**Researching a new generation of cancer care for the UK**

The UK is investing £2M to kick-start research on the next generation of radiotherapy treatments for cancer, through the establishment of the Ion Therapy Research Facility – ITRF.

ITRF will utilise the UK’s world-leading expertise built up within the LhARA programme to create a facility that will deliver intense beams of ions with properties not attainable at today’s ion therapy facilities. LhARA – the Laser hybrid Accelerator for Radiobiology Applications – will use laser sources and plasma focusing to generate these beams, utilising developments pioneered in the UK over the last few years.

The UK’s has been at the forefront of many advances in cancer therapy and today offers effective radiotherapy using both X-rays and protons. However, some cancers remain difficult to treat with these methods; heavier particles such as carbon ions can offer advantages but there remain many research questions to answer. ITRF aims to examine the benefits from different ions and different ways to deliver them.

Organised through the Science and Technology Facilities Council (STFC) at Daresbury Laboratory, this £2 million feasibility study, funded by [UK Research and Innovation](https://www.ukri.org/what-we-offer/creating-world-class-research-and-innovation-infrastructure/funded-infrastructure-projects/), is a partnership of leading clinicians, scientists, engineers and industry. Bringing together skills from across the UK and overseas, this study will develop the design and planning for a facility that will deliver the radiobiology research that will underpin the next generation of ion radiotherapy.

**A powerful weapon against cancer**

Conventional radiotherapy treats many cancers effectively, delivered by accelerator machines that direct high-energy X-ray beams at a tumour to kill the cancer cells. However, the beam can also irradiate the surrounding healthy tissue and organs, causing permanent damage.

In contrast to conventional X-rays, ion beams can deliver high-power radiation doses to tumours more precisely than conventional radiotherapy, reducing treatment time, side effects and damage to surrounding tissue.

Around a dozen ion therapy facilities already exist around the world based on existing technology. ITRF will develop next-generation technology to deliver faster and more flexible treatments in a more cost-effective way.

**What is ion therapy?**

In a nutshell, ion therapy involves accelerating ions such as carbon close to the speed of light in a particle accelerator. Beams of these ions are then manipulated to deliver precisely pulsed radiation doses to a patient.

Like with x-rays and protons, ions deliver a highly targeted dose to a treatment volume. However, ions can deliver a greater biological effect that is particularly useful for some cancers. Combined with the unique pulse shaping and delivery that the ITRF will offer, new treatment methods can be opened up. Faster ion delivery needs better treatment monitoring, and so our partnership includes development of new dosimetry methods that include a pioneering method of acoustic detection, using sound to precisely localise where the ion beams stop.

**A new path for radiotherapy research**

Prof. Ken Long from Imperial College, LhARA programme co-spokesperson, said:

*“We are enormously excited to have received UKRI funding to develop the LhARA design. In the next two years we will be able to develop our innovative laser source concept the plasma lens beam capture, two key technologies that underpin our planned future capability at ITRF.”*

Dr Hywel Owen, STFC project scientist on ITRF, said:

*“In the UK around half of all people will be diagnosed with cancer in their lifetime. Radiotherapy is crucial for the successful treatment of nearly half of those patients. Existing particle accelerator technology has helped our clinical colleagues to give the UK great advances in cancer survival, but we can do more. Our partnership takes the UK’s world-leading accelerator science and will apply it to enabling new paradigms for future treatments. Thanks to UKRI funding, this truly multidisciplinary project will help us deliver the basic research into ion radiobiology that will enable future methods of ion radiotherapy.“*

Prof. Jason Parsons, a radiobiologist from the University of Liverpool and leading scientist on ITRF and LhARA, explained:

*“This will greatly accelerate our understanding of how protons and ions interact and are effective in killing cancer cells, while simultaneously giving us experience of running the novel beam provided by the planned facility. Together, the technology and the science will help us make a big step forward in optimising radiotherapy treatments for cancer patients.”*

Paul Vernon / Massimo Noro, [title] at STFC’s Daresbury Laboratory, said: (temporary quote- this will change)

*“STFC has over 60 years’ experience of building the UK’s biggest research facilities that have kept the UK at the forefront of world research in science and technology. ITRF will deliver new understanding of the biological mechanisms of radiotherapy, and is aimed at bringing long-term benefit both to the healthcare of the UK’s people and keeping our leading position in healthcare science.”*

**Partnerships**

ITRF brings together the UK’s vibrant research base that has developed many advances in particle accelerators that have been applied both to traditional ‘big science’ and to many applications that include medical science. The project benefits from the close involvement of partners already working on proton radiotherapy research such as the Christie NHS Foundation Trust and the Clatterbridge Cancer Centre, whose experience will be applied to our project. The UK’s partnership with CERN will also allow ITRF to build on CERN’s extensive experience on medical applications, that in turn have been derived from the development of technologies for basic science.

Prof. Karen Kirkby, leading scientist at the Christie Hospital’s proton research programme, said:

*“(quote here)”*

<section here for each partner to put their contribution and quote>

**Further information**

The ITRF project is funded by the UKRI Infrastructure Fund. Find out more at the [UKRI website](https://www.ukri.org/what-we-offer/creating-world-class-research-and-innovation-infrastructure/funded-infrastructure-projects/)

Further information about ITRF is available at – link?

Full list of project partners?

Image details

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