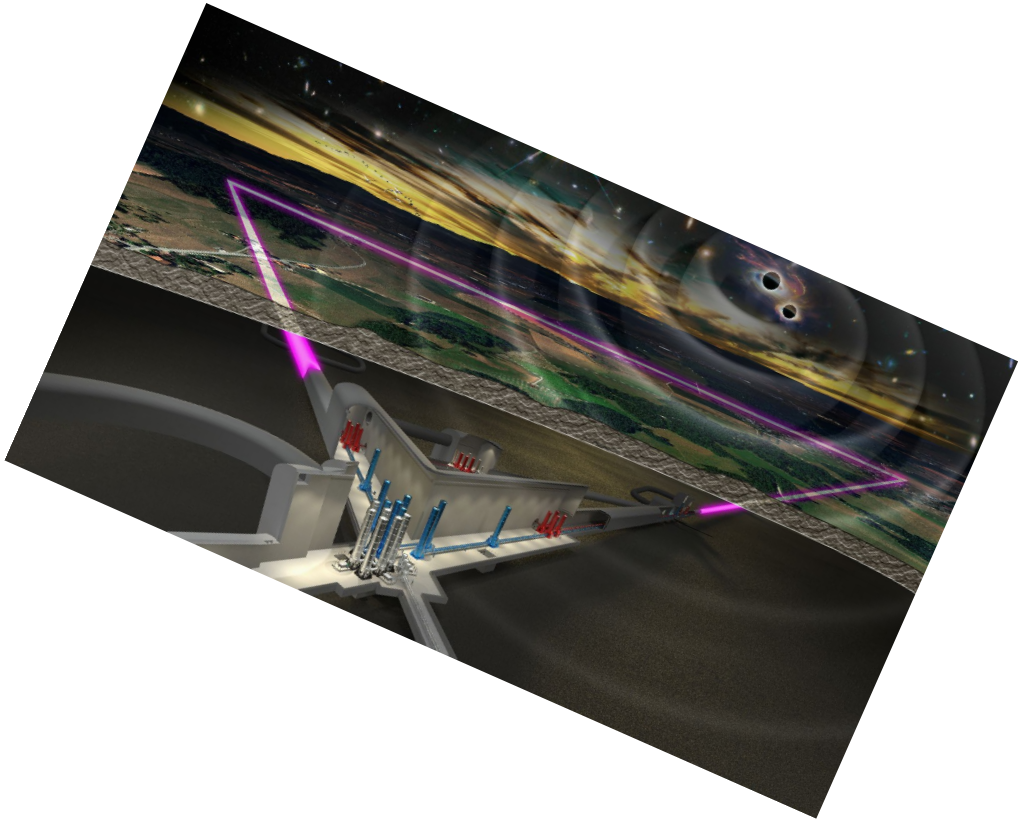
ETO Engineering Department Mandate and Organization



Patrick Werneke

2nd Einstein Telescope Annual Meeting

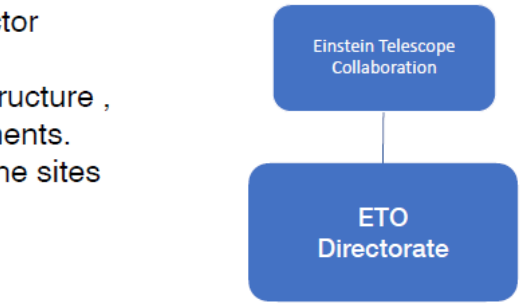
15.11.2023

Engineering Department: Mandate Phase 1

- Civil Infrastructure
- Technical Infrastructure
- Special systems

ETO Directorate scope and relations

ET Collaboration: detector design, requirements for technical and civil infrastructure , E-infrastructure requirements. Common standards for the sites



ETO Directorate deliverables:

1. Technical Design Report
2. Site Evaluation Report
3. Technical Plan report (Phase 2-4)
4. Organisation report (Phase 2-4)
5. Budget report (Phase 2-4)

BGR:
Governance & Legal entity
Site selection process
Finance

BSR:
Agencies
Finance

Local teams:
Feasibility studies civil engineering, installations
Feasibility studies subsurface
Feasibility studies environment and legal

Engineering Department – Civil Engineering Phase 1

Team: Civil Engineering

Deliverable: Preliminary Technical Design Report for the Civil Infrastructure (cost, risk and schedule) – “Principal approval for Construction”

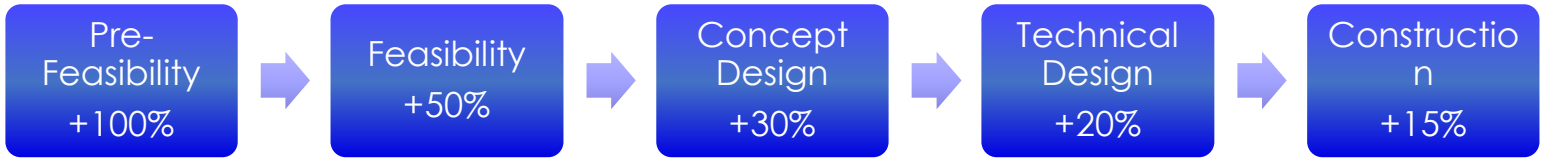
Actions: Roadmap – Work Packages

Input:

- Baseline configuration
- Detailed design of the detector and requirements
- Logistics and Installation plan
- Safety plan
- Technical Infrastructures
- Information from subsurface studies

Is there enough input to start?

Choice Methodology is Strategic: "Principal approval for Construction"



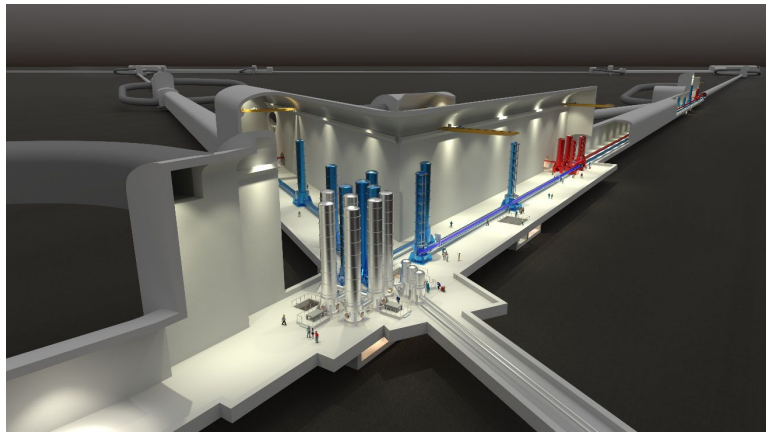
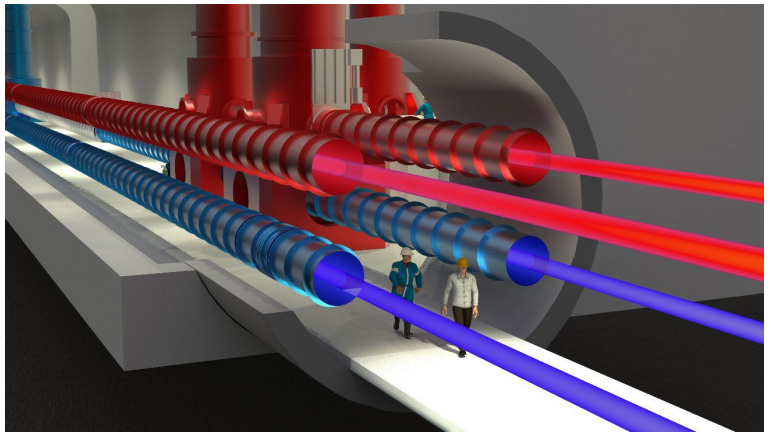
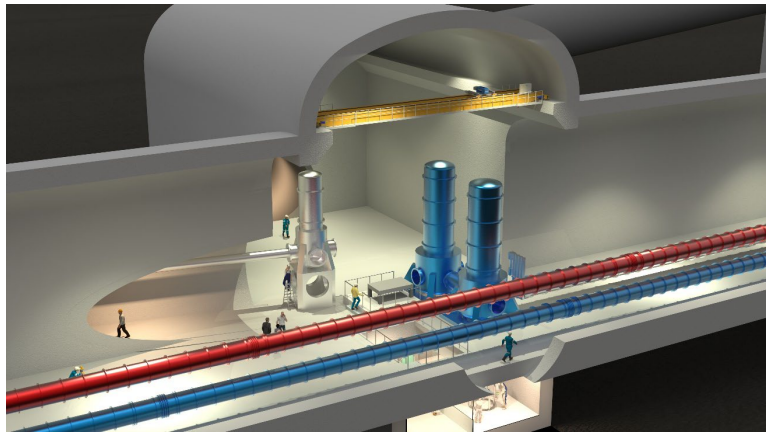
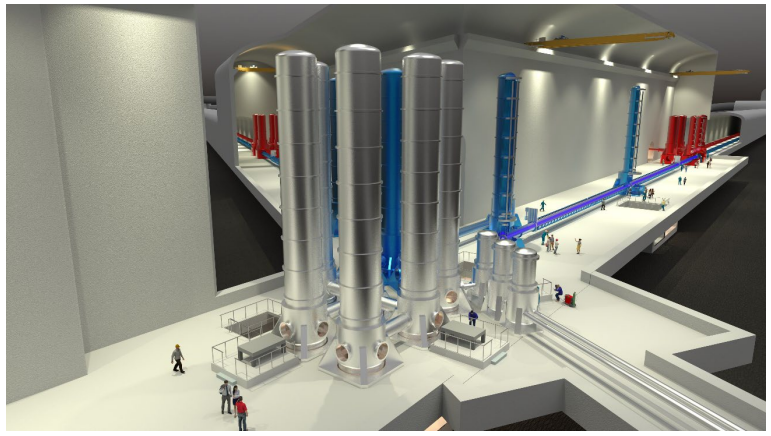
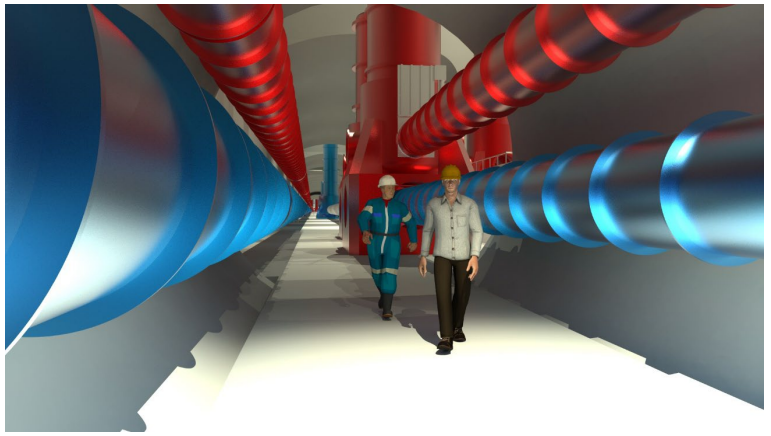
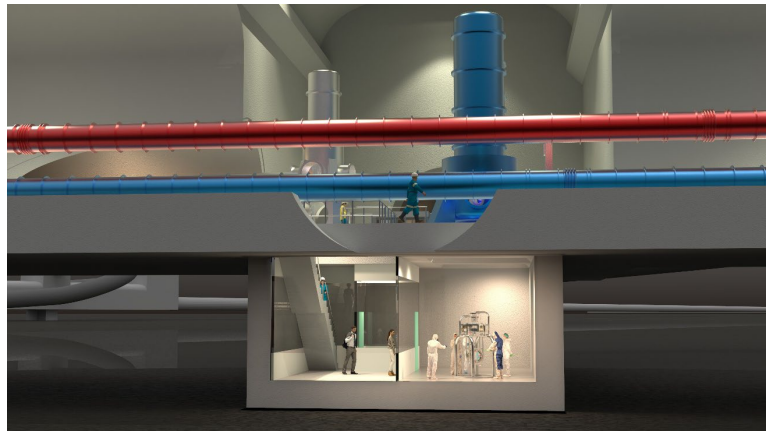
Project phases and typical upper level of cost uncertainty

- Cost uncertainty decreases with project development
- +100% > +15%
- Maturity level dictates cost class

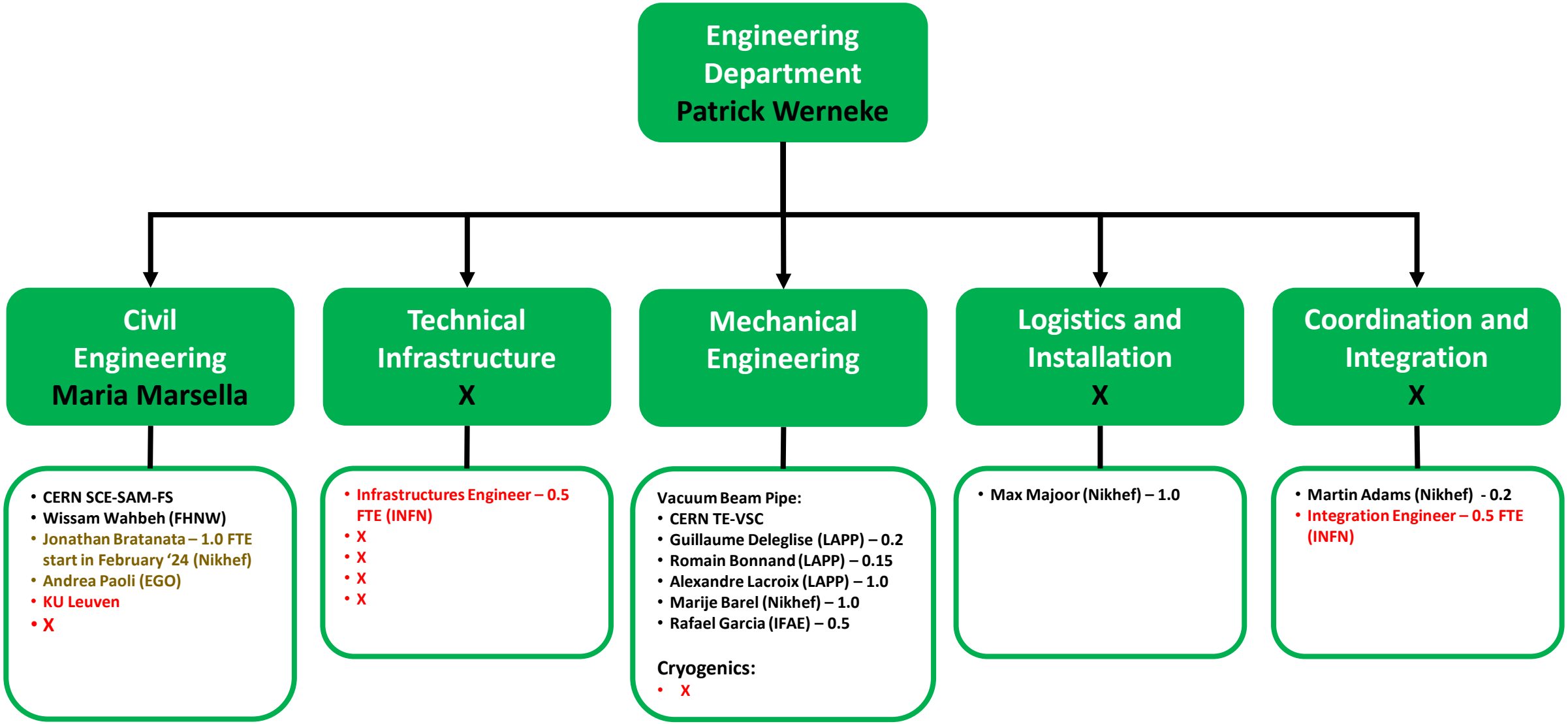
	Primary Characteristic	*Secondary Characteristic*		
ESTIMATE CLASS	**MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

Christensen, P, Dysert, LR, Bates, J, Burton, D, Creese, RC & Hollmann, J, 2016.
Cost Estimate Classification System - as applied in engineering, procurement, and construction

End

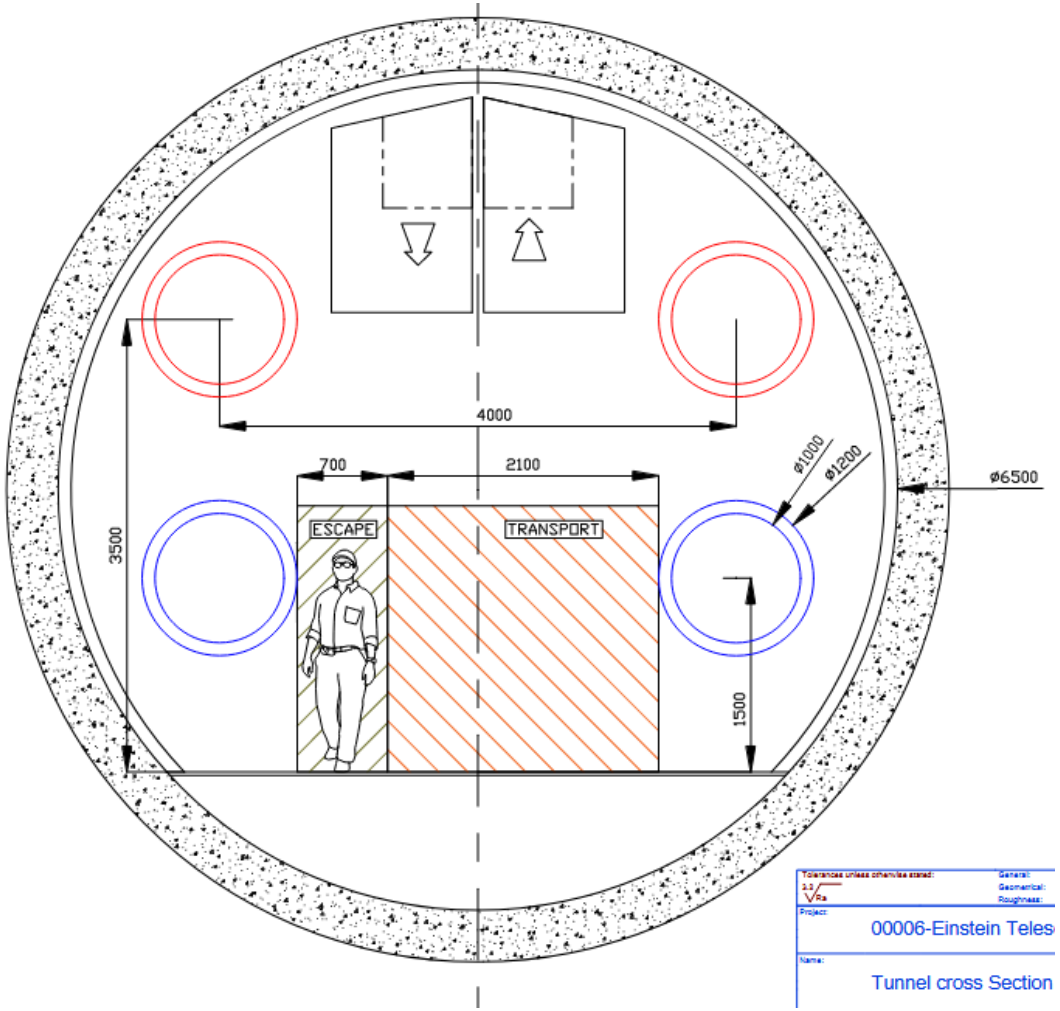







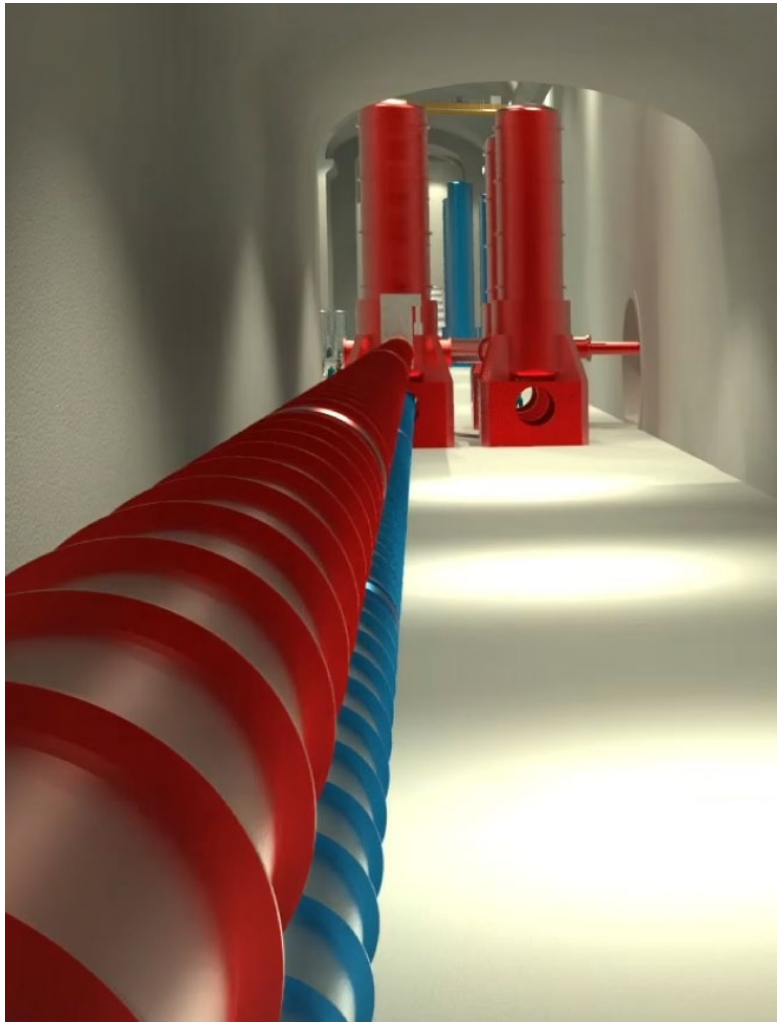
Engineering Department

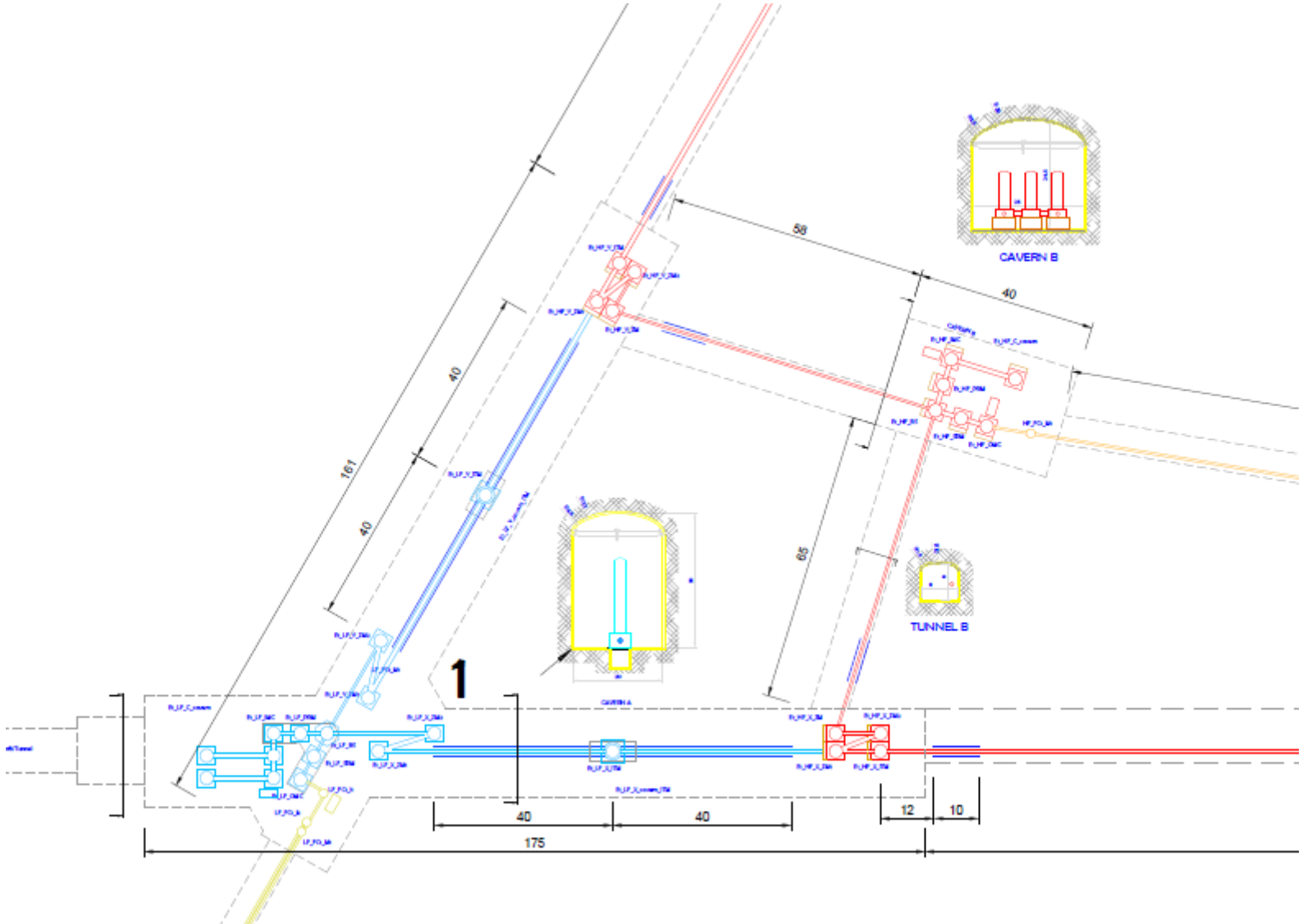


Draft version of the ED organizational chart

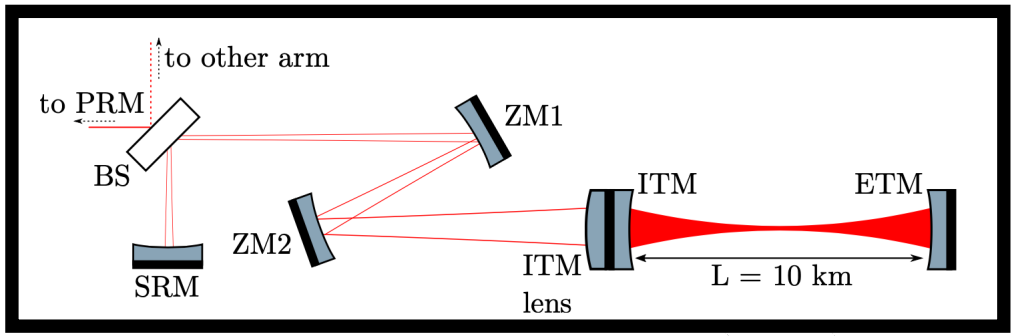
Tunnel layout from Design Report Update 2020

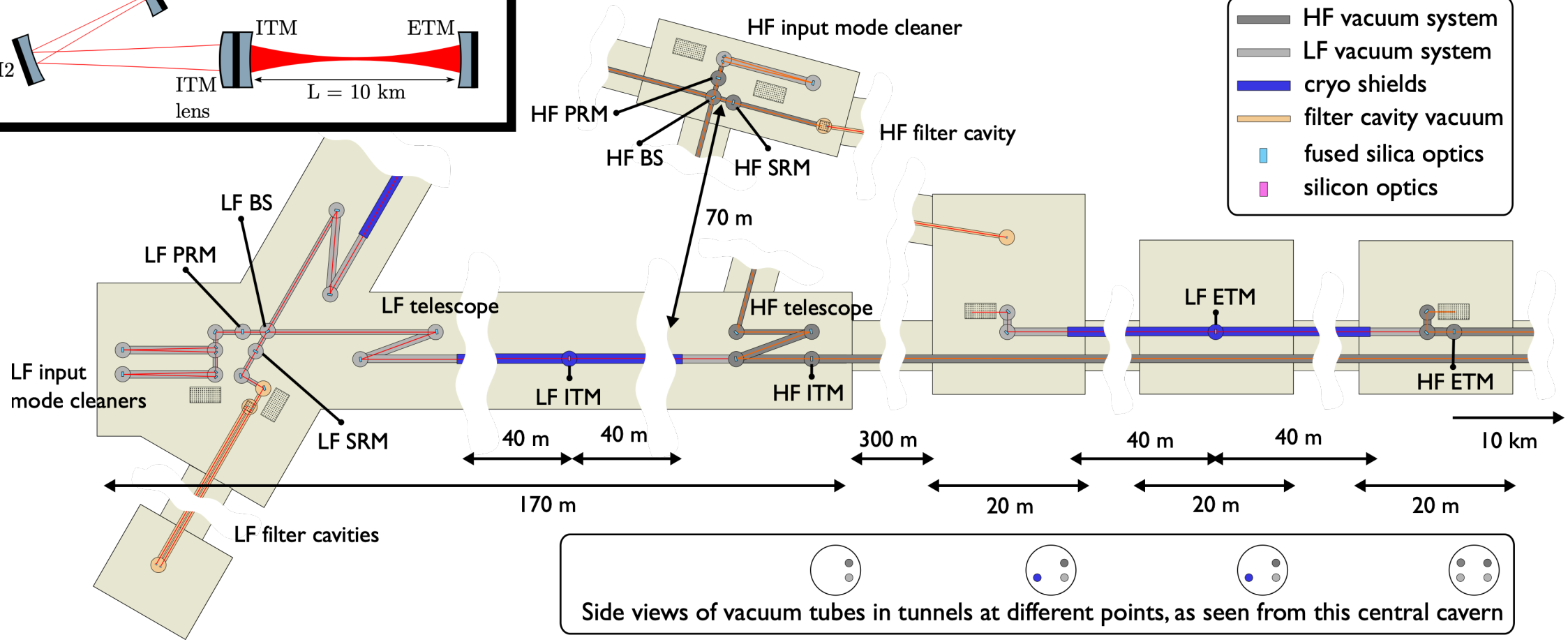





CAVERN B
TUNNEL B
CAVERN A
1
58
40
161
40
40
65
40
40
12
10
175

Optical layout





S. Rowlinson: Feasibility study of beam-expanding telescopes in the interferometer arms for the Einstein Telescope https://arxiv.org/abs/2011.02983