Establishing BioPhysicsX

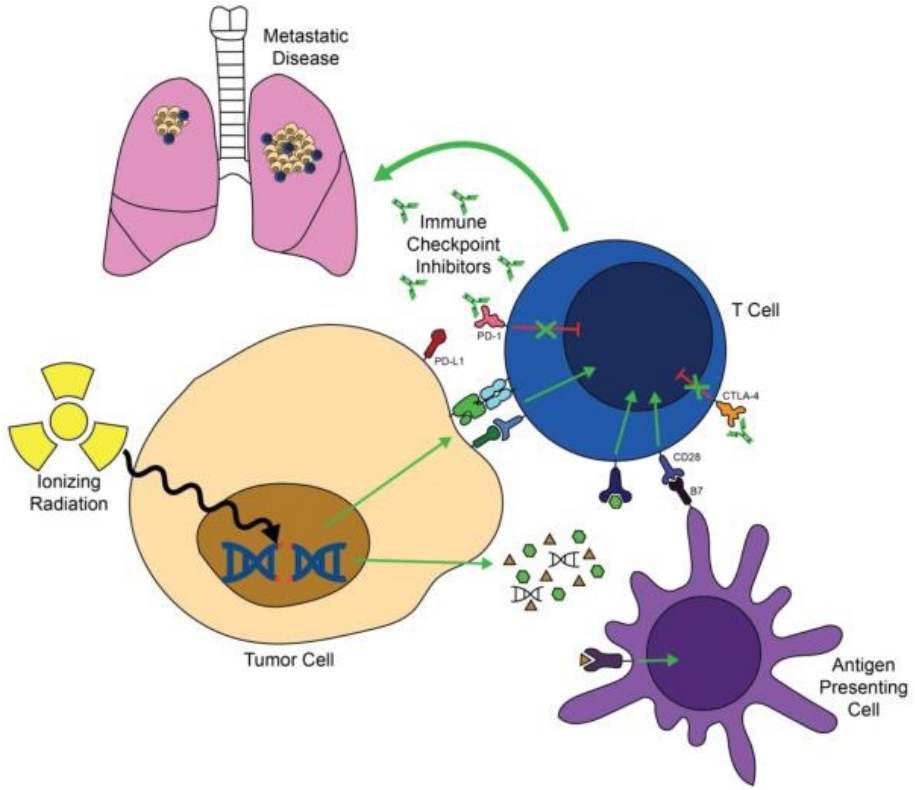
We've agreed to work to create BioPhysicsX to start Oct24. This meeting to take stock and plan steps needed to accomplish this goal.

Some slides to seed discussion:

- **Outline (thanks Charlotte)**
- **2-pager specification**
- **Adiabatic evolution of CCAP**
- **LhARA/ITRF update**
- **Automation and the White City**
- **CNRS, Imperial and BioPhysicsX**
- **Imperial Advancement**
- **CP4CT**

BioPhysicsX - The future of convergent science

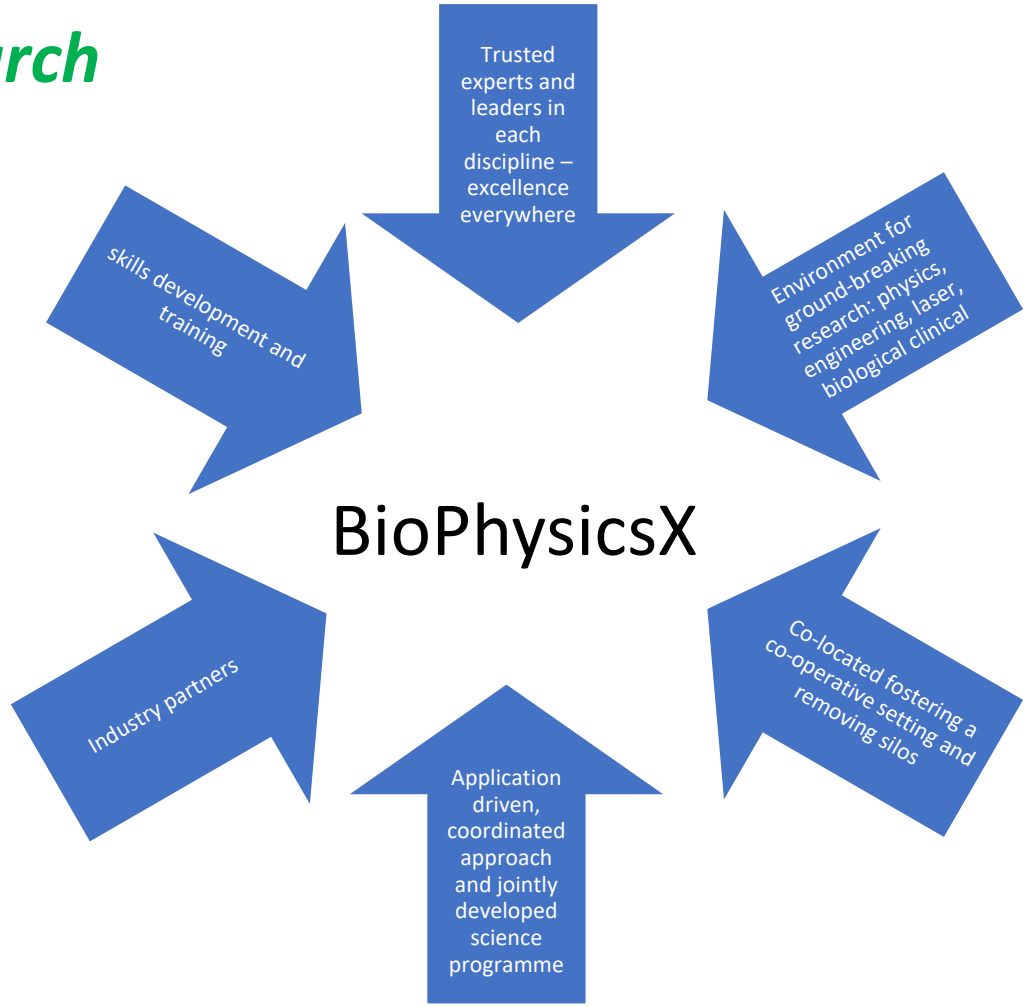
- To develop better clinical systems and improved treatment outcomes for patients
- To understand how DNA in living cells reacts to different beams and cancer treatment regimes
- To develop skills and expertise
- To attract and retain world-class researchers
- To work with industry and entrepreneurs



What is BioPhysicsX

- **A multidisciplinary institute – physics, radiobiology and clinical disciplines**
- **Will be based at Imperial College's White City campus**
- **A partnership between Imperial College, Institute of Cancer Research and Oxford University**
- **A collaboration of national and international institutes, expertise and entrepreneurs**

Novel research



Creating innovation

BioPhysicsX

What we propose

BioPhysicsX will be a unique institute focused on developing a ground-breaking new laser-based cancer treatment by combining cutting-edge developments in physics, radiobiology and clinical disciplines. This new type of cancer treatment will deliver much lower levels of toxicity than other treatments and allow treatment of previously difficult to treat tumours thus improving overall patient outcomes and quality of life.

Our vision is to realise the potential of multidisciplinary innovation and collaboration to deliver pioneering cancer research and transform cancer care for patients. Central to this is creating a collaborative community and space where students, experts, researchers, clinicians and industry leaders from all disciplines can share knowledge and work together to push the boundaries of what can be achieved in cancer treatment.

Our ambition is that BioPhysicsX, which is conceived as a partnership between Imperial College London and Oxford University, will be the fulcrum of the national and international collaboration that will develop, construct, and exploit a uniquely flexible ion-beam accelerator (LhARA) to deliver ground-breaking, innovative research in radiation biology. The research that will be carried out will inform and support future clinical developments.

We propose that BioPhysicsX be located on the White City Campus to allow interactions with other entrepreneurial cross-discipline groups in fields such as AI and computing as well as industry/start-up focused groups to capitalise on the many commercial spin offs which will emerge. Such interactions will support the development of the institute and allow it to become a leader internationally and thereby attract the best talent from around the world.

What we will do

In 2022 we received £2M from the UK Research and Innovation Infrastructure Fund for a 2-year "Preliminary Activity" which has enabled us to carry out the initial R&D and prototype-development work that will culminate in the conceptual design report for LhARA to serve the "Ion Therapy Research Facility". A follow-up proposal for a 4-year pre-construction R&D programme to start in October 2024 was submitted in July 2023.

The pre-construction R&D programme will focus on delivering two key topics;

1. *Development of the Laser-hybrid Accelerator for Radiobiological Applications (LhARA):*

   LhARA is an ion beam accelerator that can deliver a variety of ion species at ultra-high dose rate in different spatial, temporal, and spectral fractions (doses of radiotherapy).

   LhARA will deliver heavy charged particles (ions), produced using a source that is more flexible, more cost-effectively, and easier to control than currently available technologies, thus producing a better environment for research. Heavy charged-particle (ion) beams are important because they allow you to treat cancer in a different way by smashing the tumour, stimulating the immune response (autovaccination) and stopping normal tissues being damaged.

   Benefits of this type of system when developed for the clinic are;

   - *Precision treatment*
     The compact laser-driven system delivers nano-second long pulses of ions that can be re-positioned interactively during a treatment session. This innovative technology could deliver the most precise cancer treatment yet – targeting only the tumour and reducing the risk of toxicity to surrounding tissues.
   - *Concentrated treatment*
     LhARA will exploit a "plasma lens" that can capture protons and ions efficiently at higher energies than conventional magnet systems thus removing limitations on how intense the treatment can be. This means that patients could receive stronger treatment without the surrounding tissues being damaged and at a fraction of the cost of conventional systems.
   - *Personalised treatment*
     Through this system, those delivering the treatment will be able to review, consider and change in real-time which heavy ions are used and the way in which the dose is delivered. The system will be fully automated so that it can be tailored to meet individual needs as treatment is happening. This means each patient will receive the most effective and efficient treatment to respond to the tumour's location and size instantaneously.

   Extensive use is being made of computer simulation techniques and machine learning to enhance and optimise the design of the facility and of prototype components. Construction of LhARA to serve the ITRF will be the critical first step towards the development of a therapy machine.

2. *Undertake radiobiology research utilising LhARA as its research base:*

   Guided by the clinical imperatives, research in radiation biology will be undertaken during the development and construction of LhARA. This initial programme will lay the foundations of the radiobiology research that will use LhARA as its research base.

   The key areas of LhARA research are;

   - *Biological/DNA damage and repair*
     LhARA opens up a unique opportunity to research the relative biological effectiveness of different ions and the effectiveness of novel beam delivery systems. This will lead to a deeper understanding of the interaction of heavy charged-particle (ion) beams on living cells and the biological mechanisms involved in breaking DNA strands and the subsequent immune response. This insight is crucial to pave the way for improvements ion-beam therapy and its delivery for cancer patients.
   - *Physics and Medical Physics*
     To deliver this treatment, LhARA will use a fixed field alternating gradient accelerator (FFA), which provides an efficient system that maintains the time structure of the beam. This advanced technique would mark an engineering breakthrough, making LhARA a unique research tool for physicists, including medical physicists, and proving a new technique with very wide application.
   - *Technology*
     Together, the elements of the LhARA facility create an advanced, flexible, technically proficient, and easily accessible beam facility that offers a wealth of R&D opportunities for the development of instrumentation and computing techniques that will benefit medical physics and impact treatment planning.

The difference we will make

BioPhysicsX will be a unique space where experts in physics, engineering, lasers, biology, and clinical research will work together to develop new cancer treatment. Our work studying how DNA reacts to different types of radiation and treatment plans will lead to better treatment outcomes with fewer side effects and faster delivery to patients.

In the creation of LhARA – the world's first flexible laser-hybrid system for beam delivery, this multidisciplinary team will also drive forward and challenge principles in the fields of physics, laser-driven beams, the understanding of the cellular and molecular effects of spatially and temporally fractionated beams and very high dose rate radiobiology, through the production of novel, pioneering research. The advances we can make in this area will pave the way for a radical redesign of treatment machines and the development of machines that are more efficient and more effective, improving cancer patient experiences and treatment outcomes.

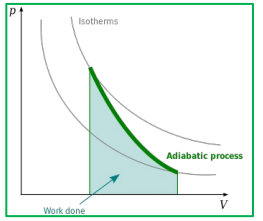
Why us?

BioPhysicsX will be led by a team of internationally recognised experts in their fields who are coming together to transform cancer care. The leadership team is composed of: Professors Iain McNeish, Ken Long, and Pat Price from Imperial and Professors Amato Giacca and Phillip Burrows from Oxford. Everything we do is driven by excellence and the vision that collaboratively we can achieve more for cancer patients.

Working at the very boundaries of our expertise, we will create a space where technology, physics, engineering, bio-medical science and medical knowledge merges and ground-breaking discoveries are made. Through research and education opportunities we will develop a new generation of researchers who view multidisciplinary projects as standard practice, rather than being remarkable and rare.

BioPhysicsX will be uniquely well placed to benefit from national and international partnerships that are already in place with organisations such as the Institute of Cancer Research and CNRS. Through these existing relationships we can quickly create synergies that can expedite our capability.

Adiabatic evolution of CCAP



Centre for Clinical Application of Particles

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About us

Related links

- Imperial Faculty of Medicine
- Imperial Academic Health Science Centre
- Imperial Department of Physics
- Imperial Academic Health Science Centre link opens in a new window

- Institute of Cancer Research
- John Adams Institute
- Oxford Institute for Radiation Oncology

Home / Research groups / Centre for Clinical Application of Particles / About us

About us

The Centre for the Clinical Application of Particles is an interdisciplinary collaboration of staff from the Faculty of Medicine, the Imperial Academic Health Science Centre, the Imperial College NHS Healthcare Trust, the Department of Physics, the Imperial CRUK Cancer Centre, the Institute of Cancer Research, the John Adams Institute and the Oxford Institute for Radiation Oncology with the mandate to:

"Develop the technologies, systems, techniques and capabilities necessary to deliver a paradigm shift in the clinical exploitation of particles."

The principal objectives of the CCAP are to:

- Deliver a broad programme of measurement of the radiobiological effect of particle beams and systematic studies of radiobiological mechanisms;
- Develop novel, compact, laser-driven accelerator systems for clinical applications; and
- Develop novel diagnostic, imaging, data-processing, and machine-learning techniques.

Same partners, more concrete direction, “socialisation of adiabatic evolution” stsarted

Wave 4 STFC Preliminary Activity proposal form

Details and descriptions

Key Information	
1. Name of project (and acronym or short name if relevant)	Ion Therapy Research Facility (ITRF) Preliminary Activity 2
2. (a) Lead contact	Amato Giaccia (amato.giaccia@oncology.ox.ac.uk) Kenneth Long (k.long@imperial.ac.uk)
(b) STFC contact	Massimo Noro (massimo.noro@stfc.ac.uk)
3. Which submission route are you using (Advisory Panel, internal, resubmission) etc.)?	Internal
4. One-line description of the Preliminary Activity (22 words) The ITRF will be a unique radiobiological research facility exploiting technologies that can transform ion-beam therapy and the treatment of "hard-to-treat" cancer.	

Project description
5. Summary of the Preliminary Activity (800 words) – please note this box expands as you type. ***Background:*** Conventional X-ray therapy (RT) is needed in 40% of cancer cures but some tumours are radioresistant and difficult to treat and cure. In Ion Beam Therapy (IBT), X-rays are replaced by energetic particles such as carbon ions. The physics of IBT allows the dose to be more precisely localised in the tumour and IBT causes significantly more direct, difficult to repair, DNA damage and stimulates a robust immune response. As a result, more tumours will be cured and with fewer side effects. However, IBT has yet to reach its full potential. Globally, there is no facility that can be used to explore the fundamental biological processes underlying IBT and which can be used to optimise radiation delivery in time, space, ion species, and energy spectrum, alone and in combination with new drugs. The project proposed here will create a facility to explore advanced radiotherapy, deliver new cancer treatments fit for 2050 and beyond, and make the UK a leader in the global fight against cancer. ***Objectives:*** The Preliminary Activity (ITRF PA2) proposed here will complete the design and planning of the ITRF construction project to create the world-leading, compact, single-site research infrastructure that will deliver the multidisciplinary programme necessary to: • Elucidate radiobiological mechanisms that underpin the clinical efficacy of particle therapy; • Generate the accelerator, diagnostic, imaging, and computing technologies required to transform the clinical practice of IBT; and • Deliver the capability to provide IBT in completely new regimens by combining ion species from protons to carbon exploiting ultra-high dose rates and novel spectral-, spatial- and temporal-fractionation schemes. The design, specification and planning carried out within ITRF PA2 will build on the complete Conceptual Design Report that is the principal deliverable of the current ITRF Preliminary Activity (ITRF PA1).

Science and Technology Facilities Council

UKRI Infrastructure Fund: Wave 4 Preliminary Activities

The STFC prioritisation process for Wave 4 preliminary activities of the UKRI Infrastructure Fund began in early 2023 with an invitation to the PPAN Advisory Panels and internal STFC departments to identify and submit proposals for consideration.

STFC received thirteen Preliminary Activity proposal submissions, seven of which were resubmissions from previous waves of the STFC prioritisation process. Initial feedback from the STFC Visions Panel was provided for all proposals in August, focusing on the potential for delivery of a step change in capability and the strategic drivers of the projects.

Following incorporation of feedback, the proposals were assessed by both STFC Science Boards, PPAN and Facilities & Laboratories, and resulting recommendations were provided to STFC Council for consideration alongside the proposals. STFC Executive Board then considered all advice to agree the final outcomes of the prioritisation process.

Unfortunately, the ITRF Preliminary Activity proposal was not selected by STFC for submission to Wave 4 of the UKRI Infrastructure Fund. More detailed proposal feedback focused solely on the outcome of the prioritisation process is provided below.

ITRF: Ion Therapy Research Facility- Preliminary Activity 2

The ITRF proposal illustrated the high impact potential of the project, and it was recognised that the full infrastructure could deliver a large step change in capability for the UK. The proposal was considered ambitious and a good fit to the Infrastructure Fund. However, the project fit within the international landscape was unclear and the proposal would have benefitted from focusing on the specific strategic drivers of the project.

The proposal clearly displayed the project's potential for broad reach beyond one discipline, but the level of engagement of potential partners for the preliminary activity and the potential target community for the full infrastructure were unclear from the proposal.

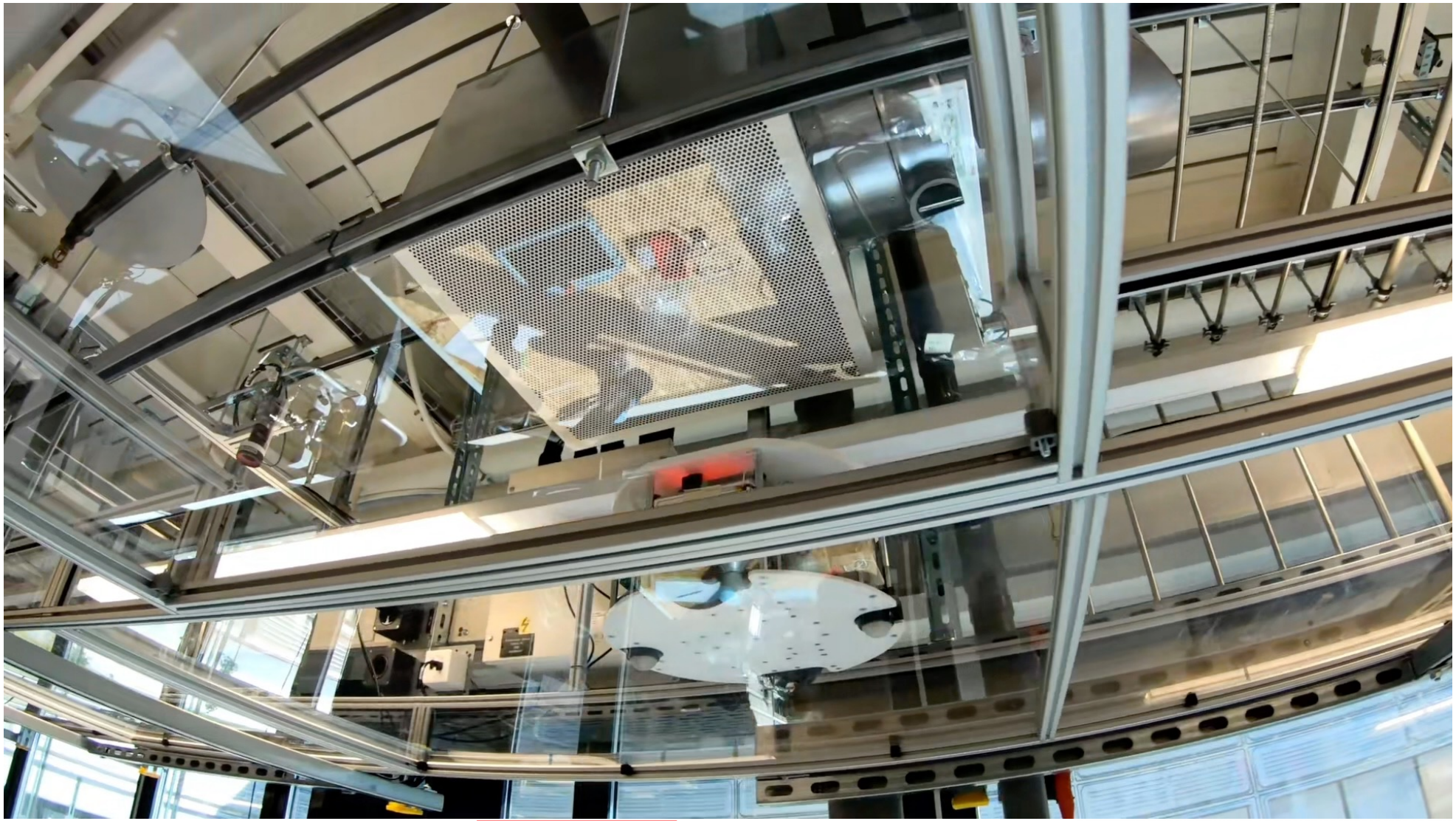
Although the proposal was ambitious, it was considered to be lacking in evidence and clarity across a few areas; the progress of the first preliminary activity could have been more prominent, the physics case for progressing the project made clearer, and the feasibility of the proposal more clearly justified. It was noted that the proposal would have benefitted from providing information on the proposed approach to achieving the listed deliverables.

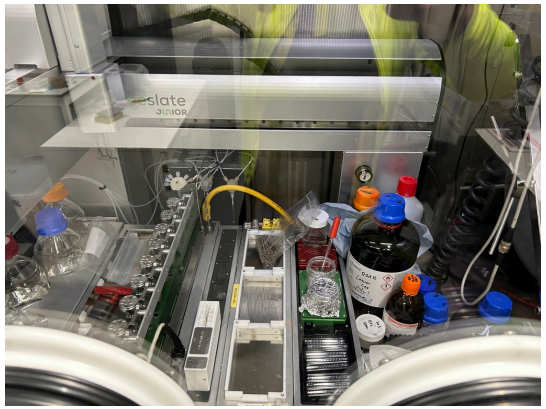
Overall, the proposal was not considered suitable for submission to Wave 4 of the UKRI Infrastructure Fund, but discussions are ongoing within STFC and in co-ordination with the ITRF team.

Discussions(?):

- Bridging in preparation for full bid
- Lab/"PPAN" split?

https://www.linkedin.com/posts/pascal-mi%C3%A9ville-448279197_epfl-bruker-agilent-activity-7102701537927290880-Uvis?utm_source=share&utm_medium=member_desktop





Chris Roberts @ ROAR
BioChem @ White City

Pascal Miéville
Automation chemist -
Executive Director Swiss
CAT+ @ EPFL

CAT+

SwissCAT+

CNRS, Imperial, and BioPhysicsX

MEMORANDUM OF UNDERSTANDING (MOU)

BETWEEN

THE CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (CNRS)

AND

IMPERIAL COLLEGE LONDON

ON

THE INTERNATIONAL RESEARCH PROJECT ENTITLED

"LHARA" THE LASER-HYBRID ACCELERATOR FOR RADIOBIOLOGICAL APPLICATIONS"

The **Centre National de la Recherche Scientifique**, a public scientific and technological institution, with headquarters at 3, rue Michel-Ange 75794 Paris cedex 16, France, represented by its Chairman - Chief Executive Officer, Mr. Antoine PETIT, and by delegation of signature by Dr. Chistelle ROY, Director, European and International Affairs Department,

Hereinafter referred to as the "**CNRS**",

AND

[**Name(s)**, legal status(es) and address(es) of the foreign Party(ies)], represented by [name(s) and position(s) of the legal representative(s)]

Hereinafter referred to as the "**XXX**",

Hereinafter referred to jointly as the "Parties" or individually as the "Party".

1. **Purpose**

By this MoU, the Parties jointly acknowledge that they share interest in the International Research Project (IRP) "**LhARA - The Laser-hybrid Accelerator for Radiobiological Applications**", detailed in Annex 1 and hereinafter referred to as the "Project".

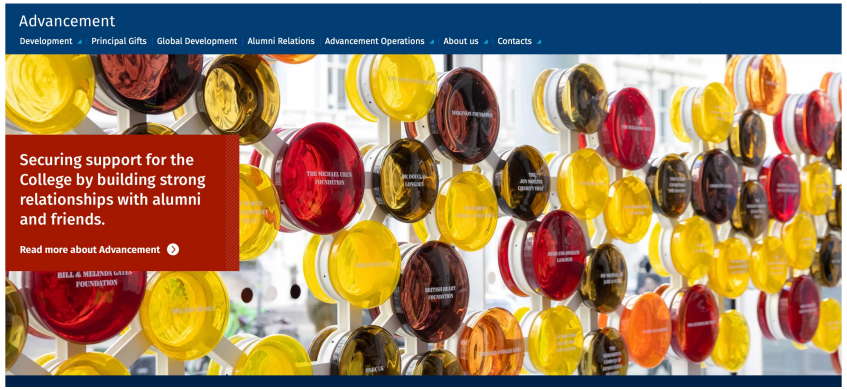
Update:

- **INSB & IN2P3 support**
  - **IN2P3 "thin silicon"**
  - **INSB Yolanda**
- **Imperial support:**
  - **Sandrine Heutz**
- **CNRS support:**
  - **Emmanuel Brouillet (INSB)**
  - **Sebastien Incerti (IN2P3)**
- **Evolution of management in CNRS:**
  - **New President and IN2P3 directors, look supportive of our initiative**

(Some of the) **Ideas from meeting with Sandrine:**

- **Work towards ratification of IRL/IRP at next annual meeting of IRC, London Mar/Apr24**
- **Pitch for 3 students *each* from UK / French sides**
  - My thought: 1 student per year for three years

Imperial Advancement



- **Good, but general, meeting with FONS and FOM representatives last year …**

- **Can we agree to pitch to them idea that they help us raise resource for “our three” students?**
  - **CNRS then doubles the impact of the donors’ contributions**

Charged Particles for Cancer Therapy

Charitable Incorporated Organisation; constitution

Date of constitution (last amended): **March 15, 2023**

1 Name

The name of the Charitable Incorporated Organisation ("the CIO") is:

Charged Particles for Cancer Therapy.

2 National location of principal office

The principal office of the CIO is in England. The address is:

139 Abbotsbury Road
London, W14 8EN

3 Objects

The objects of the CIO are:

- The advancement of research and development for the creation of transformative capability in radiotherapy to the benefit of cancer patients;
- The advancement of research into the understanding of the processes that determine the biological impact of ionising radiation to improve the precision and specificity of radiotherapy to the benefit of cancer patients; and
- The development and delivery of multidiscipinary initiatives that bring together researchers in the natural, life and medical sciences in the advancement of radiation biology and/or the clinical application of charged-particle beams to the benefit of cancer patients.

The CIO will carry out fund raising activities to provide the resources required to meet its objectives. Where appropriate, grants will be awarded to support individuals or collaborations to carry out activities that advance the CIO's objectives.

Nothing in this constitution shall authorise an application of the property of the CIO for the purposes which are not charitable in accordance with section 7 of the Charities and Trustee Investment (Scotland) Act 2005 and section 2 of the Charities Act (Northern Ireland) 2008.

4 Powers

The CIO has power to do anything which is calculated to further its objects or is conducive or incidental to doing so. In particular, the CIO has power to:

1. borrow money and to charge the whole or any part of its property as security for the repayment of the money borrowed. The CIO must comply as appropriate with sections 124 and 125 of the Charities Act 2011, if it wishes to mortgage land;

GOV.UK Apply to register a charity : Charity registration service

BETA Having problems on this page? Your feedback will help us to improve this service.

Welsh version Sign out

Charity registration service

The registration service is currently very busy which is affecting the timeliness of our response. Please help us to make an early decision by reading our guidance and making a complete and detailed application.

If you are applying to register a CIO, please read this guidance about your governing document.

Start new application to register a charity

Your existing applications

ID	Organisation	Status of application	Date of deletion	
5232568	CHARGED PARTICLES FOR CANCER THERAPY	Submitted 03 Jan 2024	03 Jul 2024	View

Your application will be deleted after 3 months of no changes and you will have to start a new application.

Submitted applications are removed 6 months after they were submitted. This means that you will no longer be able to view your application on our system, but it won't affect us processing your registration.

25	25	25	12.5

Ideas for the way forward:

Administrative:

- Act as though we already exist:
  - Quarterly meetings of BioPhysicsX leadership team
  - Quarterly meetings of CP4CT trustees

Resource:

- Pitch to joint FONS/FOM Advancement team for 3 PhD studentships in consortium with CNRS
  - Approximately £262.5k over 6 years with student at £25k/year

Scientific:

- LhARA:
  - In particular source and capture
- Radiation biology:
  - With Jason in Brm, with Strathclyde … and …
  - With automation from White City

Likely to imply paper for submission to IC centres of excellence management after CNRS/ICL IRC annual meeting

Oct24 BioPhysicsX start goal:

- >= 1 PhD student, if necessary, rebranded
- First joint publication with Brm &/or Strathclyde
- Business plan?