

LhARA Facility Integration Staff Resource Estimate

Neil Bliss 28th September 2021

CDR Chapters

Building & Services CDR Chapter

Introduction

1. Conventional Facilities
 - 1.1. Architectural Concept
 - 1.2. Construction Style
 - 1.3. Ground Floor Laser and Accelerator Concept
 - 1.4. 1st Floor Exploitation Concept
 - 1.5. Electrical Power
 - 1.5.1. RF System
 - 1.5.2. Magnets, Critical Loads and Distribution
 - 1.5.3. Cooling System
2. Water Cooling System
3. Environment Control
 - 3.1. Heating, Ventilation and Air Conditioning (HVAC)
 - 3.2. Gas, Liquid, Exhaust and COSHH Distribution Systems
 - 3.3. Other Building Services Requirements
4. Stability and Alignment

Radiation Safety Chapter

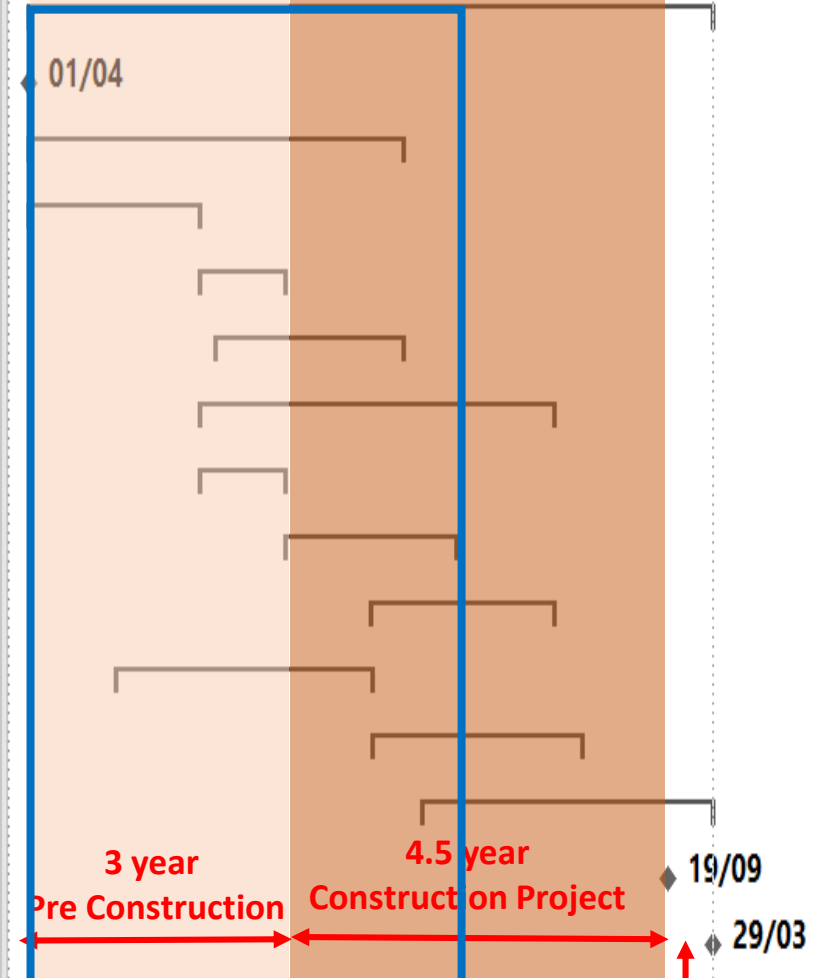
1. Dose Limits
2. Shielding Calculations
3. Prompt Radiation
4. Induced Activity
5. Designation of Areas
6. Radiation Monitoring
7. Personnel Safety System

Facility Design & Integration

1. **Facility equipment schematic** ([PowerPoint](#) diagram aimed at including all equipment required laser, Gabor lens, magnets, RF, diagnostics, vacuum equipment)
2. **Facility CAD layout** development ([2D AutoCAD](#))
 - a. Accelerator equipment
 - b. Experimental equipment
 - c. Technical services
 - d. Radiation shielding & access
 - e. Mechanical support methodology
 - f. Electrical switchboards, cable segregation and distribution from rack rooms to equipment
 - g. Equipment alignment methodology and network
 - h. Personnel safety considerations
 - i. Building
 - i. Room areas/ space requirements
 - Laser & Accelerator enclosures
 - Experimental rooms
 - Control room
 - RF room, Power source and RF distribution
 - Power supply, control & instrumentation rack rooms
 - Clean room
 - Transformer and main switchboard
 - Water plant room
 - Compressed air
 - Storage
 - ii. A/C requirements, plant location and duct distribution
 - iii. Crane or lifting methodology
 - iv. Considerations for flexibility for developments
 - v. Considerations for beam commissioning in stages, while installation in other areas are in progress to deliver in a challenging timescale.
3. **Facility CAD conceptual model** development ([3D CAD package](#), [SolidEdge](#) or [Creo](#))
4. **Parameter tables** e.g. magnet list
5. **Interfaces** & responsibilities between various WPs
6. **Vacuum flow diagram**
7. **Procurement strategy**
8. Input to **Cost model** ([Excel](#) not a **costing** but a **cost model** that could provide cost of various options)
9. Input to **Project Schedule** and **Work Breakdown Structure** ([MS Project](#))
10. Input/advice to STFC project management methodology
11. Input to **Organisational Breakdown Structure** to deliver the project
12. Input to **Resources** to deliver the project
13. Input to **Project Management Plan**

Schedule

WBS	Task Name	Duration	Start	Finish	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	▸ LhARA schedue WP6	2086 days	Fri 01/04/22	Fri 29/03/30										
1.1	Project Start	0 days	Fri 01/04/22	Fri 01/04/22	01/04									
1.2	▸ STAGE I	1143 days	Fri 01/04/22	Tue 18/08/26										
1.2.1	▸ Conceptual Design Report (CDR) - 2 years	521 days	Fri 01/04/22	Fri 29/03/24										
1.2.2	▸ Technical Design Report (TDR) - 1 year	261 days	Mon 01/04/24	Mon 31/03/25										
1.2.3	▸ STAGE 1 Prototyping, Procurement & Testing	576 days	Tue 04/06/24	Tue 18/08/26										
1.3	▸ STAGE 2	1084 days	Mon 01/04/24	Thu 25/05/28										
1.3.1	▸ Conceptual Design Report (CDR) - 1 year	261 days	Mon 01/04/24	Mon 31/03/25										
1.3.2	▸ Technical Design Report (TDR) - 2 years	523 days	Tue 01/04/25	Thu 01/04/27										
1.3.3	▸ Stage 2 Procurement & Testing	561 days	Thu 02/04/26	Thu 25/05/28										
1.4	▸ Building	782 days	Mon 10/04/23	Tue 07/04/26										
1.5	▸ Radiation Shielding & Technical Services	640 days	Wed 08/04/26	Tue 19/09/28										
1.6	▸ Equipment Installation in Building & Commissioning with Beams	888 days	Wed 04/11/26	Fri 29/03/30										
1.7	Construction Project complete	0 days	Wed 19/09/29	Wed 19/09/29										
1.8	Commissioning with Beam complete	0 days	Fri 29/03/30	Fri 29/03/30										



6 month beam commissioning

Stage 1
CDR

Stage 1
TDR
Stage 2
CDR

Stage 2
TDR

Integration staff estimate (SY)	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Mechanical engineering & design	8.00	0.50	1.00	1.70	1.70	1.50	1.00	0.50	0.10
Electrical engineering, design & testing	9.00	0.00	0.50	1.50	2.00	2.00	2.00	0.80	0.20
Controls	3.30	0.00	0.20	0.40	0.70	0.70	0.60	0.50	0.20
Technical services	3.20	0.00	0.10	0.60	0.60	0.60	0.60	0.60	0.10
Mechanical assembly & testing	10.20	0.00	0.00	0.00	2.00	3.00	3.00	2.00	0.20
	33.70	0.50	1.80	4.20	7.00	7.80	7.20	4.40	0.80

3 year
Pre Construction

4.5 year
Construction Project

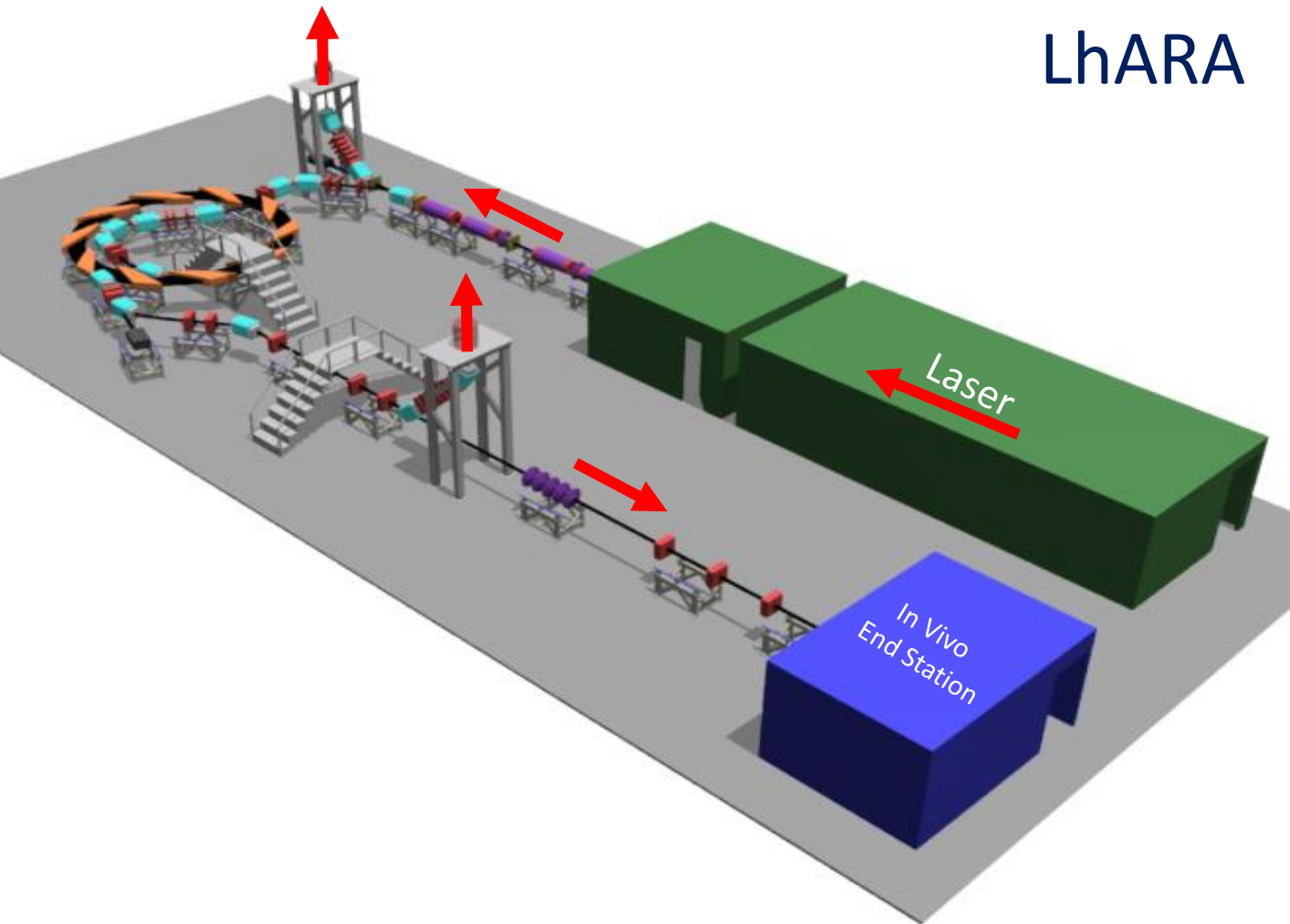
Prep. For Building
Construction

Building
Construction

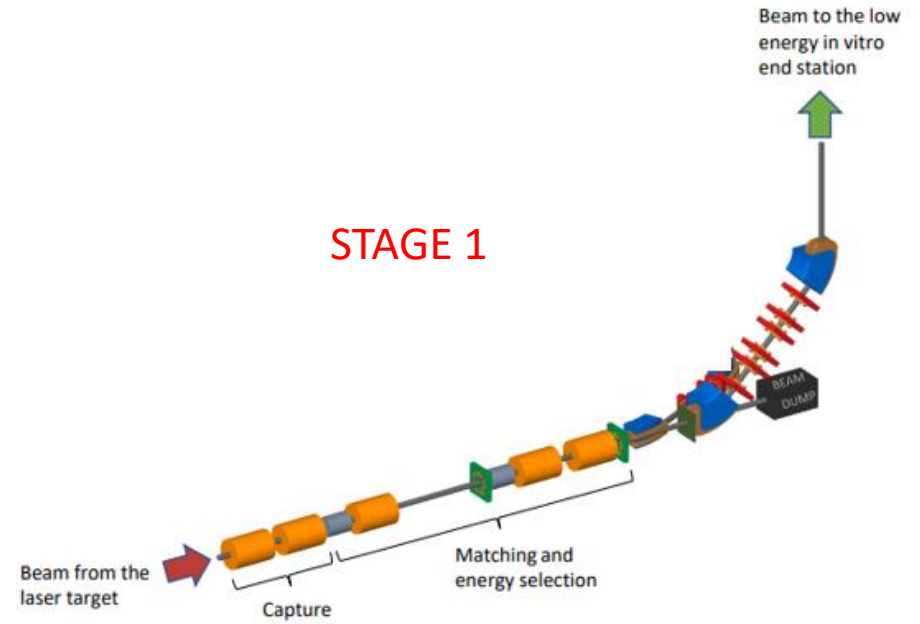
Staged installation

Commissioning with Beams

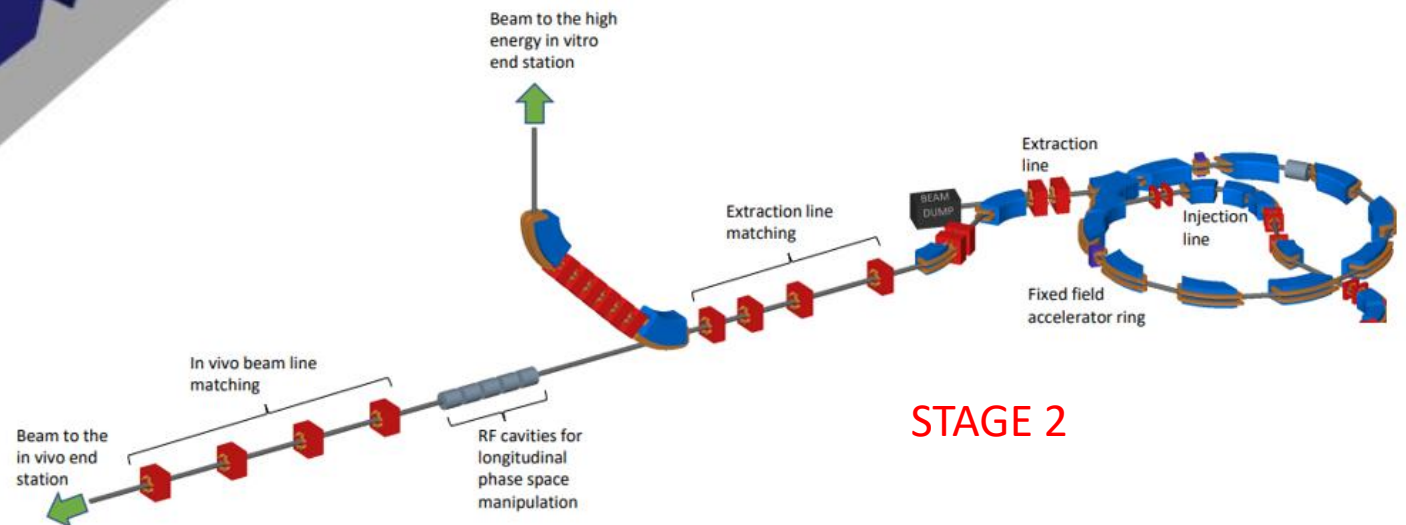
LhARA



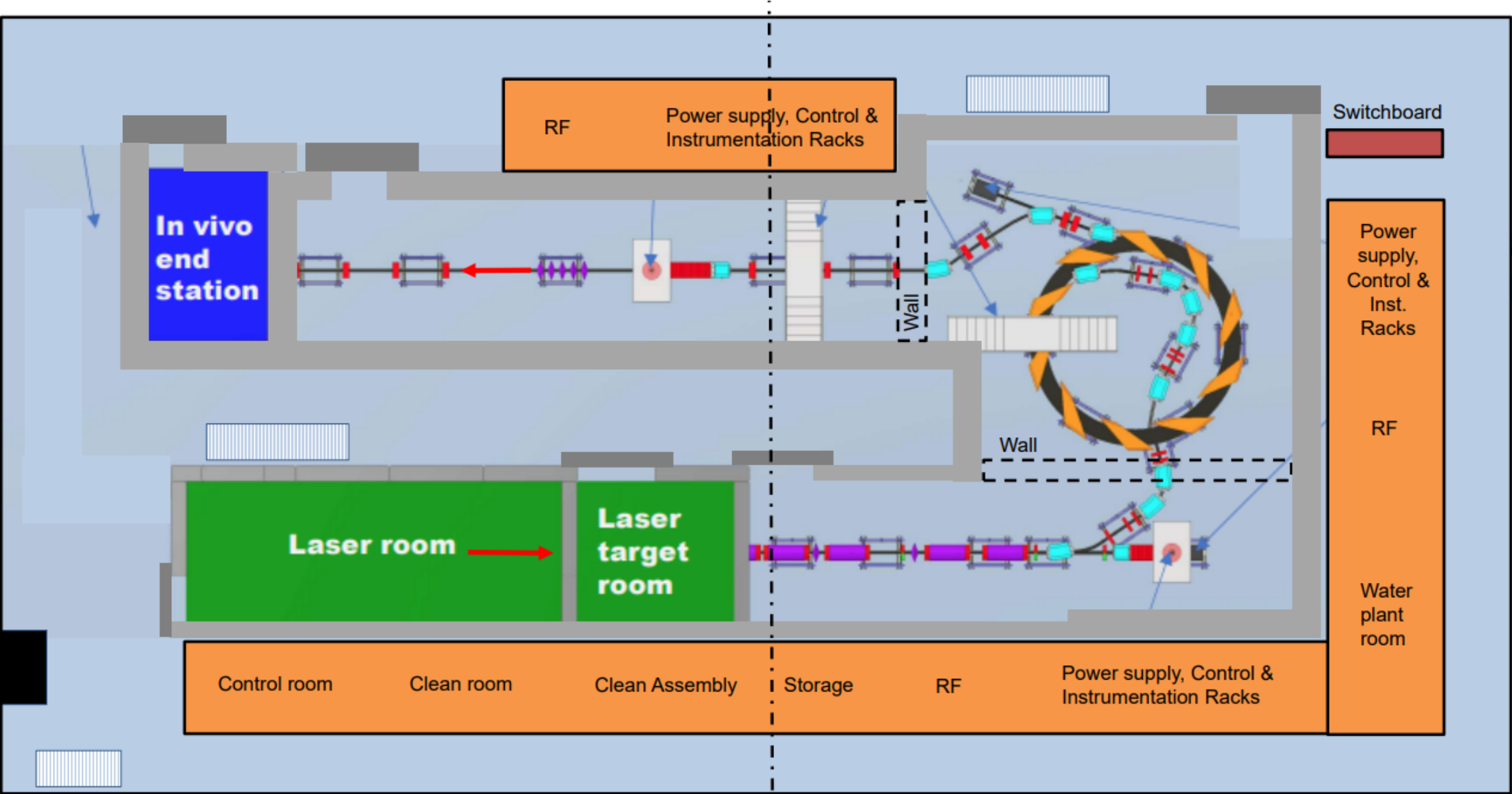
STAGE 1



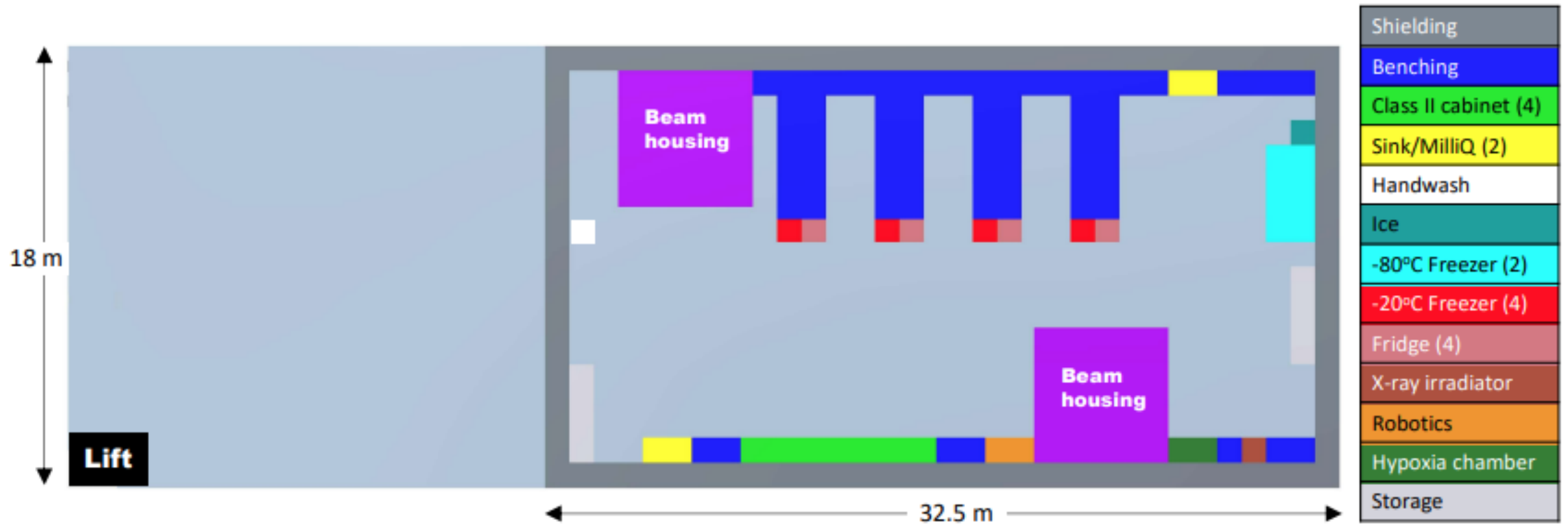
STAGE 2



LhARA Ground Floor Accelerator Complex



LhARA 1st Floor Exploitation



Exploitation only on 1st Floor ?

Building Cross Section

