

UKRI Infrastructure Fund Bridging Funding Request

Name of Project <i>(and acronym or short name, if relevant)</i>	Ion Therapy Research Facility (ITRF)
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Current funding profile

Infrastructure Fund Profile (PA)	Year		
	24/25	25/26	26/27
Base	0.65	0	0
Contingency	0	0	0
Total	0.65	0	0

Month/Year current preliminary funding ends (MM/YY)	09/24
Month/Year follow on project should start (MM/YY)	TBC, depending on timing of full project award

Bridging funding requested, max 24 months. Capped at £1m pa or final year PA budget if less than £1m

Funding request	Year		
	24/25	25/26	26/27
Total	0.5	1.0	0.5

Anticipated bridging start and end dates (MM/YY - MM/YY)	Start	End
	10/24	09/26

Justification for bridging funding [250 words max]

(brief description of activities, parties, impact of pause)

The Ion Therapy Research Facility (ITRF) has selected the Laser-hybrid Accelerator for Radiobiological Applications (LhARA) as its basis. LhARA uses non-neutral (electron) plasma lenses to capture and focus the beam and a fixed-field accelerator (FFA) to deliver proton or ion beams to *in-vitro* and *in-vivo* experiments.

Pausing investment in October 2024 will significantly damage the collaborations. Momentum and international standing will be lost.

Bridging funding of £1M/year for 24 months will prevent critical activities to be stopped. Otherwise, personnel in Birmingham, Imperial, Lancaster, Liverpool, Strathclyde and Swansea will be put at risk.

PDRAs at these institutions have responsibility for the execution of test exposures on the Birmingham MC40 cyclotron, the development of the proton and ion source at Imperial and Strathclyde, the numerical simulation of the proton and ion source in Lancaster, the development of non-destructive, low-energy diagnostics at Liverpool, and the electron-plasma characterisation and plasma-lens design activities at Swansea.

Per-annum key resources costs during the bridging period:

Birmingham, Research fellow – radiobiology and dosimetry expt. 25% (£50k)

ICR, Research fellow – novel real time dose measurement 25% (£50k)

Strathclyde, PDRA – 100% - Source (£175k), Project Manager – 50% (£100k)

Imperial, PDRA1 50% RF in FFA accelerator PDRA2 50% Source (£85k x 2)

Liverpool, PDRA 50% Gabor lens (£85k)
RHUL, PDRA accelerator design (85k)
Swansea, PDRA1 Gabor lens (£85k)
Lancaster, PDRAA Source modelling (£85k)

Without support for these existing core staff, key operational requirements for ITRF will be lost or significantly delayed.

University and STFC National Lab effort is fully integrated in the plan outlined below. STFC staff costs are £360k, requiring STFC contribution of £72k.

High level description of plan of work during bridging period [250 words max]

projects are encouraged (where appropriate) to advance environmental sustainability investigations for the full infrastructure.

Activities during the bridging period will **derisk** critical aspects of the infrastructure, build the radiation biology programme and engage the key scientific community:

A) underpinning the development of the **user case** and the scientific specification of the ITRF. It will deliver the critical experimental demonstration of radiobiological efficacy through a series of experiments at the SCAPA facility in Strathclyde. Cell survival/DNA damage studies will be followed by experiments to develop the key RBE metrics for laser-accelerated protons as compared to cyclotron-driven proton beams. We will also demonstrate ion-acoustic dose mapping and evaluate beyond state-of-the-art diagnostics and instrumentation in comparison to conventional dosimetry and imaging to maximise the technical and scientific impact of the bridging period and the scientific potential of ITRF/LhARA infrastructure proposal.

B) underpinning the development of the **business case**. It addresses key technical risks in the future ITRF/LhARA project. The three principal deliverables are the:

- Demonstration of continuous, stable 1 Hz operation for experiments at SCAPA;
- Stable containment of electron plasmas at increased density using increased HV and commensurate magnetic field; and
- Documentation of a complete design for the FFA, including feasibility studies of the magnet and cavity designs.

C) coordinating the **outreach, engagement, and advocacy** activities necessary to make the case for future investment towards the facility.

Contributions in-cash or in-kind from the UK HEI partners, and from CNRS Institut Curie total approximately **£2.26M**.

This total includes:

- PI supervision time,
- Additional post-doctoral, technical, computing and other support staff from the partner institutes,
- Purchases or loans of equipment from partner institutes.

In addition, beam time and staff support to prove the principle of the ion-acoustic technique will be an extremely valuable contribution from Ludwig Maximilian's Universität, Munich.

Endorsement from host council (Executive Chair level) that a proposal for the resulting full infrastructure is a strategic priority and is planned for submission according to the timelines above. [100 words max]



Should additional bridging funding be required, the host council would be expected to cover these costs

Signature

Date (DD/MM/YYYY):

Name (print):