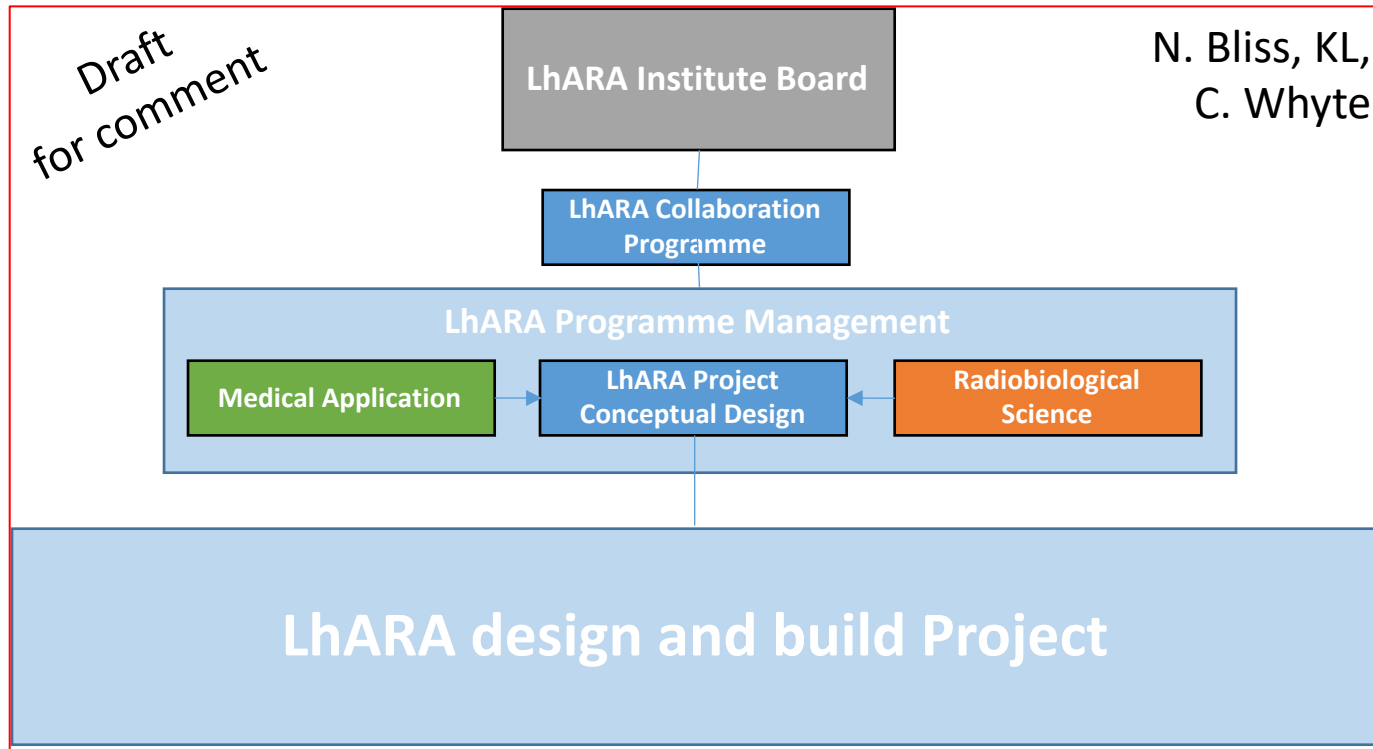


LhARA proposal:

Organisational aspects

The LhARA initiative is a *PROGRAM*

- A “Project” is defined to deliver a particular outcome:
 - The LhARA project would deliver LhARA
 - The vision of the LhARA collaboration is more ambitious
 - Encompassed in proposed collaboration
- ## “Organisational Breakdown Structure”



Key points:

Natural/Life Sciences have:

- Equal **weight** in deciding strategy, programme, etc.
- Equal **responsibility** in securing necessary resources

Need to adopt “standard language” for the various Boards

Discuss and adopt in proposal

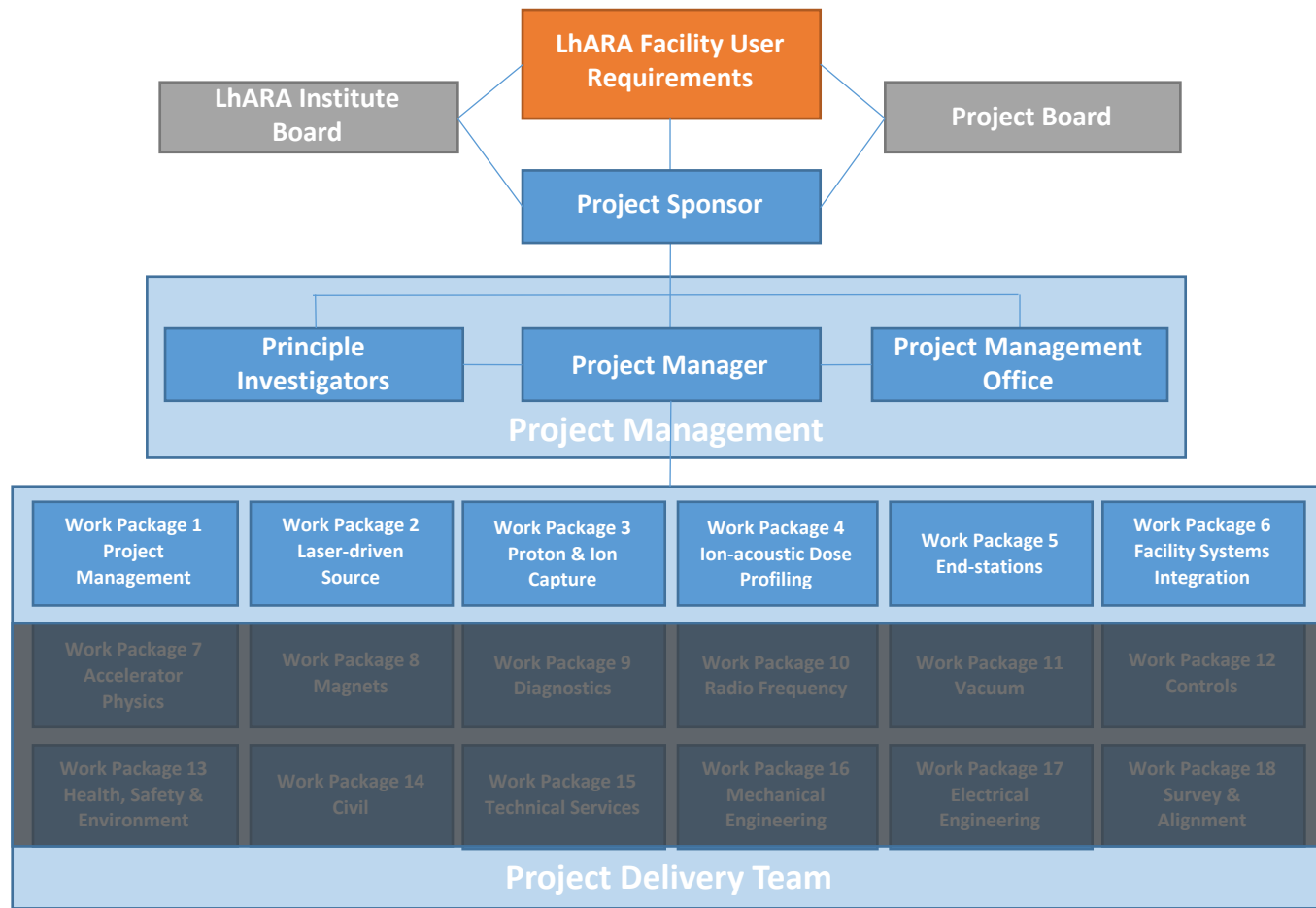
The LhARA project within the ITRF

Draft
for comment

N. Bliss, KL,
C. Whyte

LhARA Project

Organisational Breakdown Structure



Project Management formalized:
in line with best practice
and STFC Project Management Handbook

As before, adopt “standard language”
Discuss and adopt in proposal

Preliminary phase

Set of activities, and work packages to execute them, grows through Pre-construction phase

- **Excellent contributions from WPMs;**
- **Now working through costing (CW, WPMs, DK, KL) ...
... and timelines (CW, WPMs, DK)**
- **Goal now is to have good draft for LhARA meeting on
15Dec21**
 - **Structure agenda:**
 - **Radiobiological scene setting: J. Parsons, Y. Prezado session**
 - **Proposal discussion:**
 - **A “session” for each WP**

Internal review of proposal

27Sep21

CCAP International Advisory Committee

- **Almost set up; status:**

- **Chair: Dr. Mike Lamon (Dir, Accelerators and Technology, CERN)**

- Accepted

- **Members:**

- **Prof. Michael Baumann (Dir, DKFZ)**

- Accepted

- **Prof. Paul Bolton (ex. TUM, now on west coast of US)**

- Accepted

- **Michael Horsman (Aarhus University Hospital)**

- “Accepted”; passed invitation to colleague at Aarhus (awaiting update from AG)

- **PM expert:**

- E.g.: Ian Robson (STFC/Royal Observatory Edinburgh)

Will “redact” this slide when posted on wiki

- **Progress:**

- **Discussion with ML:**

- **First meeting of AIC will be set up through his office:**

- Goal Jan22

- ToR etc, agree to do review

- **Review of proposal:**

- Feb22

- **Implication:**

- **Proposal to IAC “by Christmas 2021”**

LhARA proposal:

Preliminary and Pre-construction programme development

... for Colin who's had to go to the medic

WP1: Project management

A.2.1 Work package 1: Project management

Lead authors: J. Parsons, C. Whyte

Objectives

Work Package 1: Project Management has responsibility for

- Project management and planning
- Reporting to STFC including interface with oversight as well as financial reporting
- Risk management and tracking
- Stakeholder engagement.
- Patient and Public engagement

Task objectives and deliverables

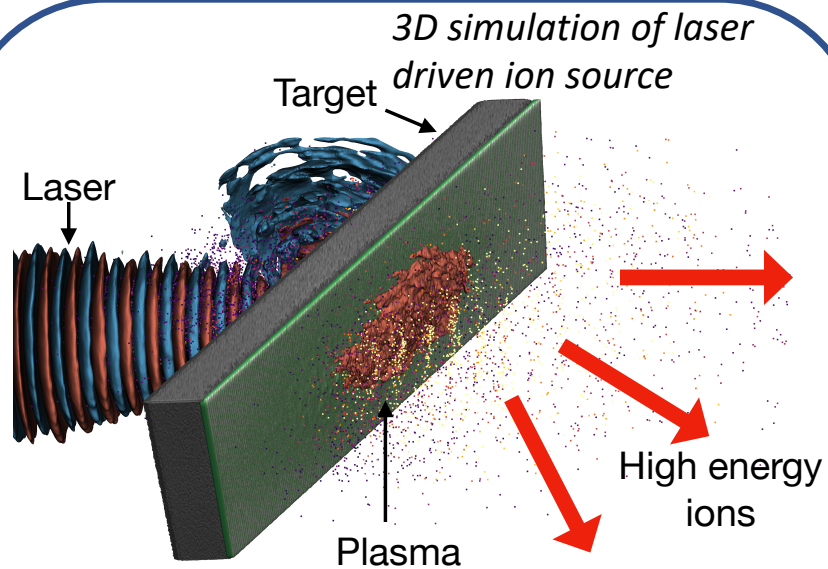
- Organise, schedule, cost and deliver LhARA project
- Organise and deliver reporting and presentation required for effective STFC oversight.
- Track progress and risk in all Work packages, managing effort through monthly progress meetings with each work package management team.
- Organise collaboration meetings on a 4 to 6 month schedule to provide cross-collaboration visibility.
- Hold regular stakeholder meetings. Maintain currency with latest results in relevant radiobiological and medical fields. Communicate current status and important developments in LhARA to future users.
- Recruit appropriate patient representatives to advise as LhARA specification and potential treatment regimes evolve.

Programme, tasks, and justification of resources:
Defined at “bullet point level”

WP2: Laser-driven proton and ion source

WP2: Ion source

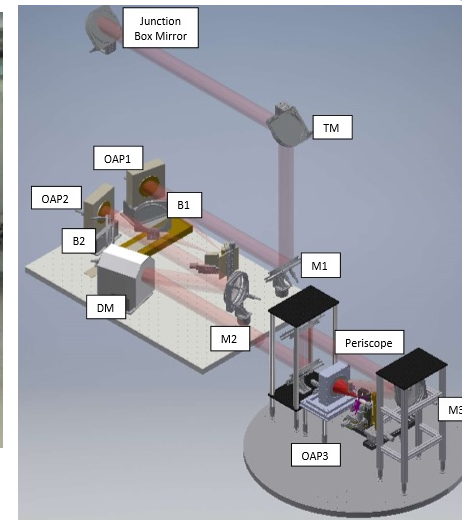
Aim: Demonstrate and optimize a high power laser driven ion source for the LhARA beamline



Source based on “target normal sheath acceleration” (TNSA) scheme, generating inherently ultra-short, energetic ion beams



SCAPA laser facility (Strathclyde)



2 Year: We will experimentally and numerically identify ideal laser and target regime for LhARA beamline using existing laser facilities

5 Year: We will develop promising new targetry technology for 10 Hz operation, and introduce active stabilization and optimization techniques

Novel water sheet target
(C. Palmer, QUB)

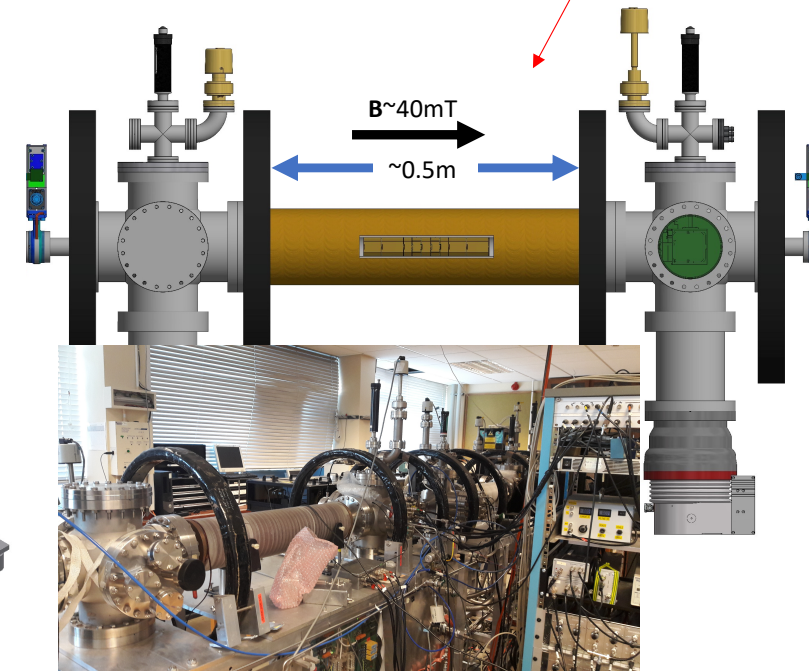
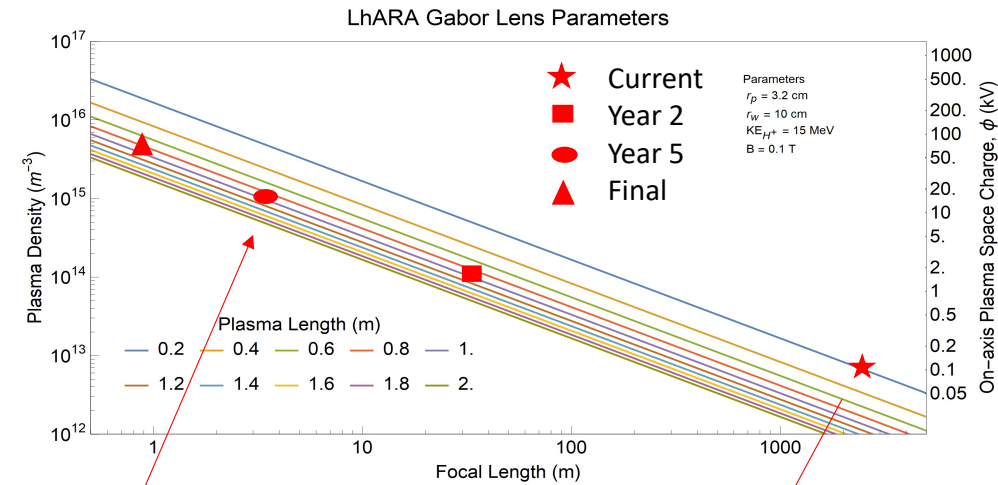
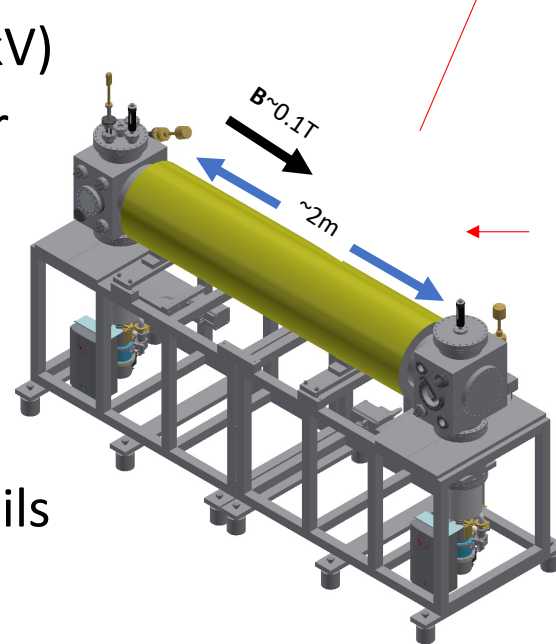


Boella,
Dover,
Gray

WP3: Proton and ion capture

WP3

- Upgrade current device to accept higher voltages ($\phi \sim 0.5 \text{ kV}$)
- Design & construct testbench capable of producing & studying larger plasma ($r_w = 10 \text{ cm}$, $l_p \sim 1 \text{ m}$, $\phi \sim 2\text{-}10 \text{ kV}$)
- Study plasma (much larger than is currently produced by non-neutral plasma community) under a multitude of conditions to inform final design details



Bertsche,
Charlton,
Baker

Yr2:
Measurements
of non-neutral
plasma to inform
design of second
prototype

Yr5:
Second prototype
design ready for
commissioning
and test

WP4: Ion-acoustic dose mapping

Bamber,
Harris,
Matheson

WP4: Proton-acoustic dose mapping

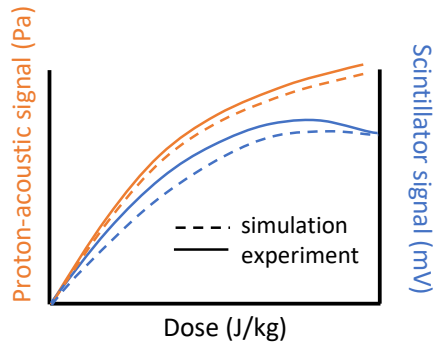
2 Years

- Validated models for the simulation of dose and proton-acoustic signals

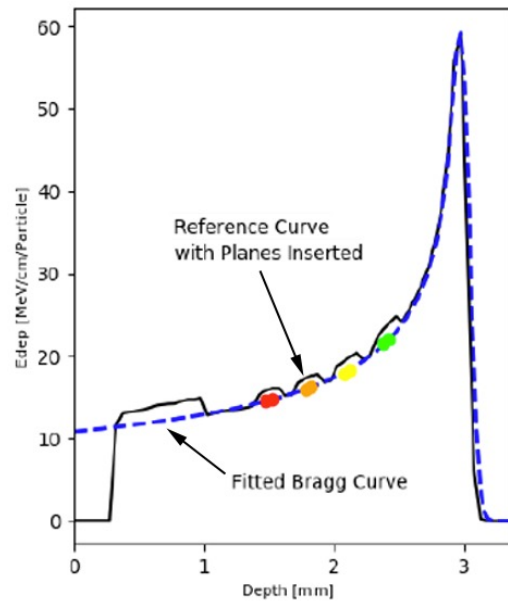


k-Wave

A MATLAB toolbox for the time-domain simulation of acoustic wave fields



Scintillator signal (mV)

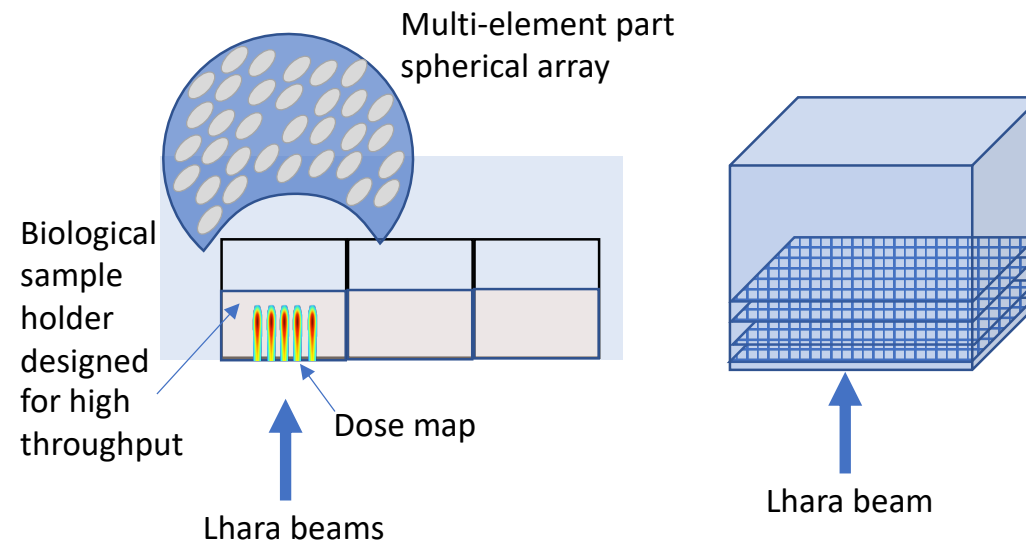


Signal (Pa)

Angle from beam direction (deg)

- Experimental testing/evaluation of initial components for proton-acoustic and scintillation systems.

5 years



- Proton-acoustic system for dose mapping on a pulse-by-pulse basis
- Smart phantom system for cross-calibration of dose/range estimation
- Validated models for the simulation of dose and proton-acoustic signals for Lhara
- Results from initial biology experiments

WP5: Novel end-station development

McLauchlan,
Price

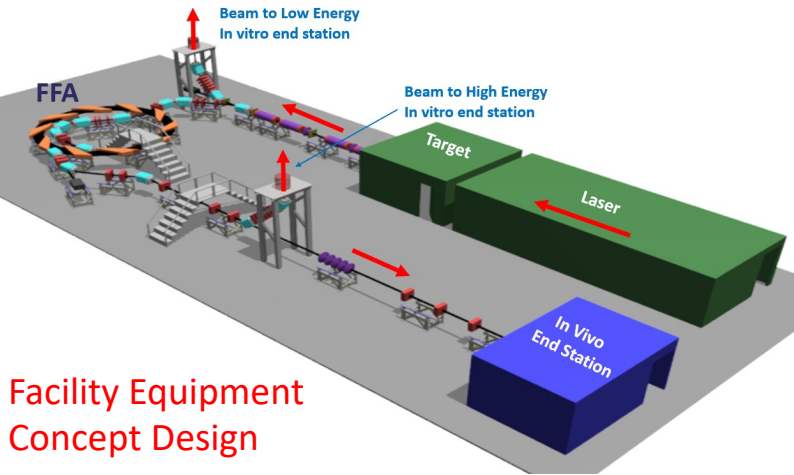
- **Four themes defined:**
 - “User peer group” consultation leading to specification
 - Vertical beamline in Brm to allow experiments and prototype development
 - Beam-line instrumentation for beam entering end-station
 - Novel end-station dosimetry and automatic sample handling
- **Needs some further discussion:**
 - Will take forward

WP6: Facility Design and Integration

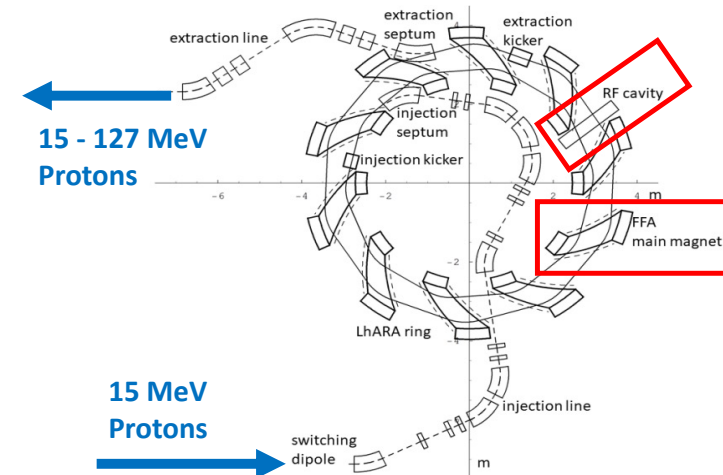
Bliss,
Pasternak

WP6 Facility Design & Integration - Deliverables

- **Conceptual Design** of the LhARA facility, accelerator systems and its integration with the source and the end stations **by 24 months**
- Technical design of LhARA accelerator systems for **Stage 1** and its integration with the source and the end station **by 36 months**
- Technical design of accelerator systems for **Stage 2** and its integration with the source and the end stations **by 60 months**

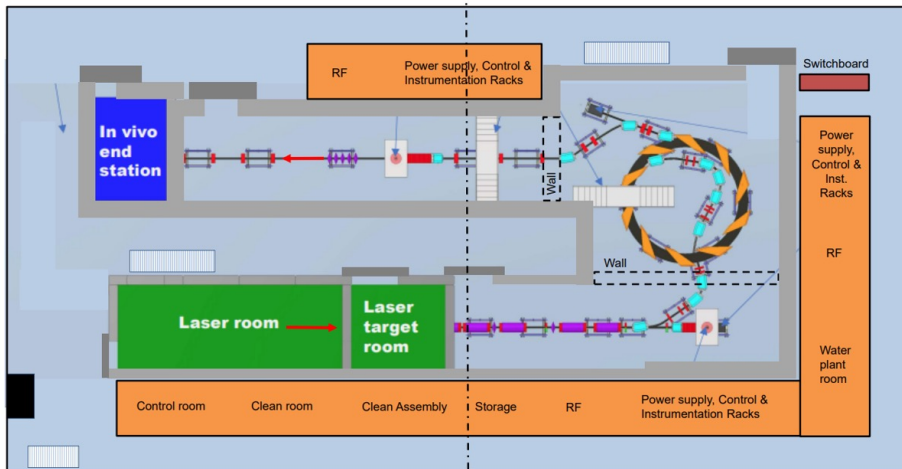


Facility Equipment
Concept Design



Fixed Field Accelerator (FFA) R&D

- FFA Main Magnet prototype **by 48 months**
- FFA Magnetic Alloy Cavity prototype **by 48 months**



Building & Technical Services
Requirements & Concept Design