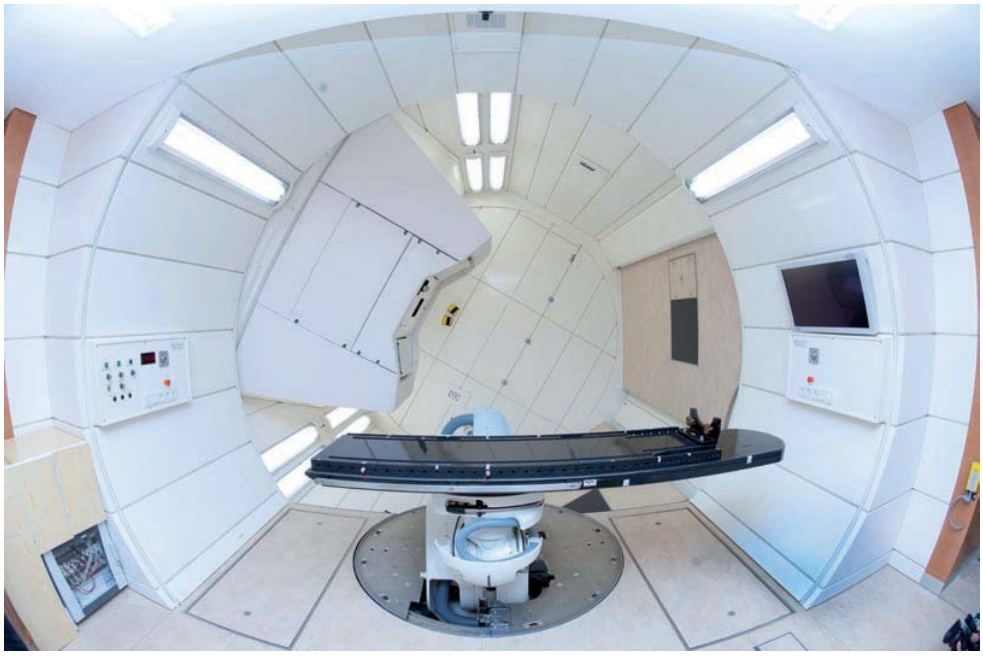
Hadrontherapy is increasingly used to treat cancer with beams of protons or ions instead of conventional X-rays: at the end of 2009, the number of proton-treated patients has surpassed the 60,000 milestone, and there are encouraging results from Germany and Japan using carbon-ion therapy. Initially, therapeutic irradiations were performed in particle physics laboratories, and it is only in the past 20 years that hospital based centres were established – the first one being in Loma Linda, USA in 1990.

In the past few years, Europe has made important steps in the development and construction of hospital-based 'dual' centres for carbon ions and protons. In particular, in November 2009 the Heidelberg Ion Radiation Therapy Centre (HIT) in Germany treated its first patient, and CNAO (the Italian Centro Nazionale di Adroterapia Oncologica in Pavia) should start treating patients at the end of 2010. Also the carbon ion facility of Philipps-Universität in Marburg (Germany) is expected to start treating patients soon. However, the challenges posed by the size and cost of hadrontherapy centres are numerous, and the design of optimal and standardised facilities must necessarily come from a global, interdisciplinary and transnational research effort.

The ULICE project was launched in 2009 to address two different complementary issues:

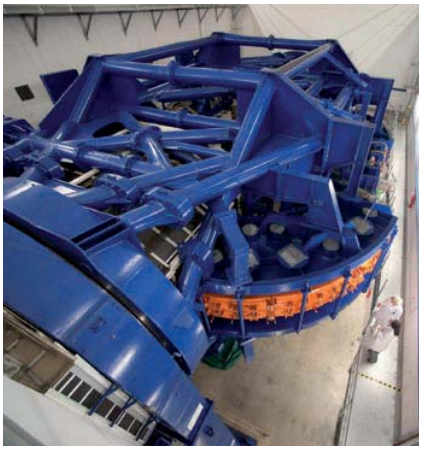
- The development of the appropriate instruments for high-performance hadrontherapy, with particular emphasis on carbon ion therapy
- The need for intensive collaboration among the existing and planned centres, as well as with the European hadrontherapy community at large

ULICE is funded for four years by the European Commission with 8.4 million Euros and involves 20 European institutions coordinated by CNAO. All the existing and planned European ion therapy facilities are involved in the project, together with two research centres (CERN and GSI) and two industrial companies (Siemens and IBA). The experience being built up in Heidelberg , Pavia and Marburg will help the development of hadrontherapy in Europe (and globally) and will provide patients throughout Europe access to these centres with treatment according to standardized protocols. In addition, other centres planned in Europe which are due to start, will benefit from this experience.



Hadrontherapy treatment room (courtesy of GSI/HIT/Siemens)

Synchrotron (courtesy of CNAO)



First rotating gantry for carbon ions (courtesy of HIT)

The project consists of 3 pillars:

- Joint Research Activities – focused on the development of instruments and protocols
- Networking – to increase cooperation between facilities and research communities
- Transnational access – to allow access to hadrontherapy facilities to researchers wanting to perform radiobiological and physics experiments as well as clinical studies.

Joint Research Activities

This pillar is coordinated by the Medical University of Vienna, and focuses on improving the performance of hadrontherapy facilities through the development of various instruments, partly available, but to be further adapted for this new and challenging form of radiotherapy. The JRA pillar will deal with clinical issues such as:

- developing novel adaptive treatment planning, including protocols that combine different types of irradiations;
- identifying tumours whose treatment would be boosted by the use of proton or ion beams instead of X-rays;
- developing a computer assisted patient selection program accessible to the whole European community interested in hadrontherapy; this will not only enable an efficient patient referral to the existing facilities, but also allow to pursue the clinical research focused on tumours with specific biological characteristics and/or critical location.

These tools will allow the different centres to optimize which radiation quality has the best chance to cure specific tumours, and provide a research infrastructure producing scientifically sound evidence on the efficacy of hadrontherapy.

Among the technical issues that ULICE will address through JRA is the challenge of reducing the dimensions and cost of the gantries, the structures that bring protons and ions to the patient allowing to target the tumour from multiple directions. HIT built the first rotating gantry for carbon ions, a giant weighing 600 tons: there is a clear need to investigate alternative design solutions.

Networking Activities

The Networking Activities pillar is coordinated by CERN and focuses on:

- Communication, interaction and interdisciplinary discussion among the 20 partners and with the external world
- Dissemination of the project results to the wider community involved in cancer care

Networking activities will provide the external research community with a clear knowledge of what is possible and what is needed in terms of research to be carried out at the facilities (both through dissemination activities, residential training for researchers and through scientific events and publications).

Transnational Access

This pillar is coordinated by the University Hospital of Heidelberg, and aims at providing access for external researchers to the recently opened ion therapy facilities for preclinical research with the available beams of particles.

Beam time will be allocated to the external researchers through a review committee, that will assess the scientific impact of the proposed research project. The possibility to have a single access point as well as transparent procedures and selection criteria to these particle beams is an important step to increase the availability of this scarce resource. Moreover, the unified application procedures ensure that each research applying for beam time is directed in a transparent way towards the facility best suited for its needs.

The Transnational Access pillar will also produce agreed protocols for multi centric clinical trials, and allow external researchers to participate in these trials.

These goals will be facilitated making an extensive use of advanced e-science grid technology.

ENLIGHT CAPACITIES

The ULICE project is funded by the European Commission under Grant Agreement No 228436

|ARC|AUH,AS|CERN|CNAO|ESTRO|ETOILE|GSI|IBA|IFJPAN|INFN|KI|MEDA|MUW|RUNMC|SAG|TUD|UCL|UKL-HD|UNIMAR|UOXF|

Contact: Manjit Dosanjh – ENLIGHT Coordinator Email: enlight @cern.ch