

# Welcome and introduction

... and update since 14Jun21 SG meeting



- **Barbara Camanzi;**  
STFC Futures Health and Cancer Care Theme Leader
- **Preparing paper for STFC EB on “paper for our Exec Board on healthcare opportunities and activities across STFC”**
- **Requested (14Sep21) i/p on LhARA with d/I 17Sep21**
  - **Submitted**
  - **Apologies for limited consultation**

17 September 2021



## The Laser-hybrid Accelerator for Radiobiological Applications (LhARA)

The [multidisciplinary LhARA collaboration](#) proposes to harness the disruptive potential of laser-driven proton and ion sources to create a ground-breaking biomedical research facility<sup>i</sup>. The collaboration's ambition is that the technologies demonstrated in LhARA will be transformative in the automated delivery of personalised, precision, multi-Ion Beam Therapy (IBT).

The beam characteristics that can be exploited in IBT facilities today are restricted to low dose rates, a small number of temporal schemes and a small number of spatial distributions. The use of novel beams with strikingly different characteristics has led to exciting evidence of reduced toxicity and enhanced therapeutic benefit. This evidence, together with developments in our understanding of personalised medicine based on the biology of individual tumours, now provides the impetus for a radical transformation of IBT.

The laser-hybrid approach offers enormous potential to satisfy the anticipated growth in demand for IBT by providing more flexible, compact and cost-effective high energy particle sources. The LhARA collaboration proposes to develop such a laser-hybrid system, in which novel strong-focusing electron-plasma (Gabor) lenses capture and focus the large flux of protons or ions created when a short pulse, high-power laser strikes a target. This will allow a wide variety of ion species to be delivered in almost arbitrary time, spatial, and spectral structures. The laser-hybrid approach will also evade the instantaneous dose-rate limitation of current sources and deliver ultra-high dose rates of up to  $10^9$  Gy/s in pulses that can be as short as 10–40 ns.

The LhARA collaboration is uniquely multidisciplinary, being composed of clinical oncologists, medical, particle, plasma, laser, ultrasound, and optical physicists, accelerator, computer, and instrumentation scientists, radiobiologists, industrialists, and patient representatives. The collaboration has access to the expertise that resides in 40 institutes drawn from across the UK's four nations. The excitement generated by the LhARA programme has attracted biomedical research groups from France and Italy to the collaboration. Within the STFC Laboratories, personnel from the ASTeC, CLF, ISIS, Particle Physics, and Technology Departments are actively supporting the programme.

LhARA is central to the transformative vision for the proposed Ion Therapy Research Facility (ITRF) that is presently being considered by the UKRI's Infrastructure Advisory Committee (IAC). The ITRF proposal identified the need for a two-year preliminary phase, that will deliver the Conceptual Design Report for the facility, followed by a three-year pre-construction phase. In parallel to the consideration of the ITRF by the IAC, the LhARA collaboration is preparing a detailed proposal for the preliminary and pre-construction phases. This proposal will define the R&D programme necessary to address the key technical risks presented by the LhARA programme. The proposal will be presented in six work packages covering the development of the laser-driven source, the non-neutral plasma lens, ion-acoustic dose-deposition profiling, proton and ion-beam instrumentation, and the design of high-throughput end-stations and their instrumentation. The collaboration plans to complete the proposal by November 2021.

Through the ITRF, the ambition of the LhARA collaboration is to place the UK at the forefront of the science and technology of particle therapy internationally, establish UK industry as a key player in the delivery of novel clinical equipment, and enable significantly enhanced access to beyond state-of-the-art proton- and ion-beam therapy across the UK.

Further formation can be found at: <https://ccap.hep.ph.ic.ac.uk/trac/wiki/Research/DesignStudy>

<sup>i</sup> <https://doi.org/10.3389/fphy.2020.567738>,  
<https://ccap.hep.ph.ic.ac.uk/trac/raw-attachment/wiki/Communication/Notes/CCAP-TN-01.pdf>

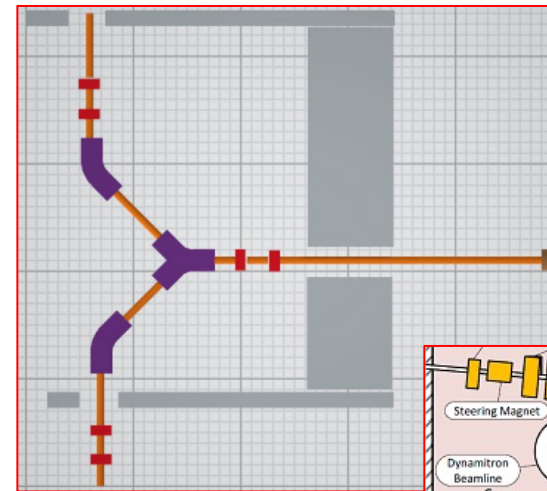
## LhARA “project organisation”:

- Proposed for proposal and Preliminary phase
- Summarised below using “particle physics collaboration model”
- Co-spokes people:
  - Giacca (OIRO, Oxf), Long (ICL/STFC/JAI)
- Co-project-managers:
  - Parsons (Liv), Whyte (Str/CI)
- Work packages and work-package managers:
  1. Project Management: Parsons (Liv), Whyte (Str/CI)
    - Project Office: D. Kordopati (ICL)
  2. Laser-driven proton and ion source: Dover (ICL/JAI), Gray (Str/CI), Boella (Lanc/CI)
  3. Proton and ion capture: Charlton (Swn), Bertsche (Manch/CI)
  4. Real-time dose-deposition imaging: Bamber/Harris (ICR), Mattheson (STFC/PPD)
  5. Novel, automated end-station development: McLauchlan (ICL NHS), Price (Brm)
  6. Facility design and integration: Pasternak (ICL/JAI), Bliss (STFC/TD DL)
- Stakeholder plan:
  - Parsons (ICL), Price (Liv)

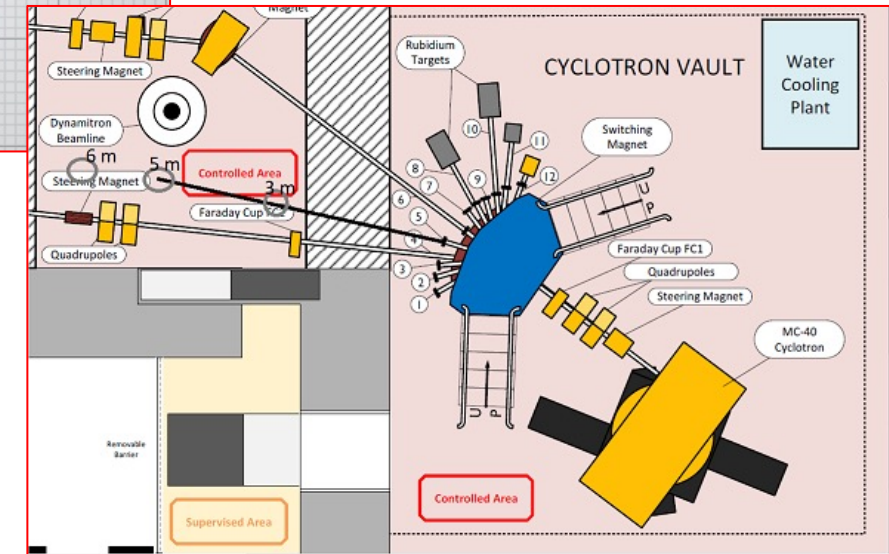


# Vertical beam line on Birmingham cyclotron

- Excellent test bed and experimental opportunity for LhARA
- Engaging with Uni Brm to understand how to present in proposal



Mamutov, Price, Taylor



## Proposal timeline

# Proposal timeline, revisited

- **Working backwards:**

- **Monday 01Nov21:**

- Proposal complete (ink drying)

- **Monday 04Oct21:**

- First drafts of text of proposal and management annexes complete
  - Implies iteration of costs and time-line analysis

- **Monday 13Sep21:**

- Scope of proposal and w/s define:
  - Implies initial costing and initial time-line analysis

- **Tuesday 20Jul21 (today!):**

- Launch of proposal preparation

05Aug21

- **Good progress over the summer, but still work to do**
- **Review proposal-preparation timetable after contributions of:**
  - Massimo Noro
  - Colin Whyte
- **Internal review of proposal:**
  - Concept discussed among WPM team and at fortnightly;
  - Propose to use CCAP's IAC (next slide) augmented with STFC-respected project management expert
- **Following internal review will need to “socialise” the bottom line**

- **White Paper:**
  - Skeleton, lead authors etc. prepared
  - Meeting of section leads:
    - Agreed time table – draft for end October
- **LhARA design update:**
  - J. Pasternak agreed to lead preparation

September 7, 2021 Draft 0.1 

**Ion therapy; the biological frontier**  
*White paper*

**This author list was taken from the Frontiers publication and must be updated.**

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17. Leo Cancer Care, Broadview, Windmill Hill, Hailsham, East Sussex, BN27 4RY, UK  
18. Corerain Technologies, 14F, Changfu Jinmao Building (CFC), Trade-free Zone, Futian District, Shenzhen, Guangdong, China  
19. University of Surrey, 388 Stag Hill, Guildford, GU2 7XH, UK  
20. Imperial Patient and Public Involvement Group (IPPIG), Imperial College London, Exhibition Road, London, SW7 2AZ, UK  
21. The Clatterbridge Cancer Centre, Bebington, CH63 4JY, UK

Footer text – in case it is of use.



# Opportunity at STFC?

- ‘Early technology development and equipment for STFC grant holders’:
  - ... capital funding to support the development of basic technologies, that build upon STFC’s core capabilities and core programme, in areas such as sensors, imaging and detector development.
  - .. existing STFC projects to request up to £200k of capital funding ...
    - I am assured we count as “existing STFC project”
  - Applicants are allowed to request a maximum of 3 items of equipment. No single piece of equipment should cost more than £138k.
  - ... maximum award ... £205k. Successful grants ... duration of up to 6 months and must start before 1st January 2022 ...
  - ... any capital funding ... awarded ... must be used by ... March 31st 2022 ...

Event	Date	Time GMT
Call open date	20 September 2021	09:00
Submission deadline	27 October 2021	16:00
Panel Meeting Date	w/c 22 November 2021	
Outcomes Announced	December 2021	
Start of successful projects	01 Jan 2022	



# A note on students

- An indicator of interest in our programme?
  - We should keep this up to date:
- Summer 2021:
  - CERN
    - Alejna Bequiri
      - Design of capture solenoid
    - Rasim Mamutov
      - Design of Brm vertical beam line
  - Imperial:
    - IROP
      - Karis Kunhsamutr:
        - TOPAZ, Ion acoustic simulation
    - UROP:
      - Ta-Jan Kuo:
        - FFA Injection line siumulation
      - Josie McGarrigle
        - Ion acoustic simulation
      - Anthea Macintos-Larocque
        - Ion acoustic simulation, searchable radiobiology paper database
  - Others? Please let me know
- New PhD students:
  - Imperial/CNRS (Institut Curie):
    - Josie McGarrigle
      - Joins Thongchai Masilela now in post at Inst Curue
  - Imperial JAI/STFC PPDF
    - Maria Maxouti
  - Others please let me know

# LhARA SG meeting schedule

- **Propose return to 2-monthly pattern**
- **Additional meetings as necessary**