HORIZON 2020

INfraStructure in Proton International REsearch

Informe

Información del proyecto

INSPIRE

Identificador del acuerdo de subvención: 730983

Sitio web del proyecto

DOI
10.3030/730983

Proyecto cerrado

Fecha de la firma de la CE
25 Enero 2018

Fecha de inicio
1 Marzo 2018

Fecha de finalización
31 Diciembre 2022

Financiado con arreglo a
EXCELLENT SCIENCE - Research Infrastructures

Coste total
€ 4 999 867,00

Aportación de la UE
€ 4 999 867,00

Coordinado por
THE UNIVERSITY OF MANCHESTER
United Kingdom

Este proyecto figura en...

1 Diciembre 2023

Periodic Reporting for period 3 - INSPIRE (INfraStructure in Proton International REsearch)

Período documentado: 2021-03-01 hasta 2022-12-31

Resumen del contexto y de los objetivos generales del proyecto

Proton Beam Therapy (PBT) is a new type of advanced radiotherapy capable of delivering and conforming a targeted dose of radiation to the tumour while causing minimal damage to the surrounding healthy tissue.
INSPIRE comprises 17 European centres to form a highly specialised research infrastructure in high energy PBT. The consortium is made up of internationally leading research and clinical facilities and industry including an SME. INSPIRE collaborates with EU Networks (ARIE) and with other EU projects (UHDPulse and HITRI-plus). INSPIRE is part of the EU canServ infrastructure.

Trabajo realizado desde el comienzo del proyecto hasta el final del período abarcado por el informe y los principales resultados hasta la fecha

The activities of INSPIRE are grouped into: Networking Activities (NA), Transnational Access (TNA) and Joint Research Activities (JRA) arranged in 10 interconnecting Work Packages.

WP1 Project Management
• Budget and continuous progress monitoring of Tasks, Milestones and Deliverables
• Coordination of INSPIRE, NA, TNA and JRA together with individual WP meetings

WP2 Access Gateway, QA and Standards
• Developed INSPIRE web site
• 3 audit, inter-comparison studies either published or being written up linking to JRA WP7, 8 and 10. Zoomorphic phantom for 3D printing developed
• QA and dosimetry of conventional and ultra-high dose rate (FLASH) proton beams

WP3 Training Users and Inspiring the Next Generation
- Online proton schools at CHRIS/ UNIMAN and PSI
- 2 international conferences Flash Radiotherapy and Particle Therapy (FRPT) organised and a third planned for Dec 2023
- Special webinar entitled “Proton Therapy across European regions, technological advances and the emerging field of heavy ion therapy” designed for policy makers currently being developed into a publication. Basis for the INSPIRE

Foresight study (WP4) feeds into EU project canSERV involves access to the TNA capabilities built during INSPIRE

WP4 Communication and Dissemination
- 109 open-access INSPIRE publications
- 7 INSPIRE Newsletters
- FRPT Dec 2021, 2022; AU hosted ESTRO in 2022
- Through collaborations with the ARIE Network, INSPIRE became involved in a large EU Horizon cancer infrastructure canSERV

WP5 Innovation and Sustainability
- IBA/UMCG developed the CAPTAIN database of NTCP models (now available Open Source)
- VARIAN developed new detector technology (WP10) for FLASH PBT. A first full beam monitors system tested on a clinical gantry at AU and is being used in the world’s first two FLASH PBT clinical trials FAST-01 and FAST-02. A commercial

product “FLEX”, developed for FLASH PBT research and a system is available for clinical use (although currently not CE marked)
- Varian worked via UHDpulse on modified dosimetry equipment for ultra-high dose rate proton beams. Varian also worked with GSI and THM Gießen on 3D printed range modulators for the delivery of Bragg peak FLASH
- TUD working with SME ADVACAM and UHDPulse. Initial experiments successful
- 5 patents filed

WP6 TNA
- 1,119.4 beams beam hours accessed by EU researchers
- All INSPIRE TNA providers demonstrated they are capable of delivering ultra high dose rate (FLASH) beams

WP7 Radiobiology
- Radiobiology inter-comparison experiments using phantom designed by GSI
- UNamur developed device for irradiating small animals and tested using the zoomorphic phantoms developed in WP10 using IBA gantry in Skandion and Varian gantry in UK. This is the subject of a patent application
- I-SEE developed web app for collecting/sharing data
- UNIMAN/CHRIS developed a customised hypoxia end station with robotic arm for high-throughput radiobiology experiments

- GSI developed a new small portable hypoxia chamber for in vitro irradiations in acute hypoxia. This is the subject of a patent application
- Drug radiation experiments undertaken by IFJ-PAN and LSMU. At IFJ-PAN the work has led to a patent application

WP8 Patient Selection and Data Sharing
- CAPTAIN database of NTCP models developed and available open access
- With UMCG, PSI studied inter-centre variability. A single nasopharynx case was selected so that the differences in planning and the use of the Dutch NTCP model could be studied
- PSI developing a fully automated treatment planning system using Machine Learning

WP9 Mathematical Simulation and Modelling for Proton Therapy
- UNIMAN/CHRIS developed mechanistic mathematical models of DNA damage and repair and combined with realistic DNA conformations using a HiC cell model. Work available Open Access through the TOPAS n-Bio (gold standard in the field) and has been incorporated in to the research version of the Raysearch software
- TUD led an international benchmarking study which harmonised LET calculations
- Incorporation of normal tissue effects in the models in WP9 as part of the LET bench-marking exercise, this feeds in to NTCP models in WP8

WP10 Dosimetry, Robustness and Uncertainties
- VARIAN developed new detector technology for FLASH PBT
- UNIMAN/CHRIS investigating the parameter space for FLASH and integrated with spot scanning and treatment planning. PSI working on FLASH treatment planning and a new model of spatially varying dose-rate
- INSPIRE dosimetry audit led by NPI-CAS complete. Three different types of detector are being used and feeds into WP2
- TUD extended their the first-in-human validation of a prompt gamma device to 5 head and neck treatments
- SKANDION made measurements to characterise the field of secondary neutrons and gamma photons from clinically relevant irradiation

Avances que van más allá del estado de la técnica e impacto potencial esperado (incluida la repercusión socioeconómica y las implicaciones sociales más amplias del proyecto hasta la fecha)

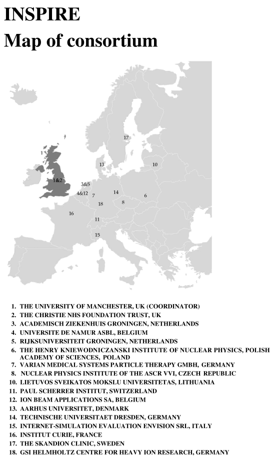
VARIAN continued to develop their new detector technology (WP10) for FLASH PBT. This is a non-CE marked device, available commercially and has been used in the world’s first FLASH PBT clinical trial FAST-01 and now being used in a subsequent trial FAST-02. VARIAN developed this commercial product, in part through INSPIRE’s Innovation Gateway (WP5). Work conducted with AU demonstrated that this device could be used clinically at both FLASH and conventional dose rates. In addition, Varian worked with PTW-Freiburg, a partner of another related EU project (UHDpulse) on modified dosimetry equipment for qualification of ultra-high dose rate proton beams. Varian also worked with GSI Darmstadt and THM Gießen applied for testing 3D printed range modulators for fast delivery of custom-designed spread out Bragg peak FLASH. An article was prepared by VARIAN to highlight INSPIRE and the collaborations that have led to these developments.

An international benchmarking study led by TUD across PBT centres (WP9) is allowing the harmonization of LET calculations and RBE reporting following proton therapy. This work has now been published.

INSPIRE working with the founders of the FLASH Workshops, UHDPulse and Kenes on a new conference series Flash radiotherapy and Particle Therapy (FRPT) https://frpt-conference.org/. Due to the Omicron variant of Covid-19 the first conference in Dec 2021 had to take place virtually. This attracted over 700 people from over 40 countries. The next conference took place in Barcelona 30 Nov-2 Dec 2022 with over 650 people; 450 in person from 41 different countries. The third is scheduled for Toronto 5-8th Dec 2023. Selected papers from the conference have been published in a special edition of the Green journal (Radiotherapy and Oncology). The conference series is endorsed by ESTRO.

The CAPTAIN database (WP8) developed by IBA/UMCG has been further developed and the NTCP models it now includes has significantly increased. CAPTAIN is available as an Open Source platform.

INSPIRE project logo



INSPIRE
Map of consortium

1. THE UNIVERSITY OF MANCHESTER, UK (COORDINATOR)
2. THE CHRISTIE NHS FOUNDATION TRUST, UK
3. ACADEMISCH ZIEKENHUIS GRONINGEN, NETHERLANDS
4. UNIVERSITE DE NAMUR ASBL, BELGIUM
5. RIJKSUNIVERSITEIT GRONINGEN, NETHERLANDS
6. THE HENRY KNIEWODNICZANSKI INSTITUTE OF NUCLEAR PHYSICS, POLISH ACADEMY OF SCIENCES, POLAND
7. VARIAN MEDICAL SYSTEMS PARTICLE THERAPY GMBH, GERMANY
8. NUCLEAR PHYSICS INSTITUTE OF THE ASCR VVI, CZECH REPUBLIC
10. LIETUVOS SVEIKATOS MOKSLU UNIVERSITETAS, LITHUANIA
11. PAUL SCHERRER INSTITUT, SWITZERLAND
12. ION BEAM APPLICATIONS SA, BELGIUM
13. AARHUS UNIVERSITET, DENMARK
14. TECHNISCHE UNIVERSITAET DRESDEN, GERMANY
15. INTERNET-SIMULATION EVALUATION ENVISION SRL, ITALY
16. INSTITUT CURIE, FRANCE
17. THE SKANDION CLINIC, SWEDEN
18. GSI HELMHOLTZ CENTRE FOR HEAVY ION RESEARCH, GERMANY

INSPIRE Map of Consortium

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