
HITRI*plus*

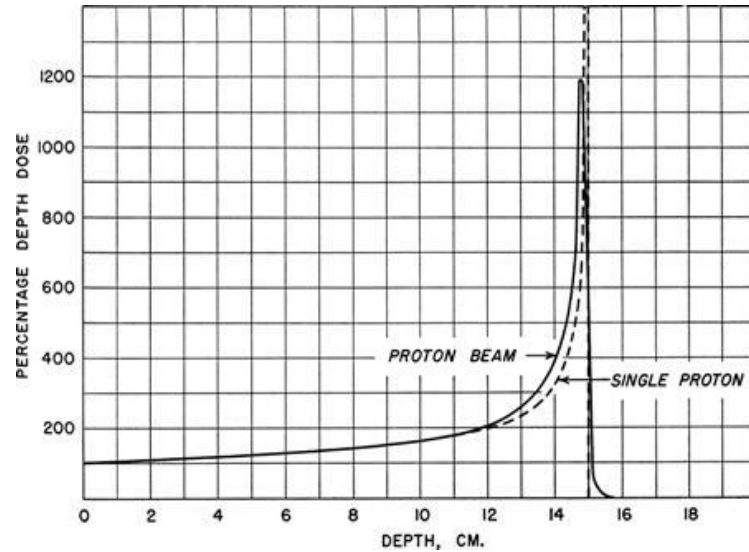
Heavy Ion Therapy Research Integration *plus*

Manjit Dosanjh (SEEIIST, CERN, University of Oxford)

1932-E.Lawrence
First cyclotron



1946 – proton therapy
proposed by R. Wilson

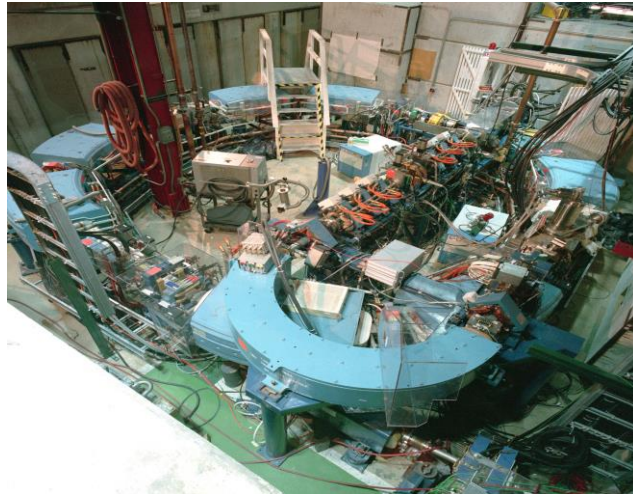


1954 – Berkeley treats
the first patient



Hadron Therapy from physics.....

**1993 - Loma Linda
USA (proton)**



First dedicated clinical
facility

**1994 – HIMAC
Japan (carbon)**

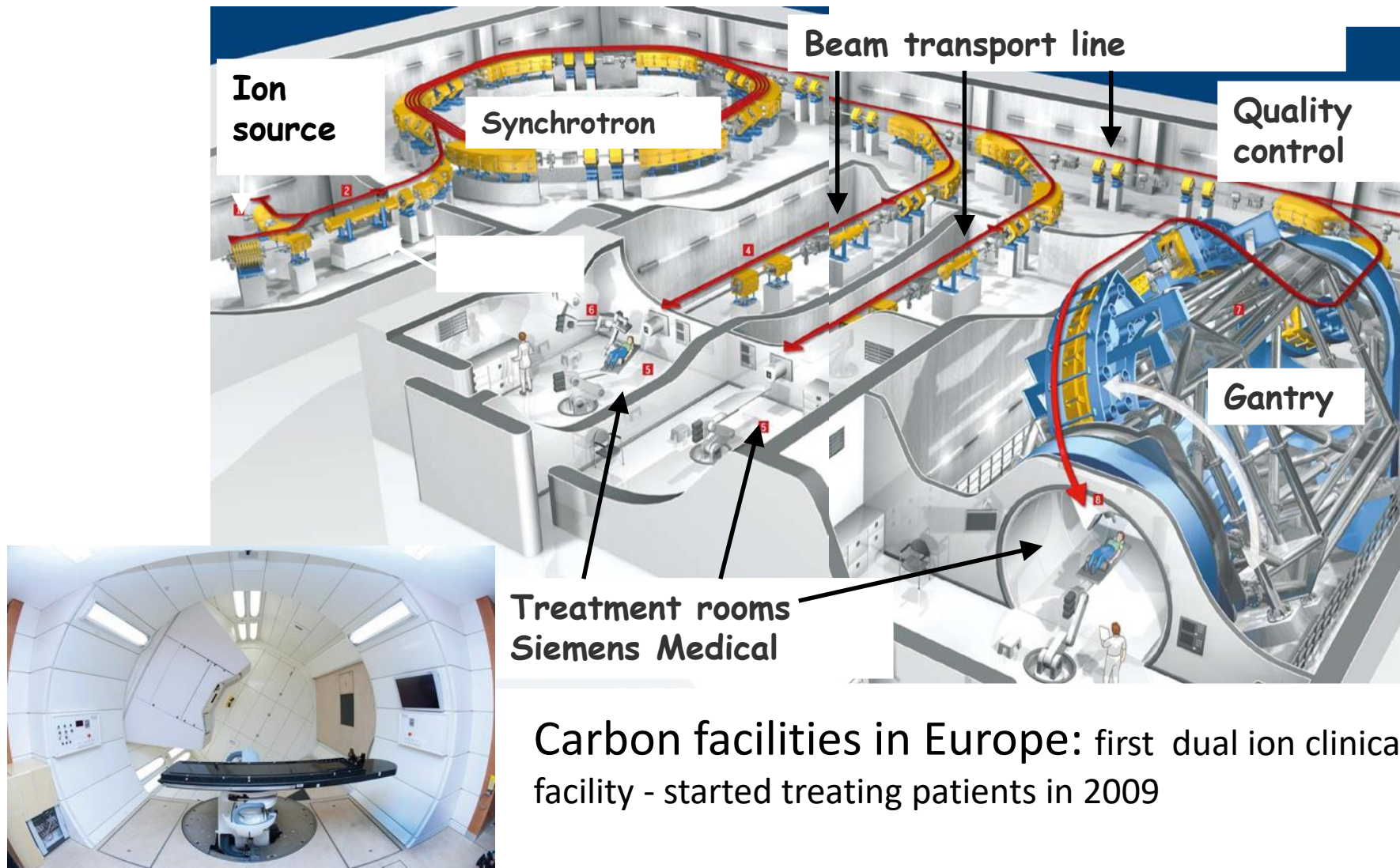


**1997 – GSI
Germany (carbon)**



.....to clinics

HIT - Heidelberg

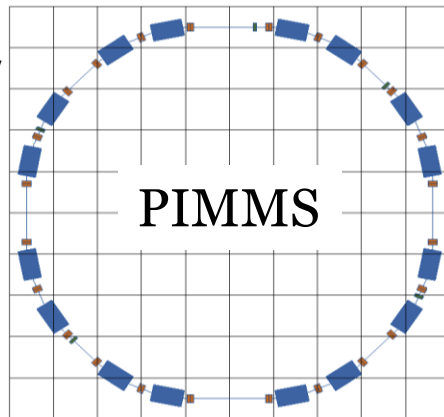


PIMMS study at CERN (1996-2000)



Treatment , CNAO, Italy
2011

1996-2000
PIMMS study



MedAustron, Austria 2016

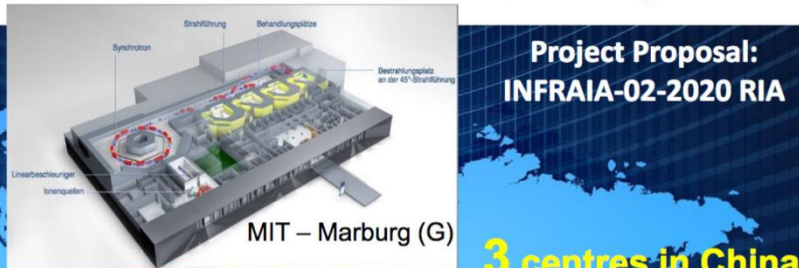


Starting Community Integrating Activity of the Horizon 2020 EC Framework Programme covering 04/2021-03/2025

HITRIplus

Courtesy S. Rossi

HITRIplus: Heavy Ion Therapy Research Integration plus



CNAO – Pavia (I)



MedAustron – Wien (A)



3 centres in China

6 centres in Japan

HITRIplus PARTICIPANTS

22 Institutes
(4 CIRT centres, 10 research institutions, 5 universities, 3 SMEs)

14 European Countries

Participant No *	Participant organisation name	Country
1 (Coordinator)	Fondazione Centro Nazionale di Adroterapia Oncologica (CNAO)	IT
2	Bevatech GmbH (BEVA)	DE
3	Commissariat à l'énergie atomique et aux énergies alternatives (CEA)	FR
4	European Organisation for Nuclear Research (CERN)	IEIO
5	Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT)	ES
6	Cosylab Laboratorij za kontrolne sisteme dd (CSL)	SI
7	GSI Helmholtzzentrum für Schwerionenforschung GmbH (GSI)	DE
8	Universitätsklinikum Heidelberg (UKHD/HIT)	DE
9	Istituto Nazionale di Fisica Nucleare (INFN)	IT
10	EBG MedAustron GmbH (MEDA)	AT
11	Marburger Ionenstrahl-Therapie Betreibergesellschaft mbH (MIT)	DE
12	Paul Scherrer Institut (PSI)	CH
13	South East European International Institute for Sustainable Technologies (SEEIIST)	CH
14	Università ta Malta (UM)	MT
15	Philipps-University Marburg (UMR)	DE
16	Uppsala University (UU)	SE
17	Wigner Research Centre for Physics (Wigner RCP)	HU
18	Riga Technical University (RTU)	LV

Third party participation linked to SEEIIST		
Participant No *	Participant organisation name	Country
19	Ss. Cyril and Methodius University in Skopje, Republic of North Macedonia (UKIM)	MK
20	Clinical Centre of Montenegro (CMSM)	ME
21	Senatomis a.d. (SEN)	RS
22	Jožef Stefan Institute (JSI)	SI





HITRIplus PARTNERS



Courtesy of S. Rossi



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101008548

HITRI*plus* Overall Objectives

- To **integrate, open up** and **broaden** the leading European Research Infrastructure
- To **coordinate and strengthen** the research programmes on heavy ion therapy of different European institutions
- To develop **novel technologies**
- To establish a **European multidisciplinary community** for heavy ion therapy research
- Future **pan-European Research Infrastructure** to be built in South-East Europe and beyond

WP1: Management
WP13: Ethics Requirement

WP2: Networking and
Communication,
Dissemination and
Outreach



WP3: Clinical
networking



WP4: Innovation,
technology transfer,
industry relation



WP5: Education and
Training



JRA
Joint Research
Activities



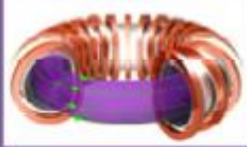
TNA
WP6
Transnational Access



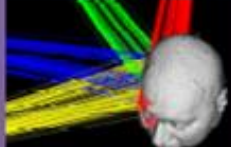
WP7: Advanced
accelerator and
gantry design



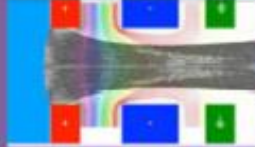
WP8:
Superconducting
magnets design



WP9:
Advanced beam
delivery



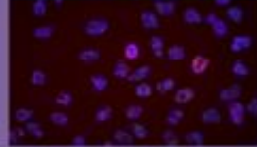
WP10: Multiple
energy extraction
system

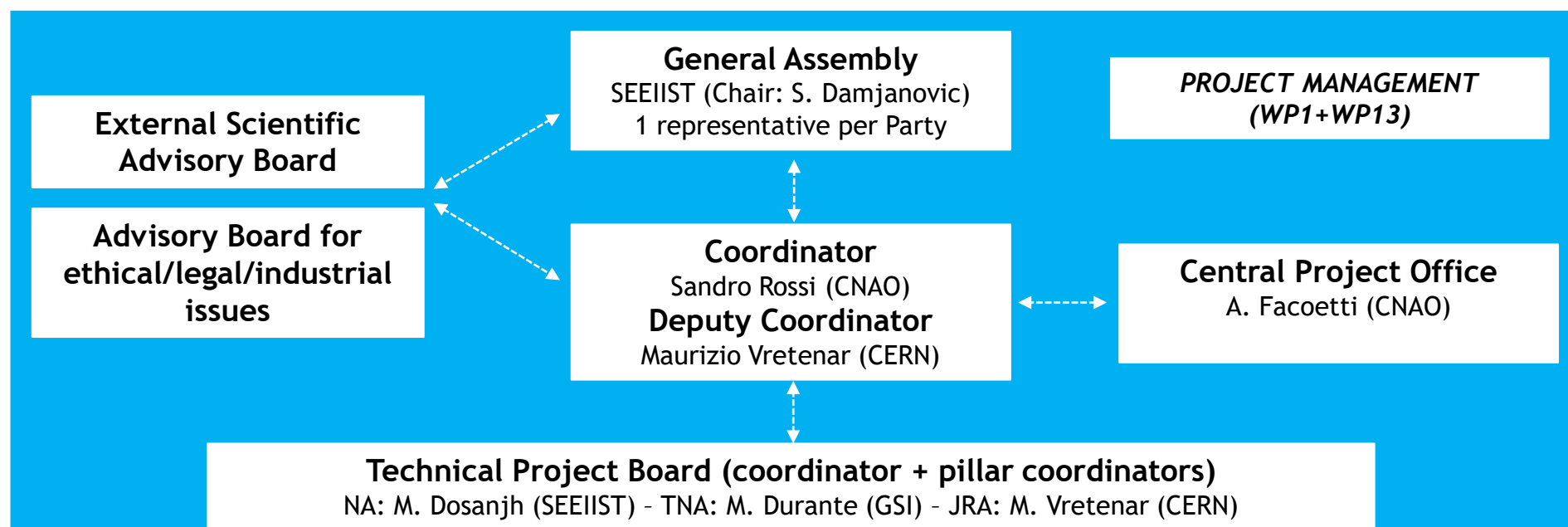


WP11: Controls
and safety

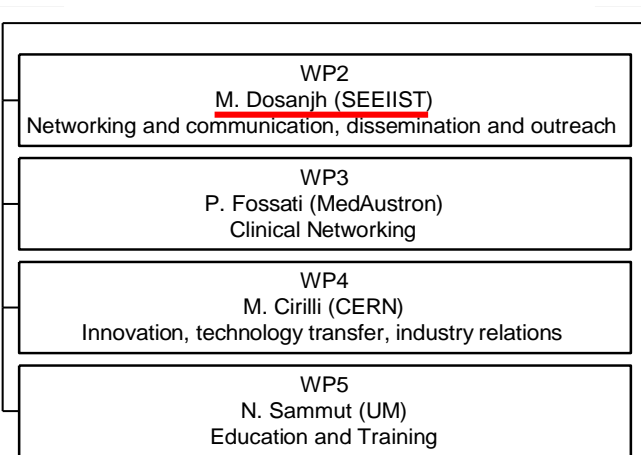


WP12:
Radiobiology and
quality assurance

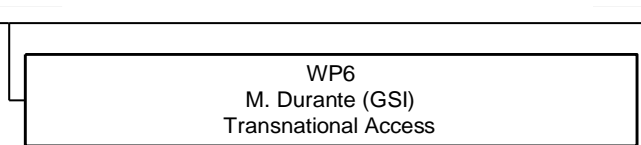




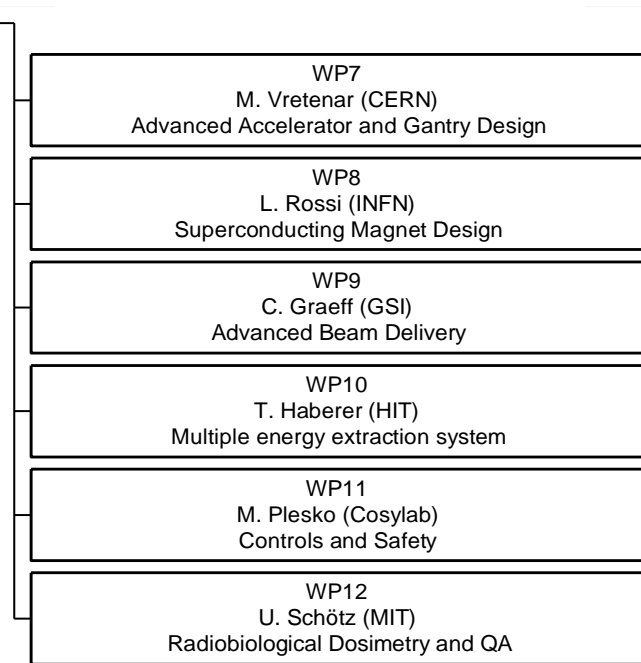
Network Activities

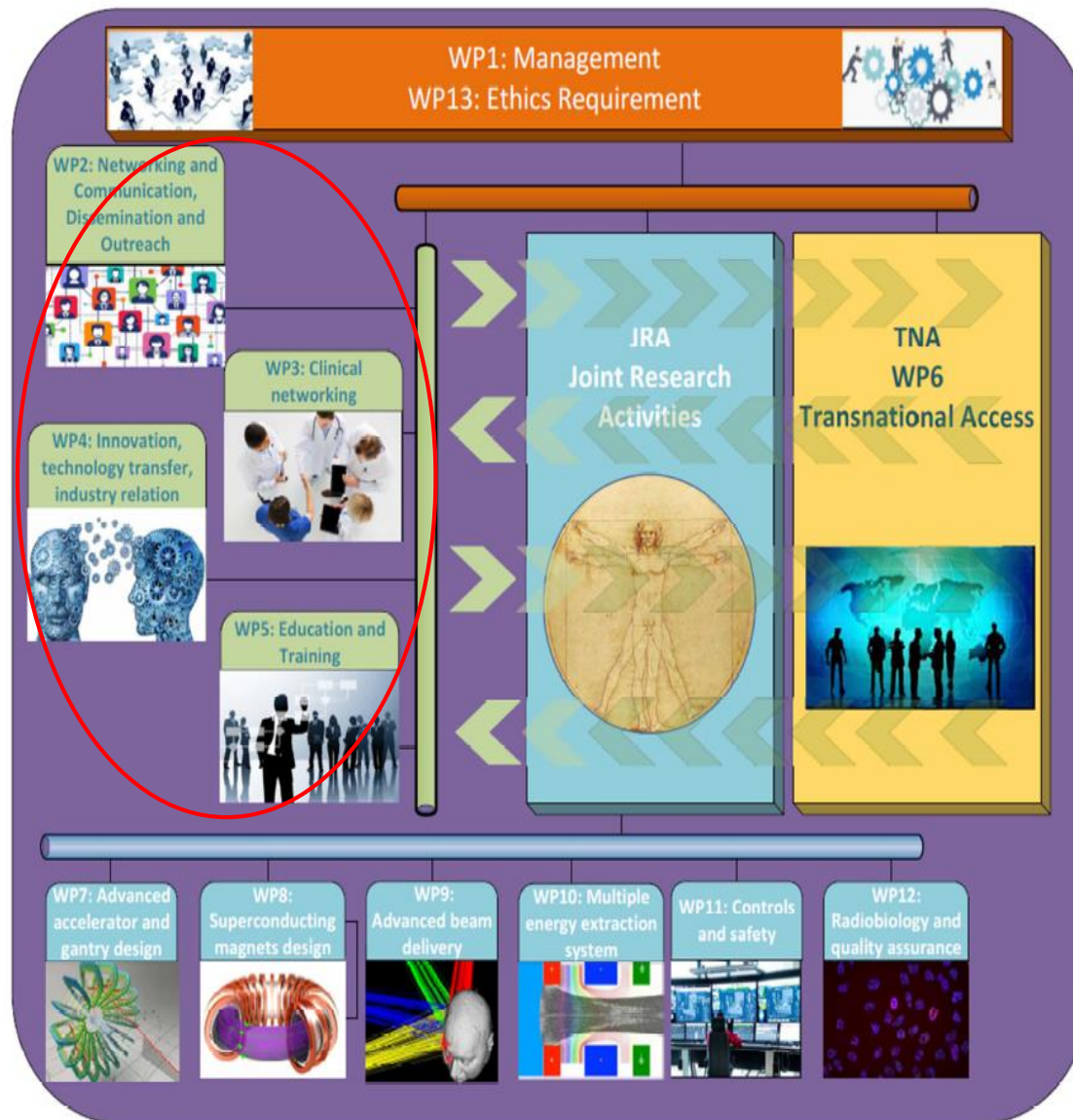


Transnational Access



Joint Research Activities





Networking Activities:

communication, dissemination and outreach, clinical networking, innovation technology transfer and industry relations, education and training;

Transnational Access: to promote the access to the existing facilities of the research and clinical communities;

Joint Research Activities:

improved accelerator and gantry design, superconducting magnet design, advanced beam delivery, multiple energy extraction system, controls and safety, radiobiological dosimetry and Quality Assurance.

Global Objectives for Networking Pillar

- ❖ To promote and communicate **outcome of research activities** among all HITRIplus partners
- ❖ To catalyse the **collaboration between the different scientific communities** (oncologists, physicists, radiobiologists, biomedical engineers.....), necessary for successful development and improvements in hadron therapy at the project and European level
- ❖ To promote hadron-therapy to the **research community all over Europe and beyond**
- ❖ To increase the **awareness** of HT to general public and the research and medical communities
- ❖ To highlight **new possibility** for cancer patients of this treatment
- ❖ To promote **transnational access** and **access to beam time** from HITRIplus
- ❖ To develop **training courses** for student, personnel working at the facilities and training of “end-users” (researchers that want to use the facility)

Networking Activities: WP2-WP5 Coordinators

- **WP2:** Communication and Networking: Manjit Dosanjh, SEEIIST
- **WP3:** Clinical Network: Piero Fossati, MedAustron
- **WP4:** Innovation, Technology, Industry: Manuela Cirilli, CERN
- **WP5:** Education and Training: Nicholas Sammut, Uni of Malta



L-Università
ta' Malta



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WP2: Network and Communication Dissemination and Outreach

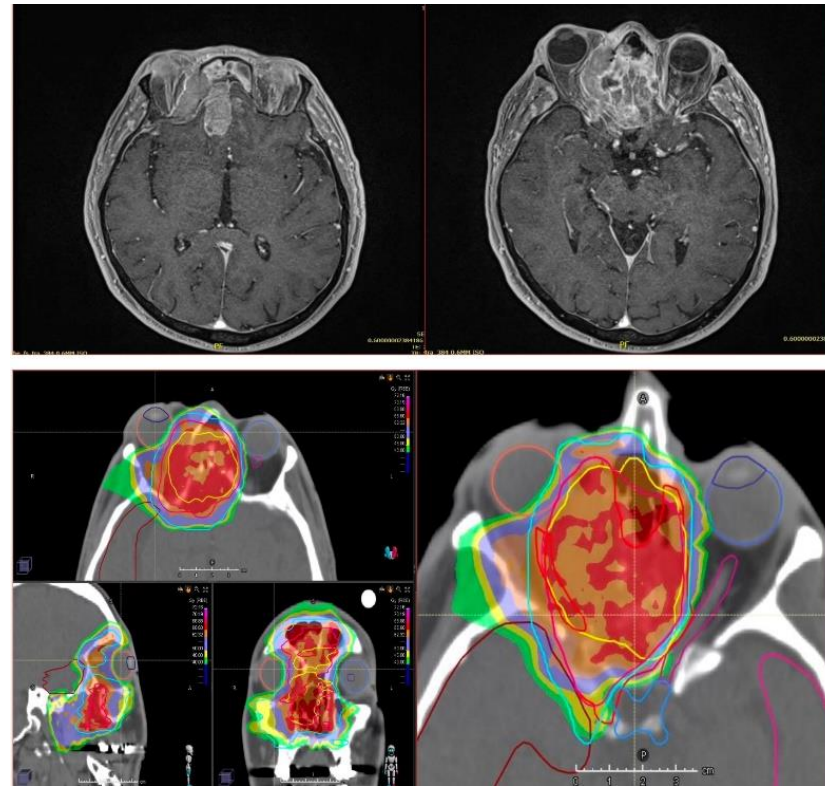


HITRIplus monthly seminars



WP3: Clinical networking

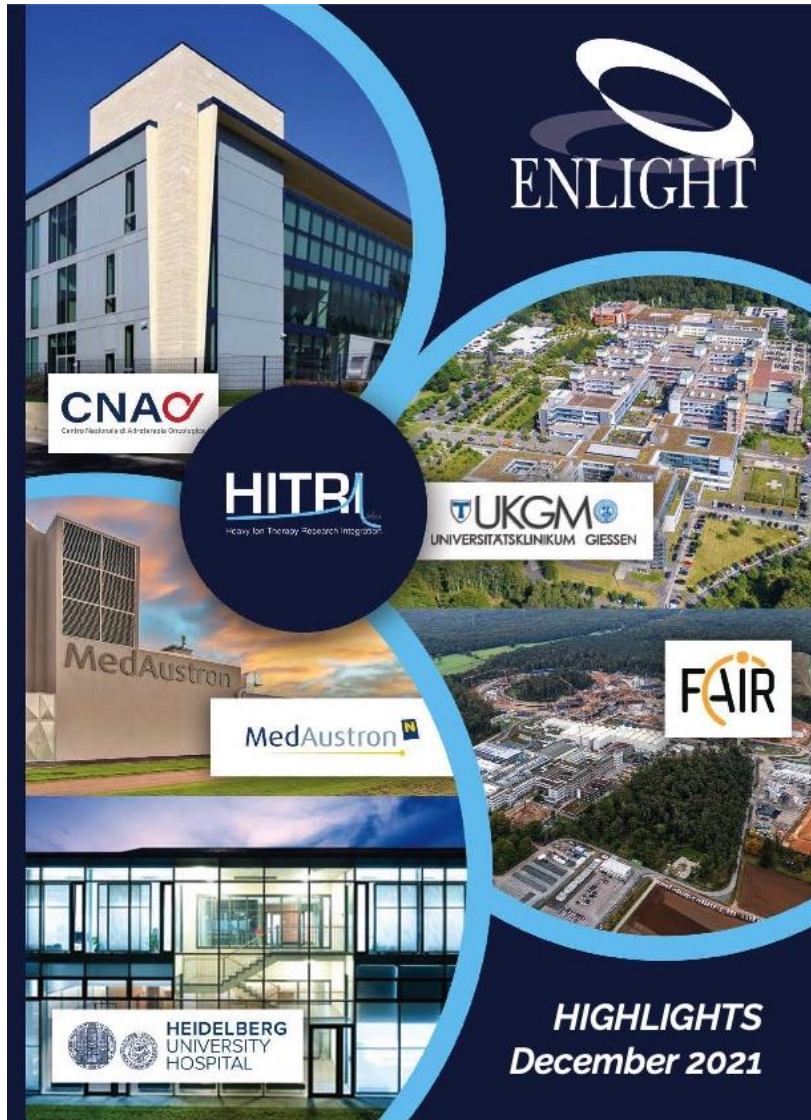
- ✓ Design **one trial** as a template for bringing innovative heavy ion therapy approaches in the clinics
- ✓ Set up a **European registry** to collect data on rare cancers treated with heavy ion therapy
- ✓ Review existing data on **OARs dose constraints** in use in the clinical facilities



HITRIplus dedicated ENLIGHT Highlights

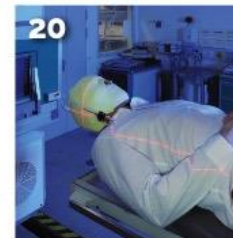


<https://enlight.web.cern.ch/sites/default/files/media/downloads/Final.pdf>



PAGE INDEX

- **News**
- 04 Heavy Ion Therapy
- **Perspective**
- 08 Management Board Pillar
- 11 Joint Research Activities pillar
- 15 Networking Activities Pillar
- 20 Transnational Access Pillar
- 26 The rest of the work packages under HITRI Plus
- **Features**
- 39 Behind the scenes of TNA beam access video
- 42 Inspire Project
- **Focus On**
- 48 Snezhina Dimitrova
- 50 Riko Hoashi
- 52 Kouroumidis Ioannis
- **Past Event**
- 56 Kick-off Meeting HITRIplus
- 58 General Assembly meetings HITRIplus
- 59 Seminars HITRIplus
- **Future Event**





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HITRIplus Seminars

Upcoming HITRIplus seminars

Katia Parodi, LMU - Imaging

Maurizio Vretenar - NIMMS/CERN/SEEIIST

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- Successful seminars since June 2021
- 100-150 participants each time

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TNA (Transnational Access Pillar): Marco Durante, GSI

Dedicated to providing TNA to research and clinical aspects in Heavy Ion centres in Europe

Task 6.1: Provision of Access and Review of Proposals

Task 6.2: TNA Providers: Description of Capabilities

Task 6.3: TNA to Clinical Activities

Task 6.4: South Eastern Europe Research Community (SEEIIST) in TNA

Task 6.5: Support through HITRI+ and Outreach to New Users

In the home page section dedicated to **TRANSNATIONAL ACCESS** video clip on TNA you saw this morning

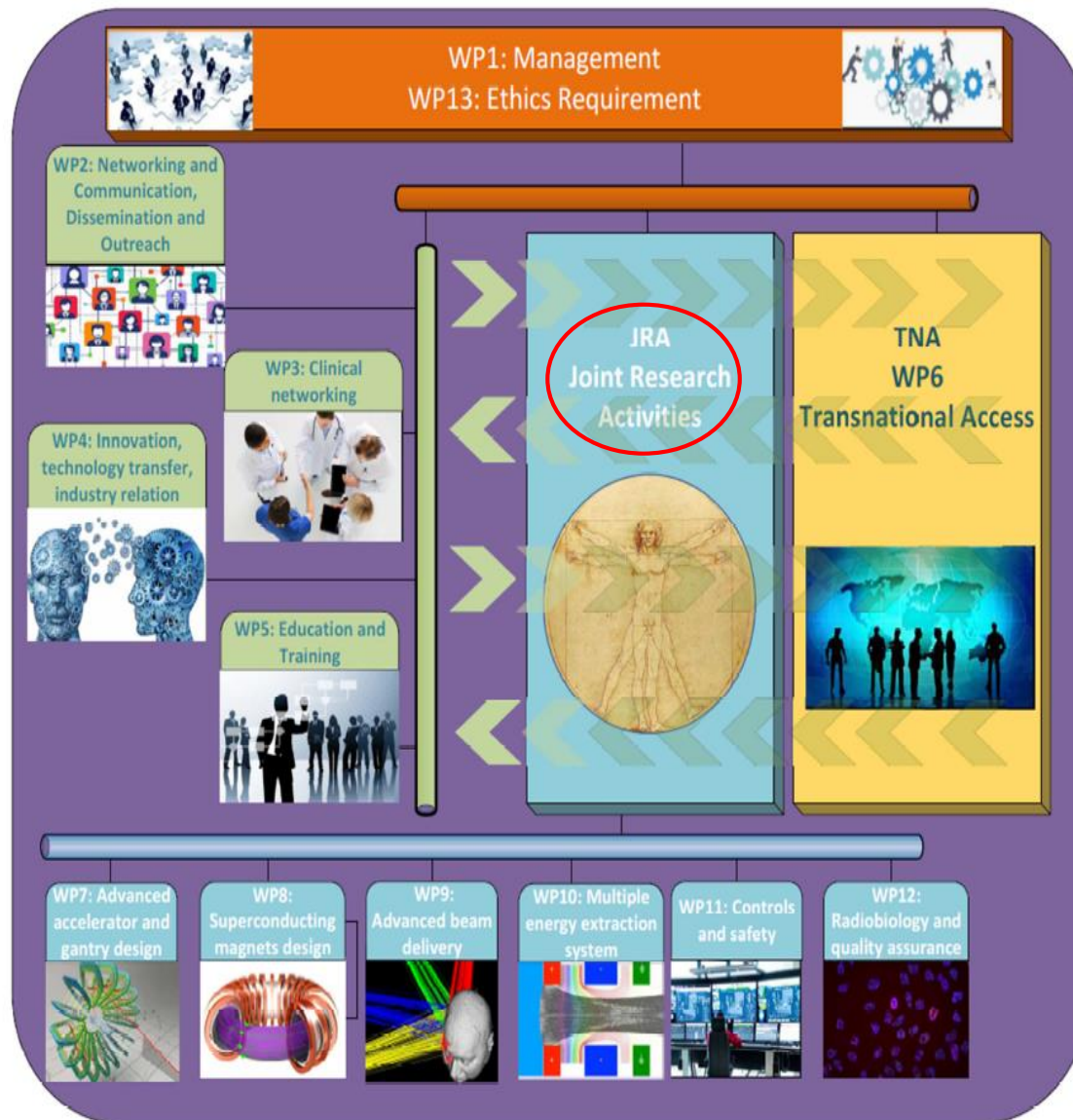
What is TNA

The TNA brings together, the four heavy ion centres in operation in Europe and opens them in a coordinated way to the medical and research community. Additionally, their programme will be integrated with the biophysics programme at GSI. The WP includes two Access programmes.

The Clinical Access will give the opportunity to the hospitals and oncological institutes in Europe to refer patients to the existing hadrontherapy facilities and share clinical Prospective Investigations and patient follow up. Secondly, it will allow the radiation oncologists to work together with their European colleagues and non-European colleagues in multicentre Prospective comparative studies to improve the knowledge both in heavy ion therapy and in classical radiation oncology through clinical research practice.

The Research Access will attract universities, research centres, and hospitals, which will connect all the groups to perform research activities in the experimental halls of the existing carbon ion facilities and at GSI. Performing research at a clinical facility will allow researchers to meet different clinical professionals. In direct contact with the real needs of the therapy and of the patient, they will have a clear perception of the feasibility to translate the research from bench to bedside. Industrial partners will be encouraged to take part in the research programme, to be involved in the development of new clinical procedures and new medical devices.





Networking Activities:

communication, dissemination and outreach, clinical networking, innovation technology transfer and industry relations, education and training;

Transnational Access: to promote the access to the existing facilities of the research and clinical communities;

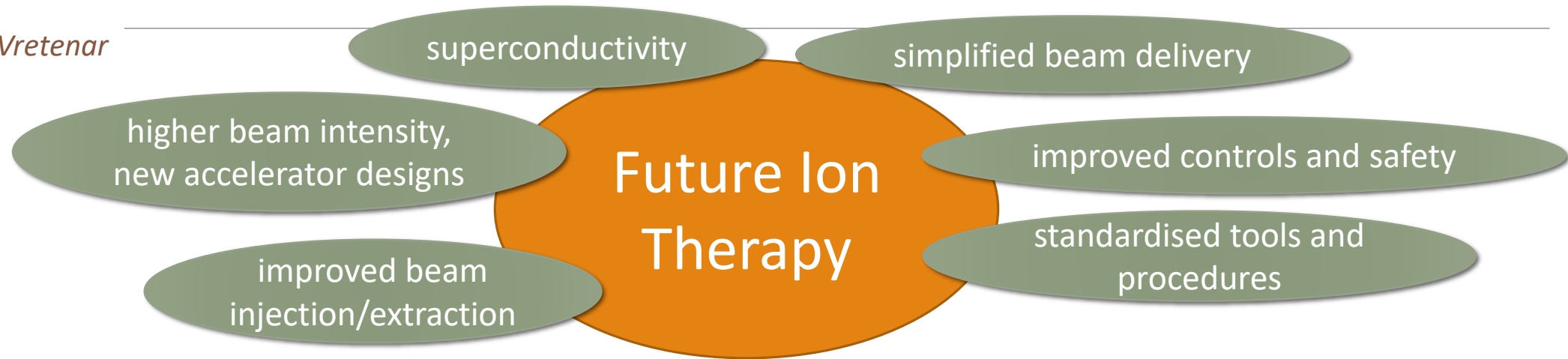
Joint Research Activities:

improved accelerator and gantry design, superconducting magnet design, advanced beam delivery, multiple energy extraction system, controls and safety, radiobiological dosimetry and Quality Assurance.

The JRA: 6 strategic directions to advance Ion Therapy



Courtesy of M. Vretenar



WP	Title	Coordinator	Goals
7	Advanced accelerator and gantry design	M. Vretenar (CERN)	Develop technologies and designs for synchrotron, gantry
8	Superconducting magnet design	L. Rossi (INFN)	Assessment and preliminary design of SC magnets
9	Advanced beam delivery	C. Graeff (GSI)	Develop new patient chair and related arc therapy
10	Multiple energy extraction system	T. Haberer (HIT)	Develop strategy and tools for multiple en. extraction
11	Controls and Safety	M. Pleško (Cosylab)	Design controls and safety for increased intensity
12	Radiobiological Dosimetry and QA	U. Schötz (MIT)	Dosimetry standardization for radiobiological experiments

Thank you for listening, now we start the course with the plenary talk by **Prof Ugo Amaldi**



HITRIplus TNA and Project Flyers