

LhARA engineering: status and plans

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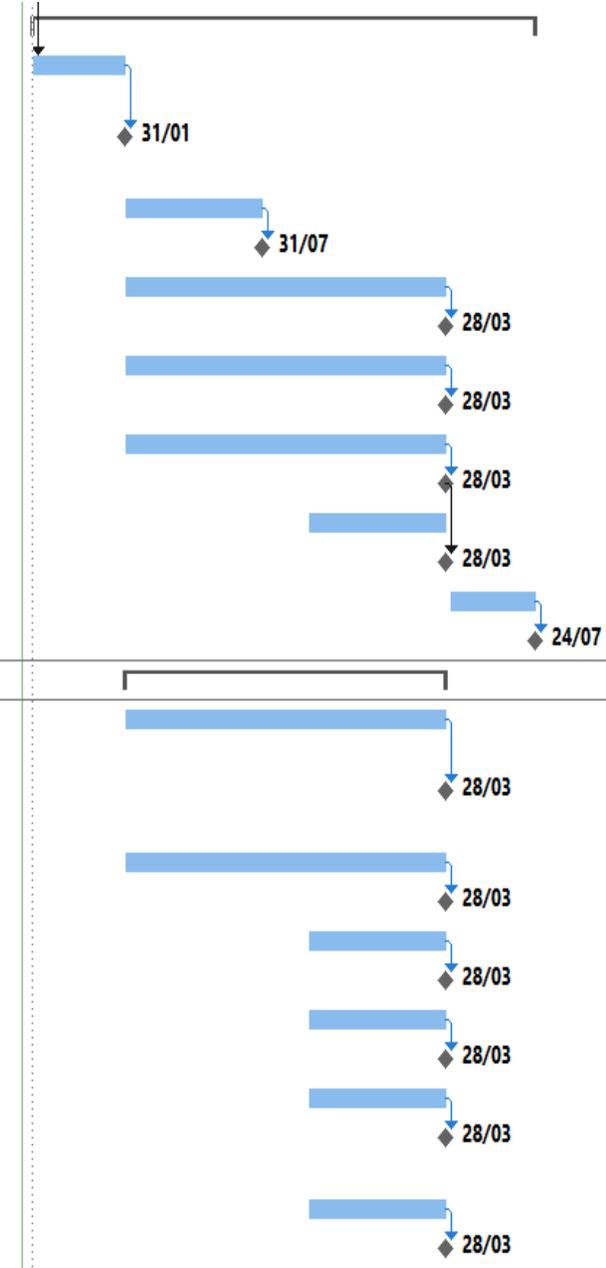
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7. Planning & Designing for Sustainability
8. Costing



Schedule – LhARA WP1.6 & WP2

4.6	WP1.6 LhARA Facility design & Integration	473 days	Mon 03/10/22	Wed 24/07/24	
4.6.1	LhARA lattice optimisation, aperture estimation, parameter list and schematic diagram update	87 days	Mon 03/10/22	Tue 31/01/23	1
4.6.2	M1: LhARA lattice optimisation, aperture estimation, parameter list and schematic diagram update	0 days	Tue 31/01/23	Tue 31/01/23	55
4.6.3	Preliminary design of LhARA mitigating solenoid	129 days	Wed 01/02/23	Mon 31/07/23	
4.6.4	M3: Preliminary design of LhARA mitigating solenoid complete	0 days	Mon 31/07/23	Mon 31/07/23	57
4.6.5	Preliminary design of LhARA MA RF cavity	302 days	Wed 01/02/23	Thu 28/03/24	
4.6.6	M5: Preliminary design of LhARA MA RF cavity complete	0 days	Thu 28/03/24	Thu 28/03/24	59
4.6.7	Preliminary design of LhARA FFA magnet	302 days	Wed 01/02/23	Thu 28/03/24	
4.6.8	M6: Preliminary design of LhARA FFA magnet complete	0 days	Thu 28/03/24	Thu 28/03/24	61
4.6.9	Preliminary design of LhARA diagnostic system	302 days	Wed 01/02/23	Thu 28/03/24	
4.6.10	M7: Preliminary design of LhARA diagnostic system complete	0 days	Thu 28/03/24	Thu 28/03/24	63
4.6.11	Preliminary design of LhARA control and feedback systems	129 days	Mon 02/10/23	Thu 28/03/24	
4.6.12	M8: Preliminary design of LhARA control and feedback systems complete	0 days	Thu 28/03/24	Thu 28/03/24	64
4.6.13	Finalise Conceptual Design iterations (All LhARA systems)	80 days	Thu 04/04/24	Wed 24/07/24	
4.6.14	M17: Finalise Conceptual Design iterations (All LhARA systems) complete	0 days	Wed 24/07/24	Wed 24/07/24	67
5	WP2 ITRF Facilities & Costing	302 days	Wed 01/02/23	Thu 28/03/24	
5.1	Preliminary design study of bulk shielding, beam dump and radioprotection requirements	302 days	Wed 01/02/23	Thu 28/03/24	
5.2	M9: Preliminary design study of LhARA bulk shielding, beam dump and radioprotection requirements complete	0 days	Thu 28/03/24	Thu 28/03/24	70
5.3	Mechanical design of accelerator systems & integration	302 days	Wed 01/02/23	Thu 28/03/24	
5.4	M10: Mechanical design of LhARA accelerator systems & integration complete	0 days	Thu 28/03/24	Thu 28/03/24	72
5.5	Preliminary design of the building and infrastructure requirements	129 days	Mon 02/10/23	Thu 28/03/24	
5.6	M11: Preliminary design of LhARA building and infrastructure requirements complete	0 days	Thu 28/03/24	Thu 28/03/24	74
5.7	LhARA vacuum systems specification	129 days	Mon 02/10/23	Thu 28/03/24	
5.8	M12: Finalise LhARA vacuum systems specification	0 days	Thu 28/03/24	Thu 28/03/24	76
5.9	Preliminary design of the mechanical supports including the vertical arc	129 days	Mon 02/10/23	Thu 28/03/24	
5.10	M13: Preliminary design of LhARA mechanical supports including the vertical arc complete	0 days	Thu 28/03/24	Thu 28/03/24	78
5.11	Estimation of LhARA power consumption and cooling requirements	129 days	Mon 02/10/23	Thu 28/03/24	
5.12	M14: Estimation of LhARA power consumption and cooling requirements complete	0 days	Thu 28/03/24	Thu 28/03/24	80

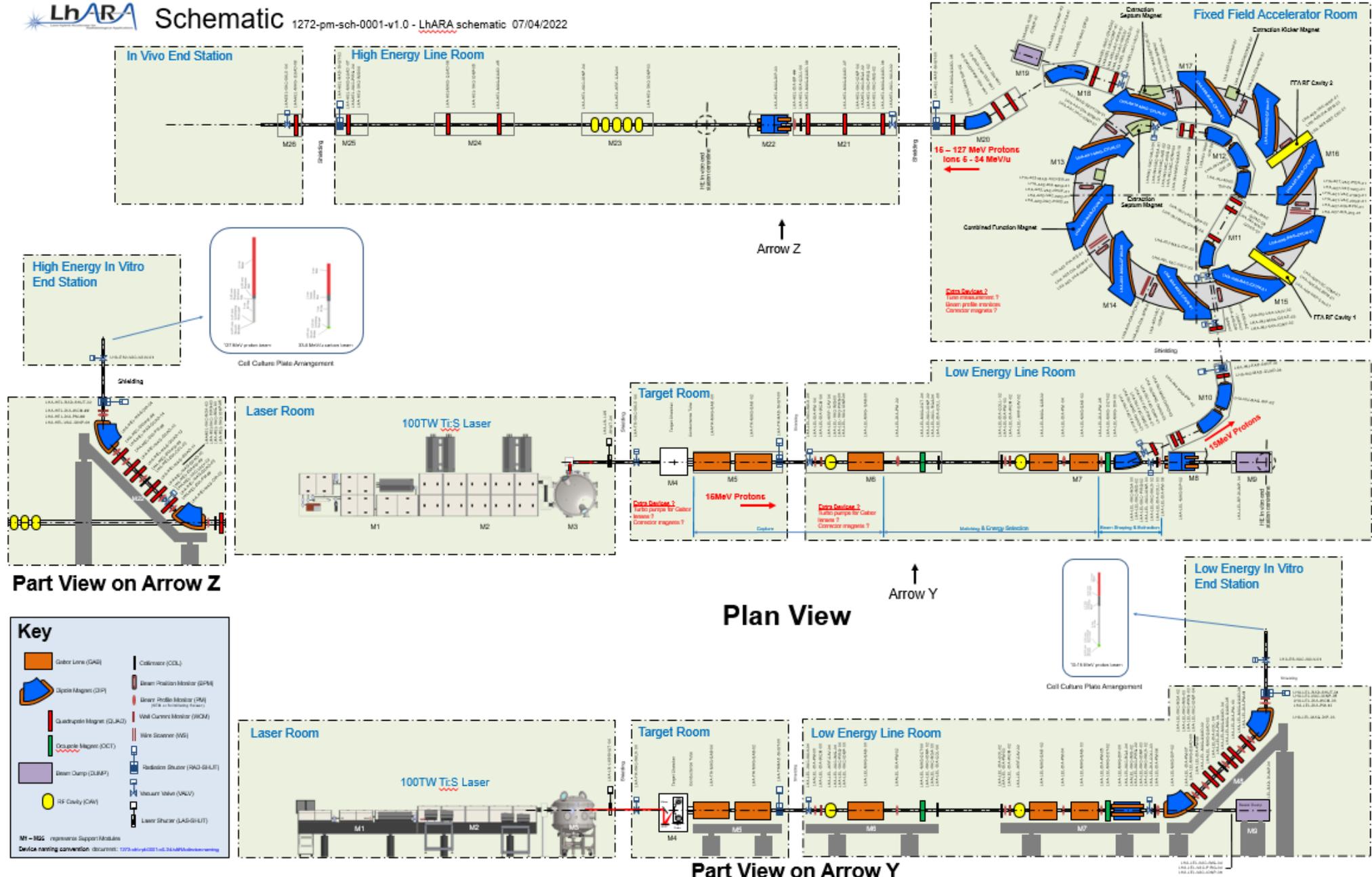


Resources

+ £50k for a radiation shielding study

			October 2022 start assumed		September 2024 finish assumed
			FY22-23	FY23-24	FY24-25
ITRF Preliminary activity					
		Total (SY)			
	STFC activity lead, Group, Department.				
WP2 Facilities & Costing					
Work Package Management	N Bliss, PQM, Technology (Temp.)	0.500	0.125	0.250	0.125
Mechanical engineering design specification	C Hill, P&ME (DL), Technology	1.200	0.300	0.600	0.300
Electrical engineering design specification	S Griffiths, EE, Technology	0.650	0.100	0.450	0.100
Controls specification	G Cox, CS&SI, Technology	0.350	0.050	0.250	0.050
Technical services specification	R Buckley, BP&F, ASTeC	0.450	0.050	0.350	0.050
Vacuum specification	A Vick, VS, ASTeC	0.250	0.050	0.150	0.050
Radiation protection specification	A Goulden, BP&F, ASTeC	0.100	0.015	0.070	0.015
	WP2 Staff Total	3.500	0.690	2.120	0.690

LhARA Schematic 1272-pm-sch-0001-v1.0 - LhARA schematic 07/04/2022



Part View on Arrow Z

Plan View

Arrow Y

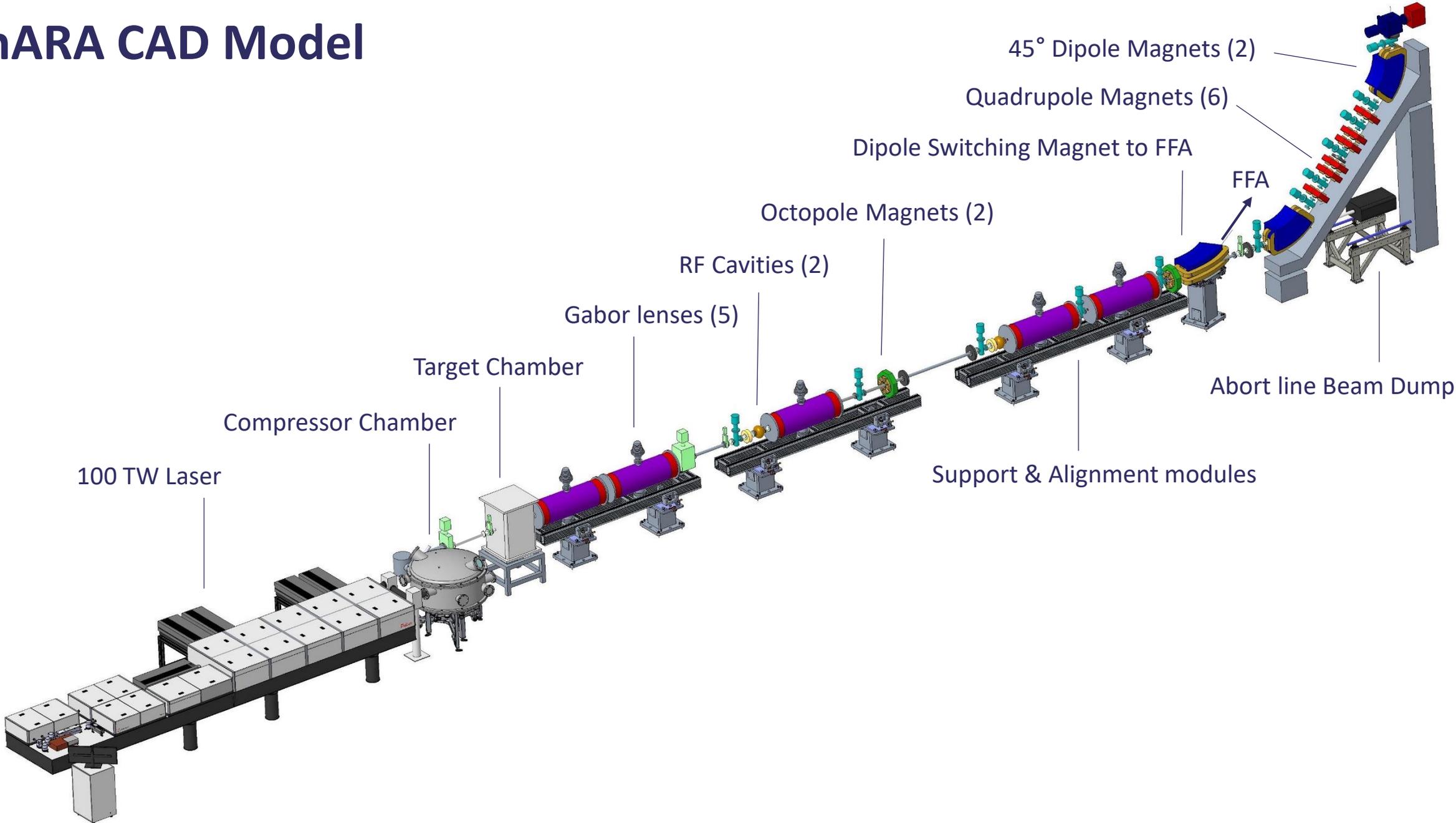
Part View on Arrow Y

Key

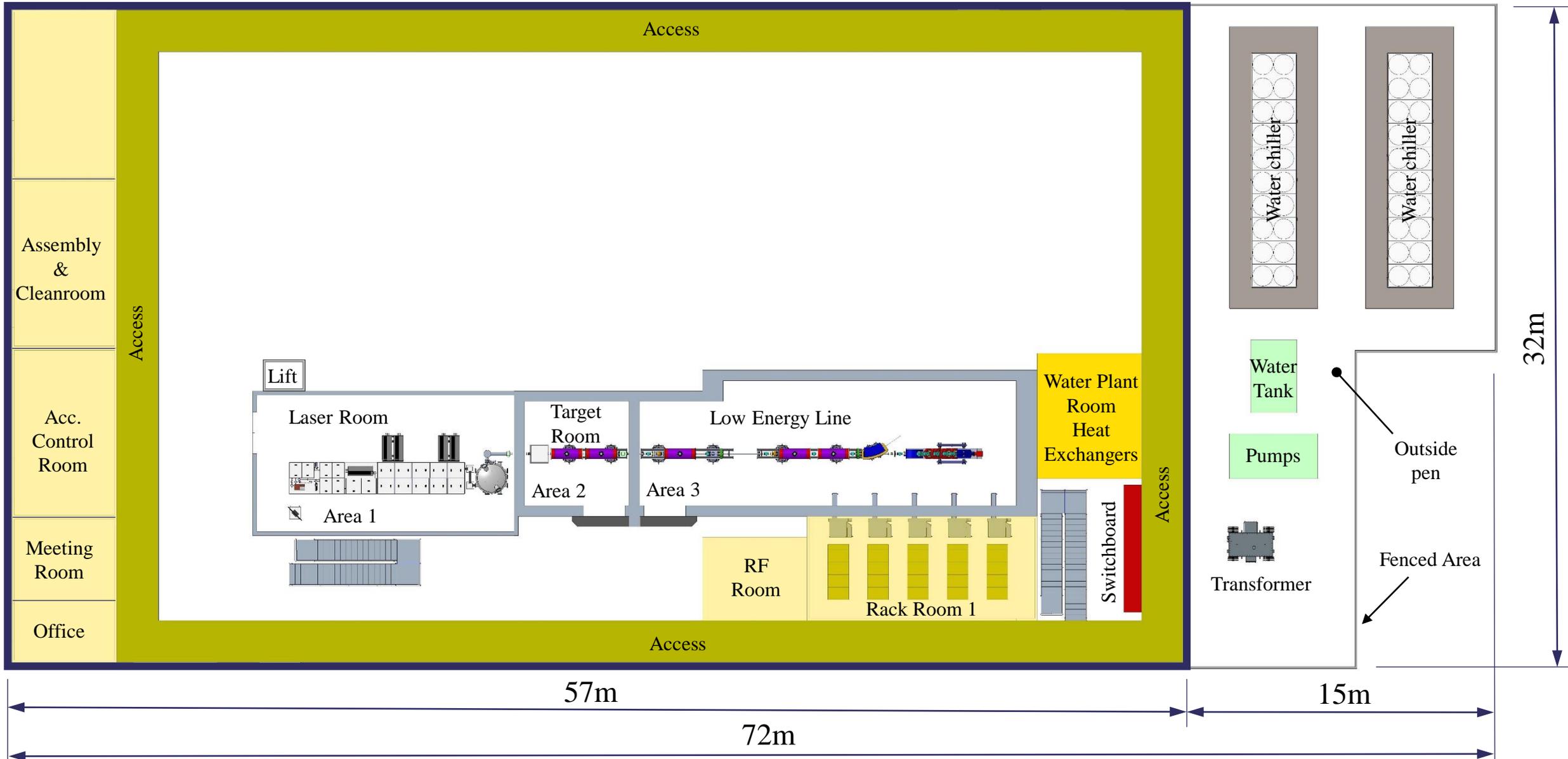
	Gabor Line (GAB)		Collimator (COL)
	Dipole Magnet (DIP)		Beam Position Monitor (BPM)
	Quadrupole Magnet (Q1-Q2)		Beam Size Monitor (BSM)
	Octupole Magnet (OCT)		Wall Current Monitor (WCM)
	Beam Dump (DUMP)		Wire Scanner (WS)
	RF Cavity (CAV)		Reduction Slit (RAD-SLIT)
			Vacuum Valve (VAV)
			Laser Shutter (LAS-SHUT)

M1 - M26 represent Superferrite
 Device naming convention: document: 1272-pa1-pm-sch-0001-v1.0-LhARA-schematic

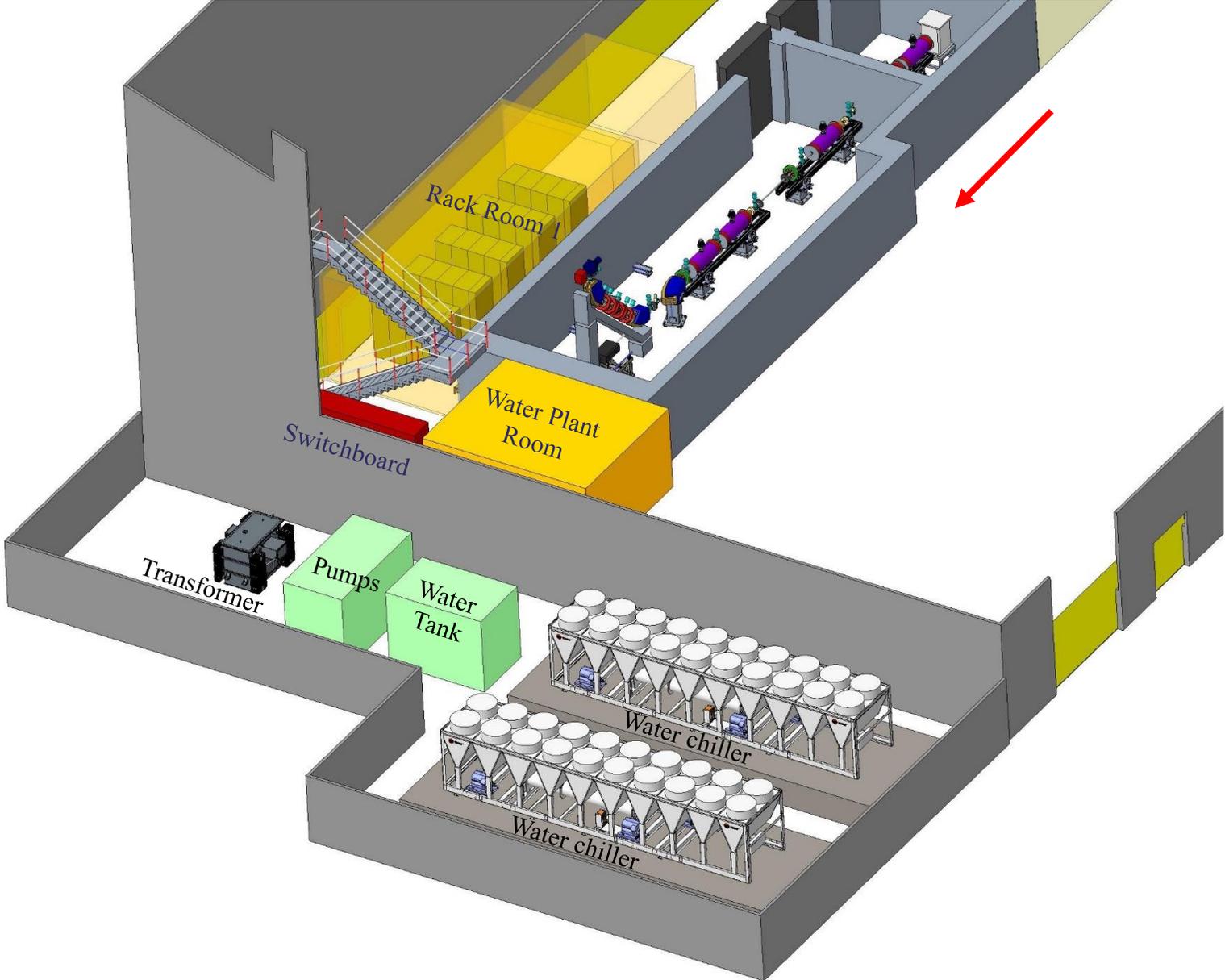
LhARA CAD Model



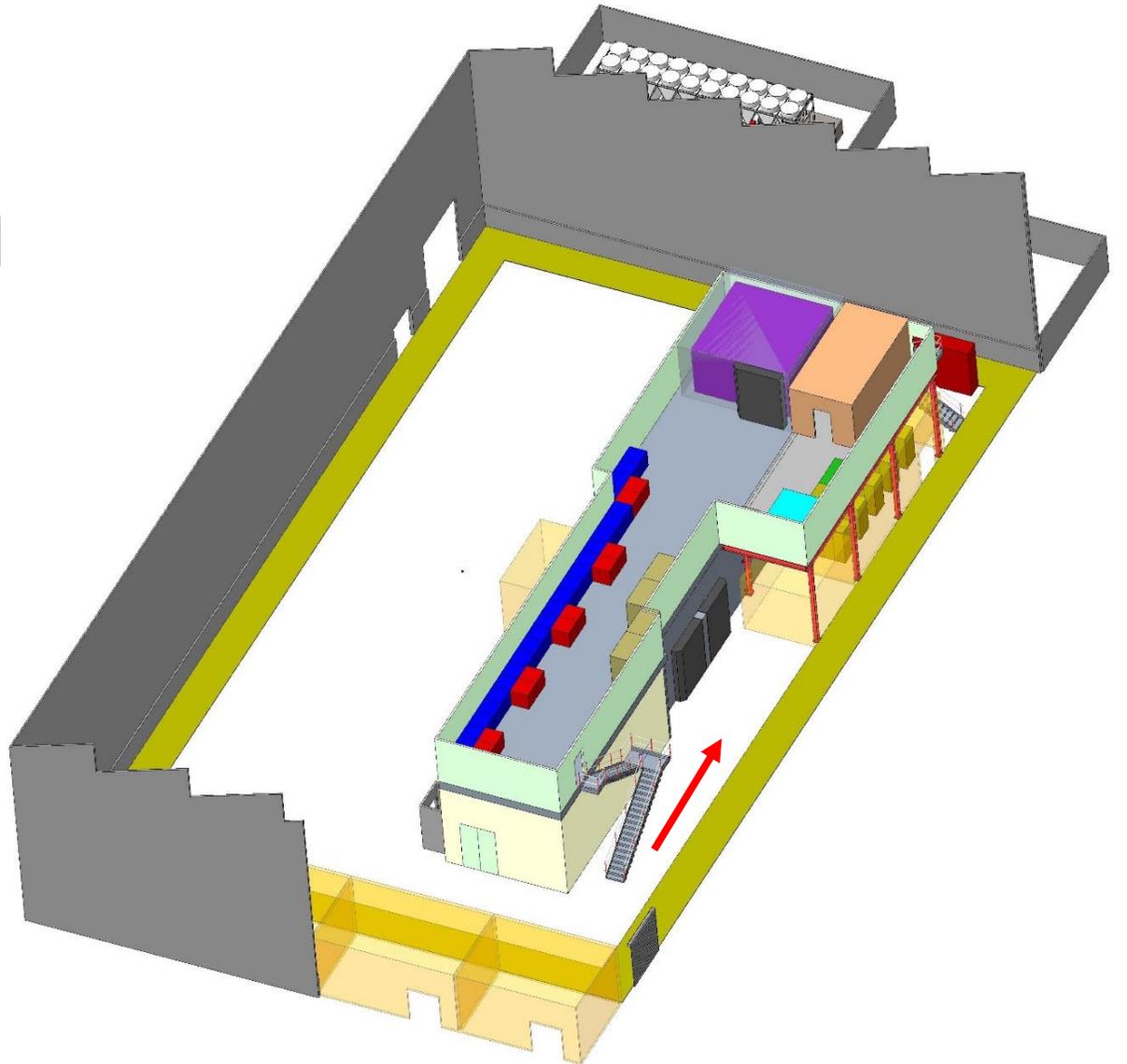
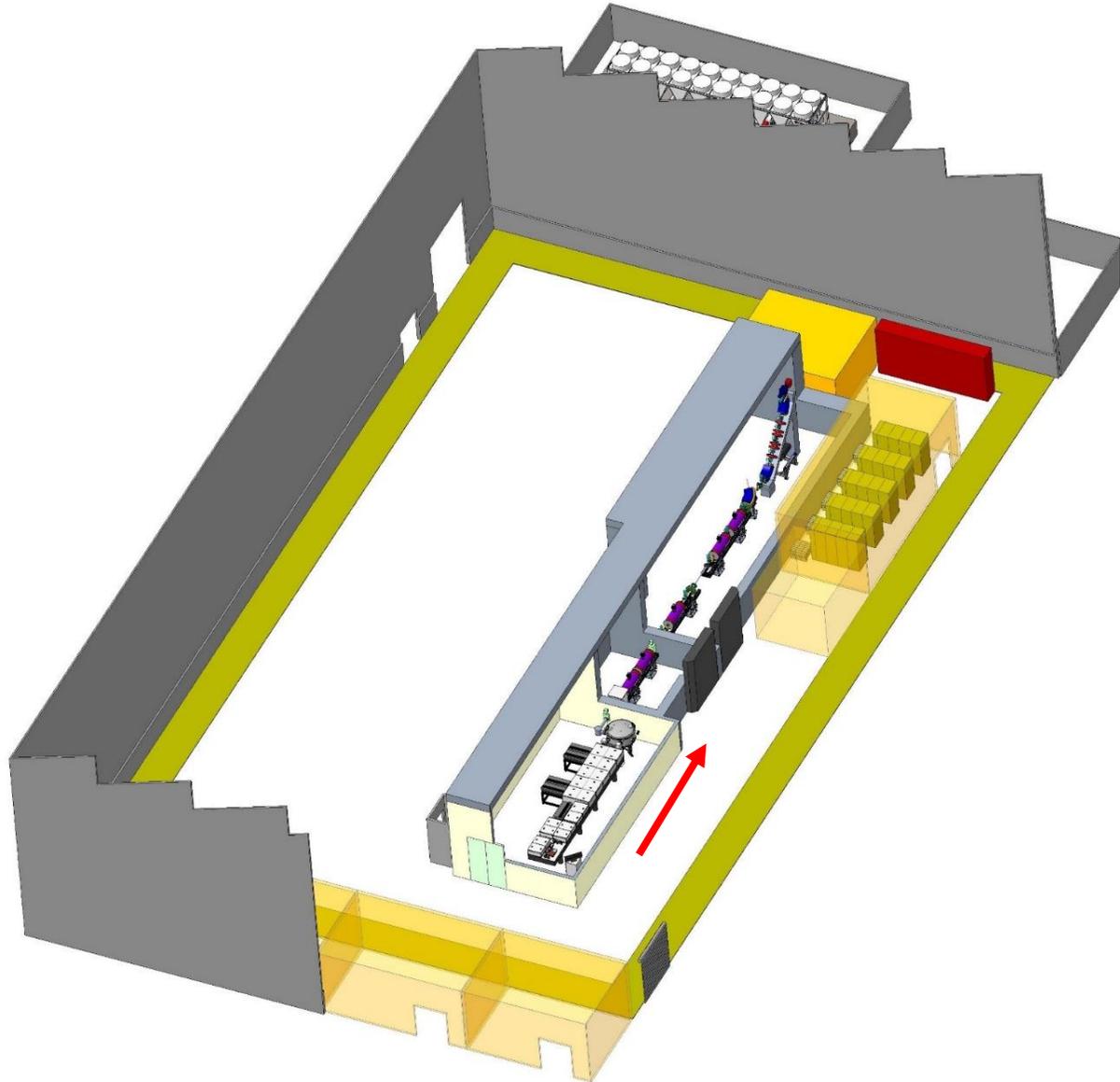
Plan View Layout of Facility – Stage 1



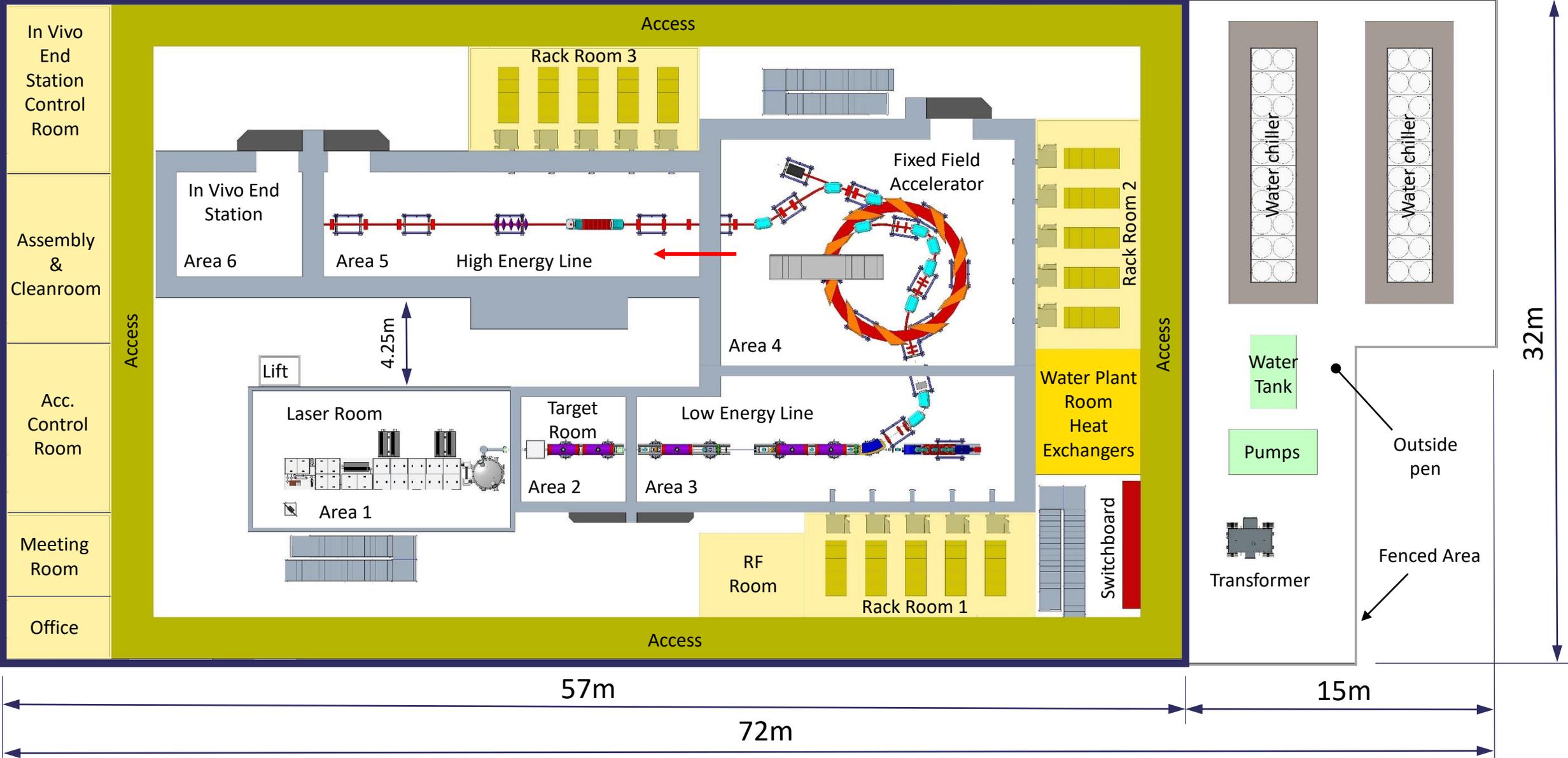
Water Chillers, Pumping and Transformer pen



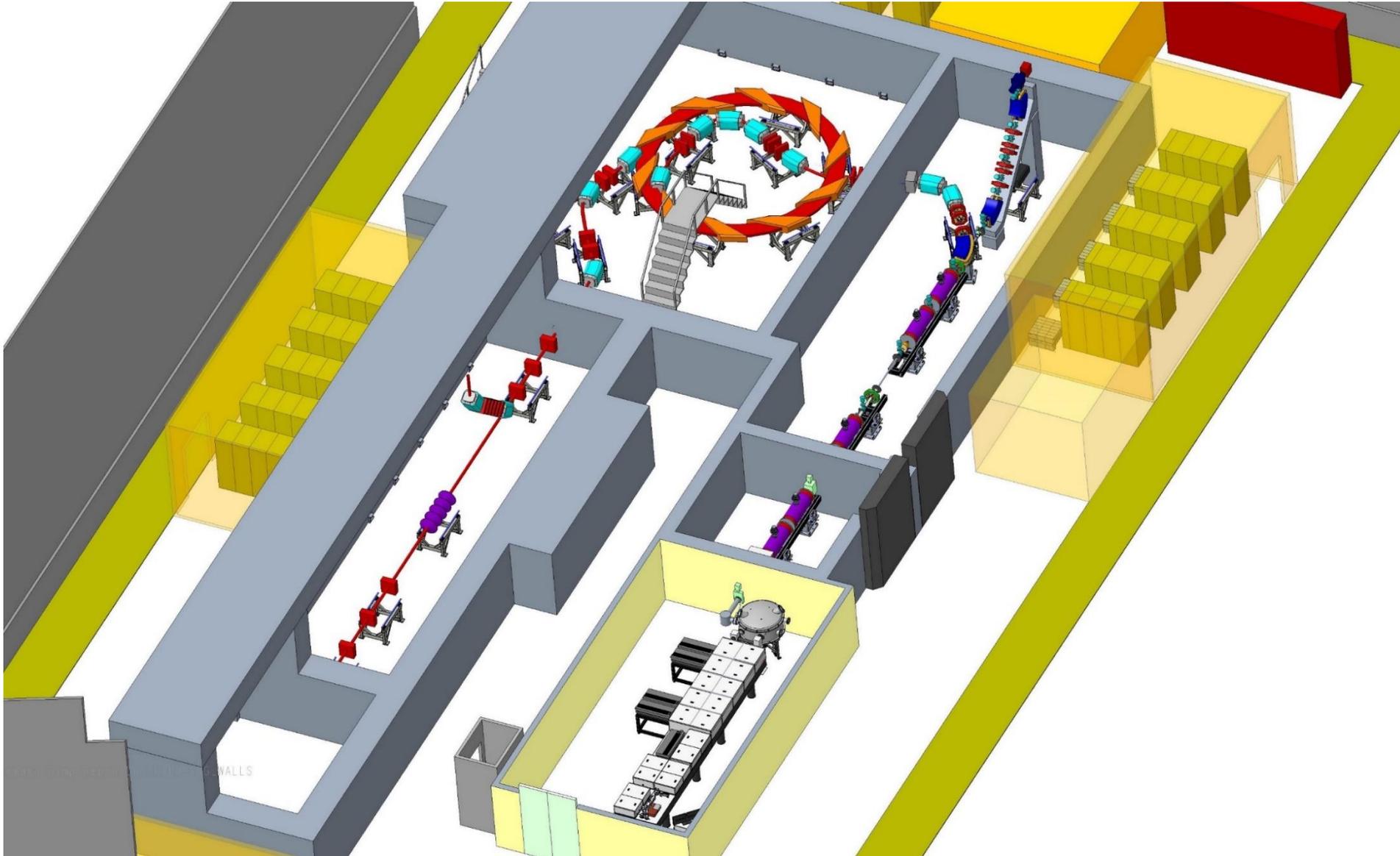
Stage 1 Building Concept

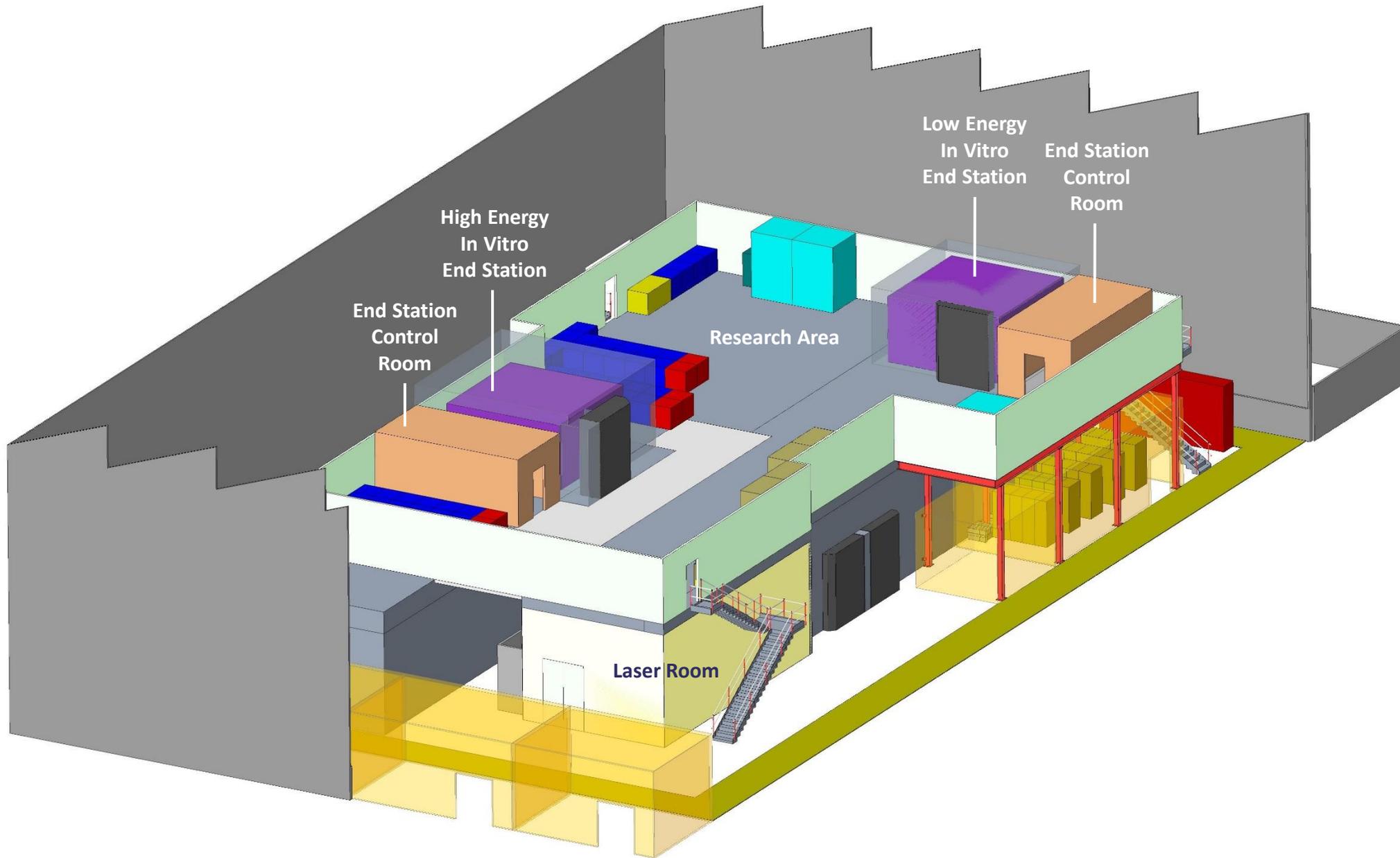


Plan View Layout of Facility – Stage 2

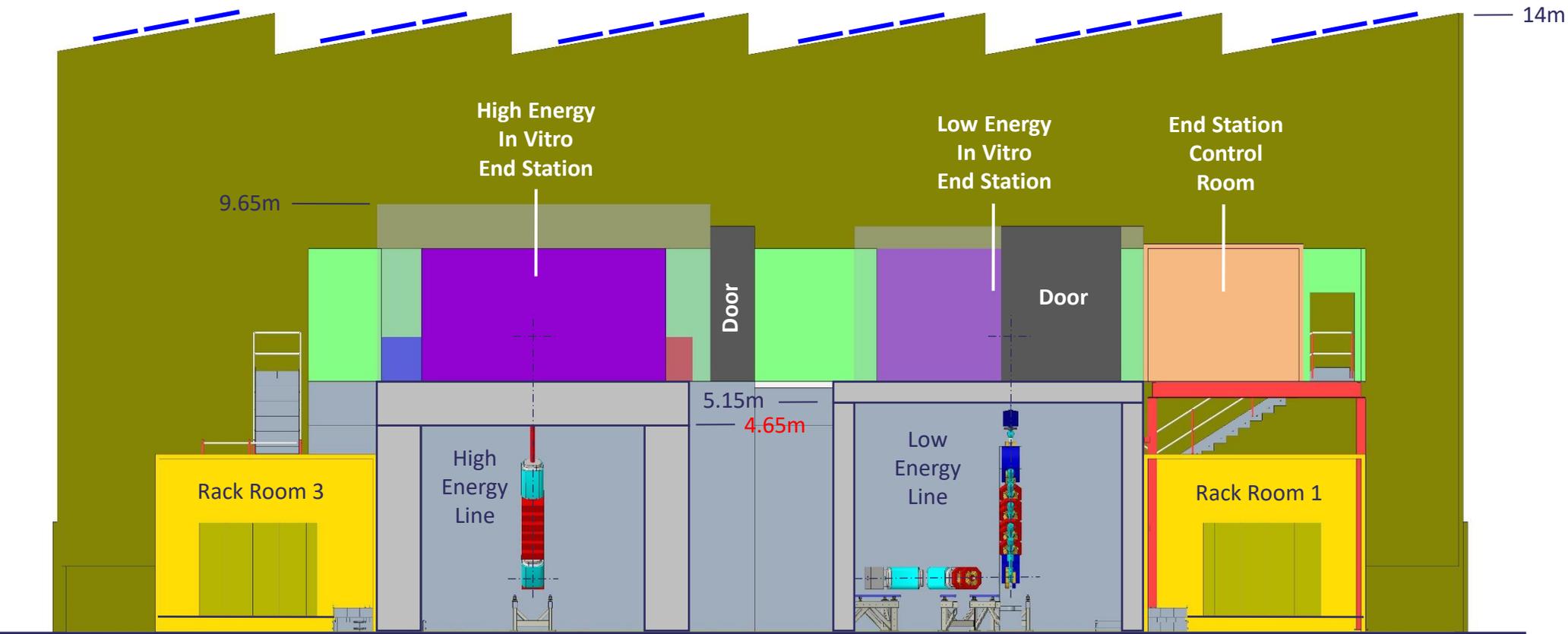


Building Concept Design with cutaway to show equipment





Cross section through building



Radiation Shielding Study by TUV SUD (Nuclear Technologies, Birchwood)

- A high-level shielding design basis report that creates a point of reference for all shielding & radiation protection calculations
- Radiological Classification of Areas
- Preliminary Bulk Shielding Requirements
- Concrete Sustainability Appraisal

Costing

- **References**
 - Pre CDR costing
 - Accelerator cost studies performed by DL staff
 - Recent accelerator build costs (ASTeC RTF & Commercial activities)
 - Recent building construction at RAL
- **Significant increase in costs recently associated to Brexit, Energy costs, Material and Component availability.**
- **Allowance in TDR phase for Sustainability studies**
 - Pre CDR
 - Accelerator studies performed by DL staff
 - Recent building construction at RAL