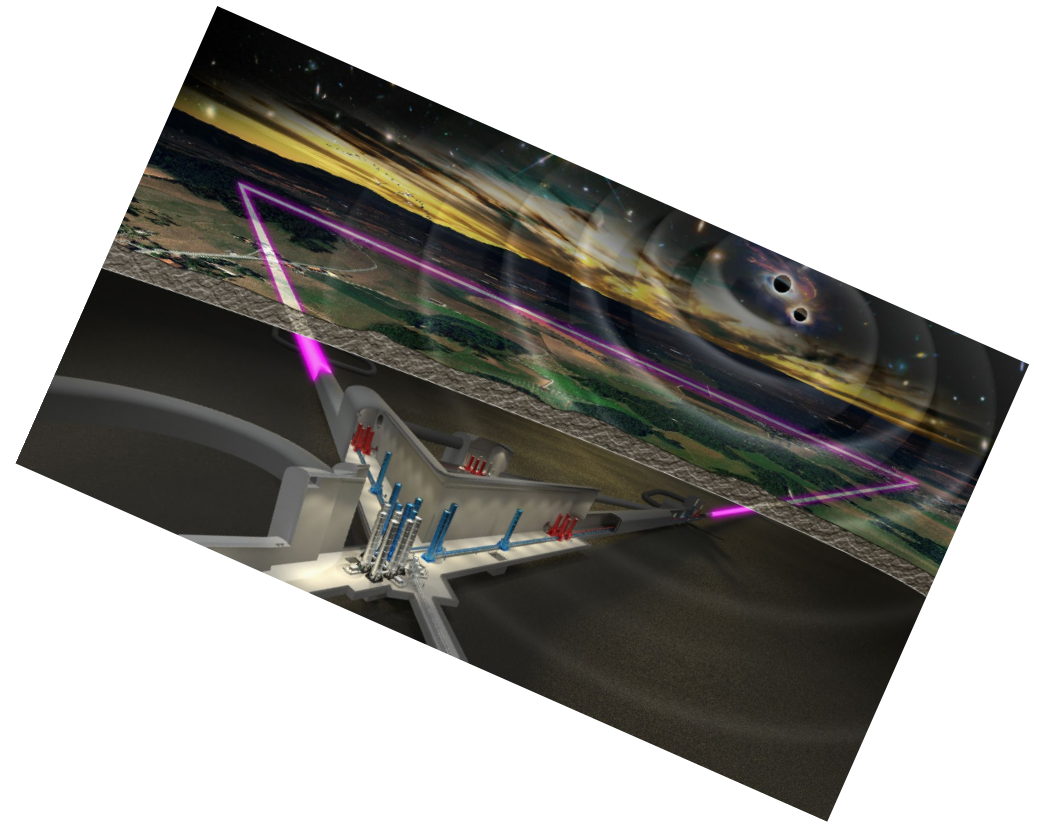


Engineering Department

Patrick Werneke
ET-PP INFRA_DEV Annual Meeting
12.06.2023



Engineering Department

Monday June 12 | 18:00 – 19:00

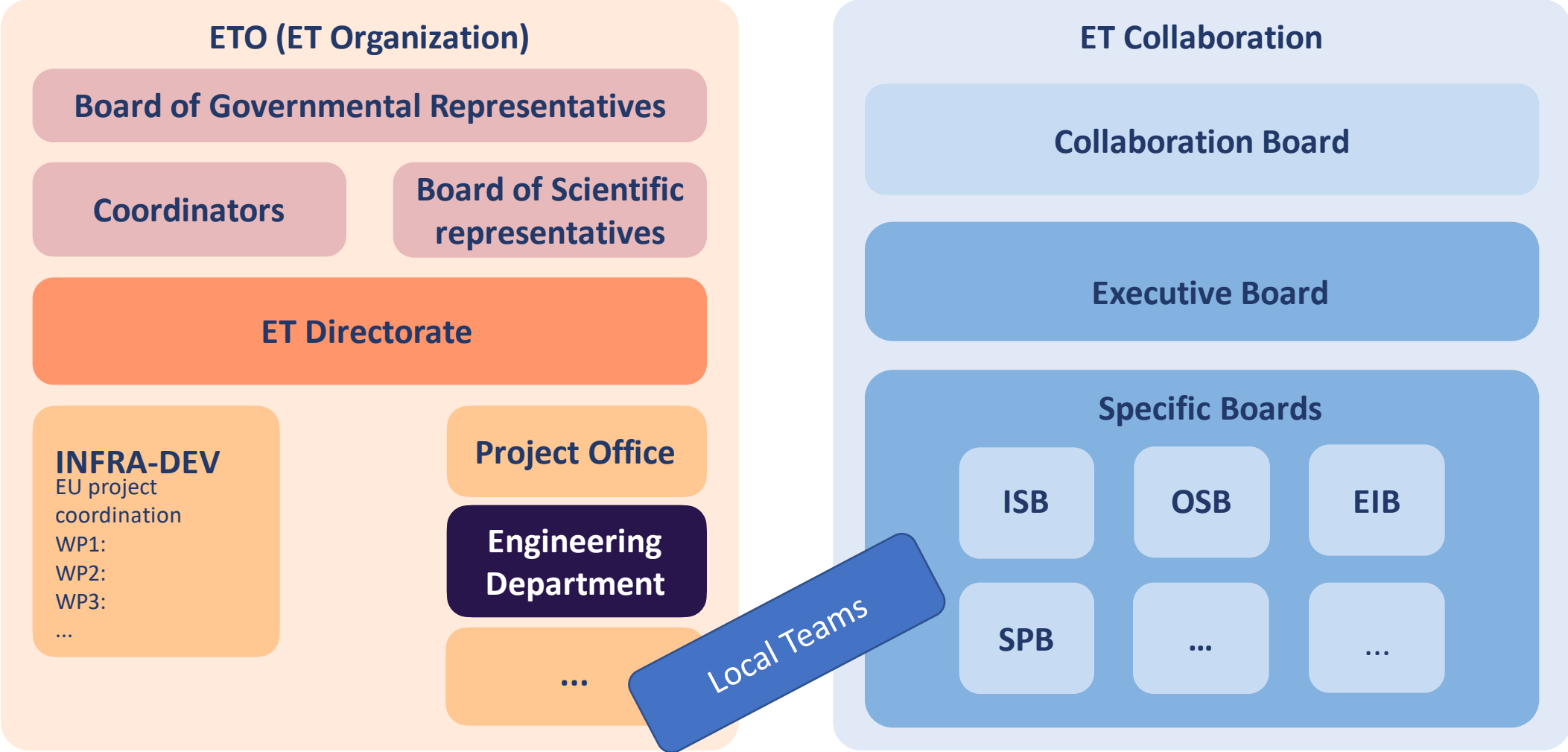
Polivalent Room, 6th Floor, UPF-Barcelona School of Management

Agenda:

- Organization of the Engineering Department: Patrick Werneke
- Activities of the Civil Engineering: Maria Marsella
- Working session: Interference of the Beampipe and Civil Infrastructures:
 - Luigi Scibile will kick-off with a presentation
 - Identify some of the configuration parameters

ET Dual Organizational Structure

1) project organization (towards legal entity) and 2) scientific collaboration



Engineering Department: mission

The Engineering Department will **design, procure, install, commission, operate, maintain and eventually, dismantle:**

1. **The special systems** (e.g. vacuum, cryo, monitor & survey) associated with the gravitational wave detector
and
2. **The technical infrastructure systems needed to operate the interferometer** (e.g. civil engineering, technical infrastructures (power distribution, cooling & ventilation, ...))

Date: 9 March 2023

Document ID	ET.IDV.05.00.DLR.00001
TDS Reference	
Document type	Management
Status	First draft version

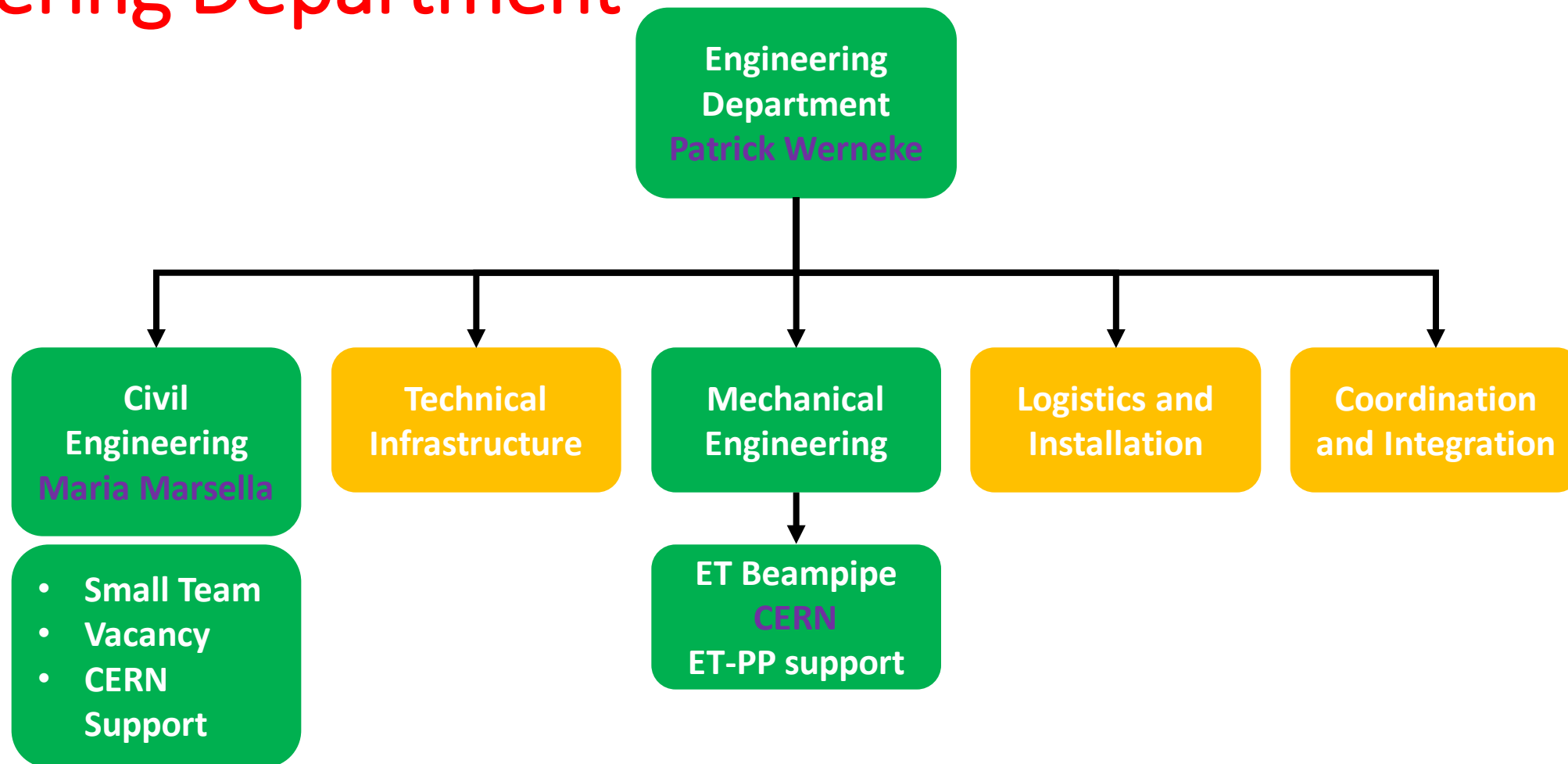
Engineering Department Mandate and Structure

Abstract

This document describes the mandate and structure of the Engineering Department for the Einstein Telescope Organization (ETO).

Author(s) & Affiliation(s)	Verified
Patrick Werneke, ETO/Nikhef	

Engineering Department



Draft version of the Organization chart

Engineering Department

- We are also in discussion with other teams at CERN:
 - **Health, Safety and Environment**
 - **Technical Infrastructures**
 - **Mechanical and Materials Engineering (MME)**
 - **Accelerator Coordination & Engineering (coordination of large projects)**
 - **Handling Engineering (Logistics and transport)**
 - **Engineering Information Management**

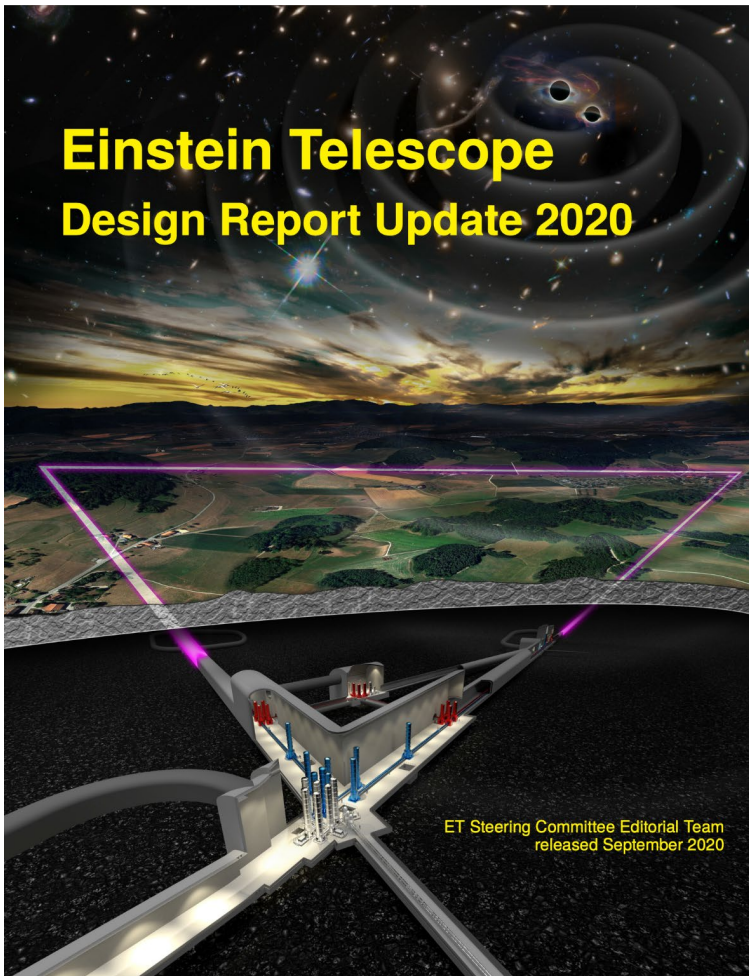
Engineering Department: ET Phases

ET is currently in Phase I of a **Design and Preparation Phase**, which ends with the **selection of a site** for ET.

Deliverables Phase 1:

- TDR
 - Costing overview
 - Risk assessment
 - Schedule
2. Preparatory Phase 2: this phase will end with the final TDR, costing overview and risk assessment;
 3. Implementation Phase: this phase will end with the Einstein Telescope commissioned;
 4. Operation Phase
 5. Termination Phase

Next steps: layout and requirements



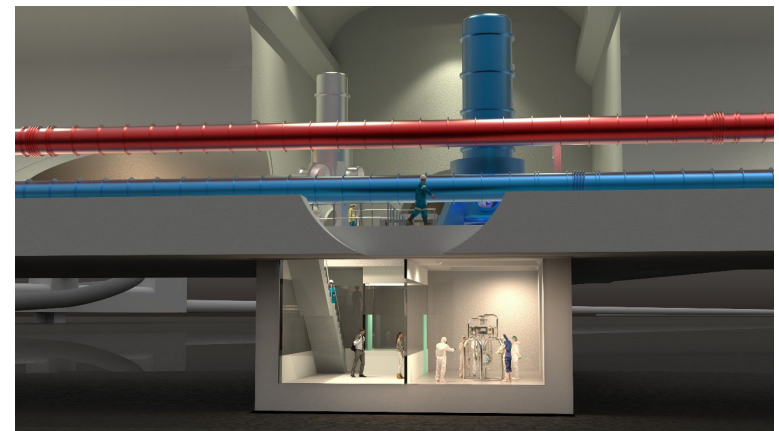
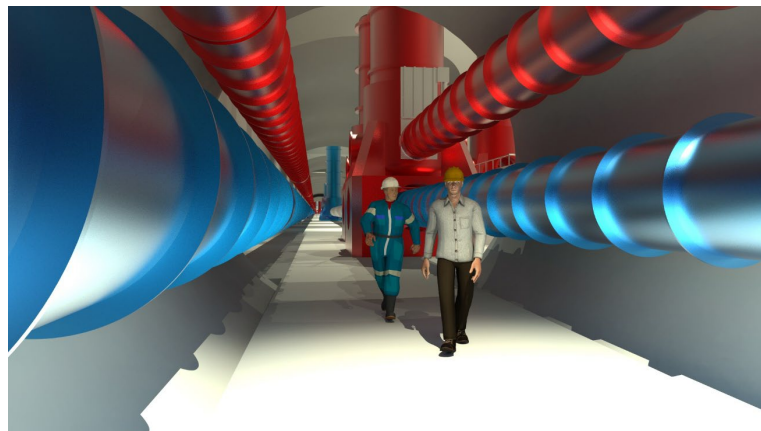
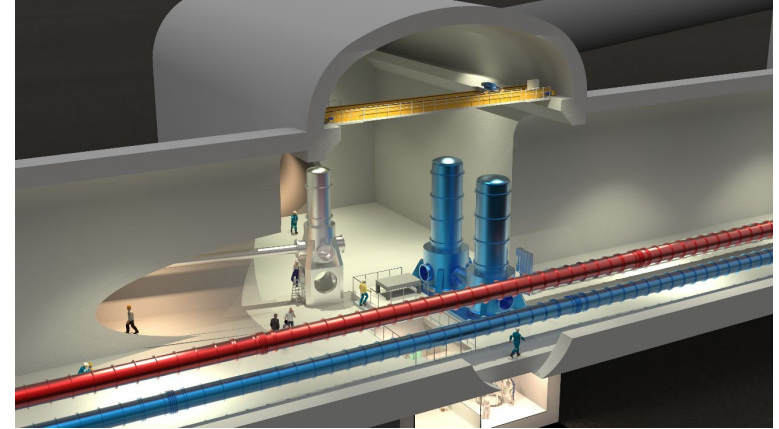
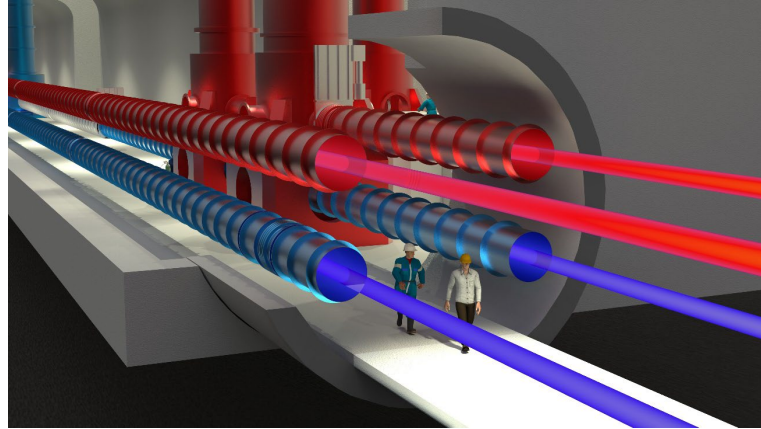
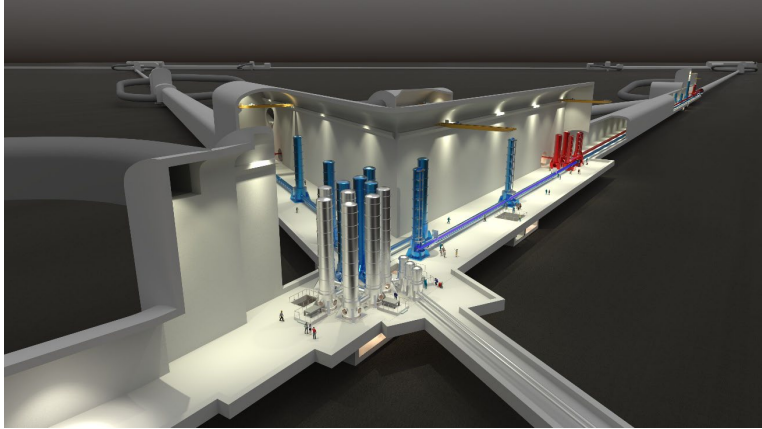
A PBS (Product Breakdown Structure) was created:

- Provide input for costing and naming
- Provide backbone for the WBS that will define the project schedule
- Provide backbone for requirements breakdown and hierarchy

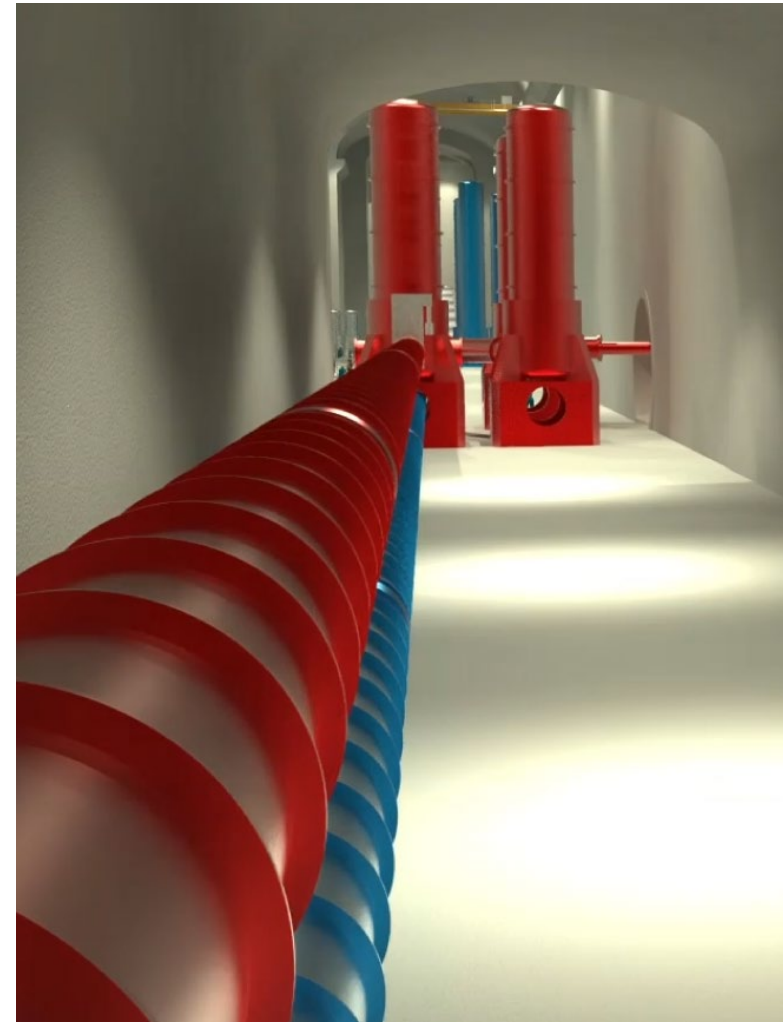
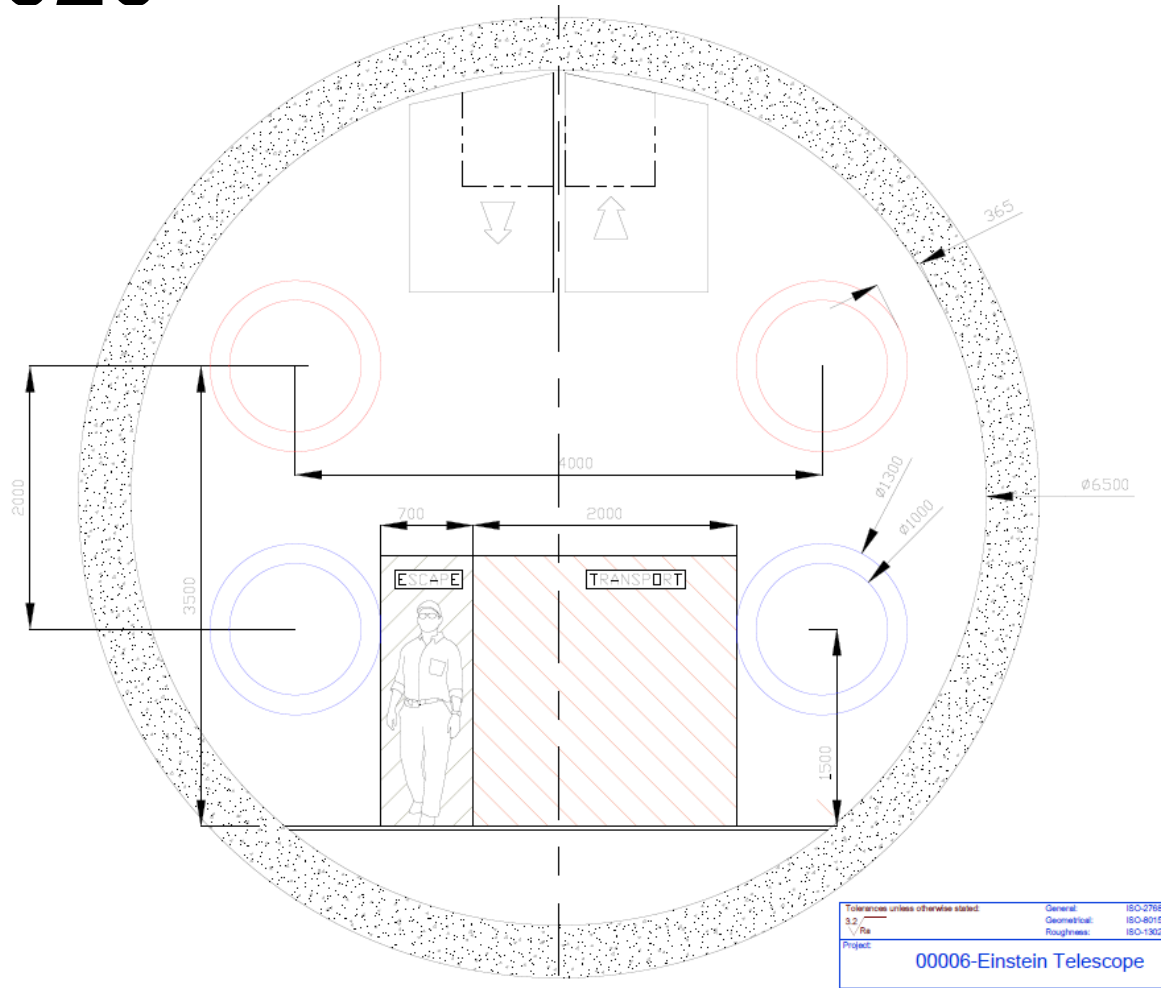
The Design Report Update 2020 is a good starting point for finding layouts and requirements, however they are not complete and subject to change.

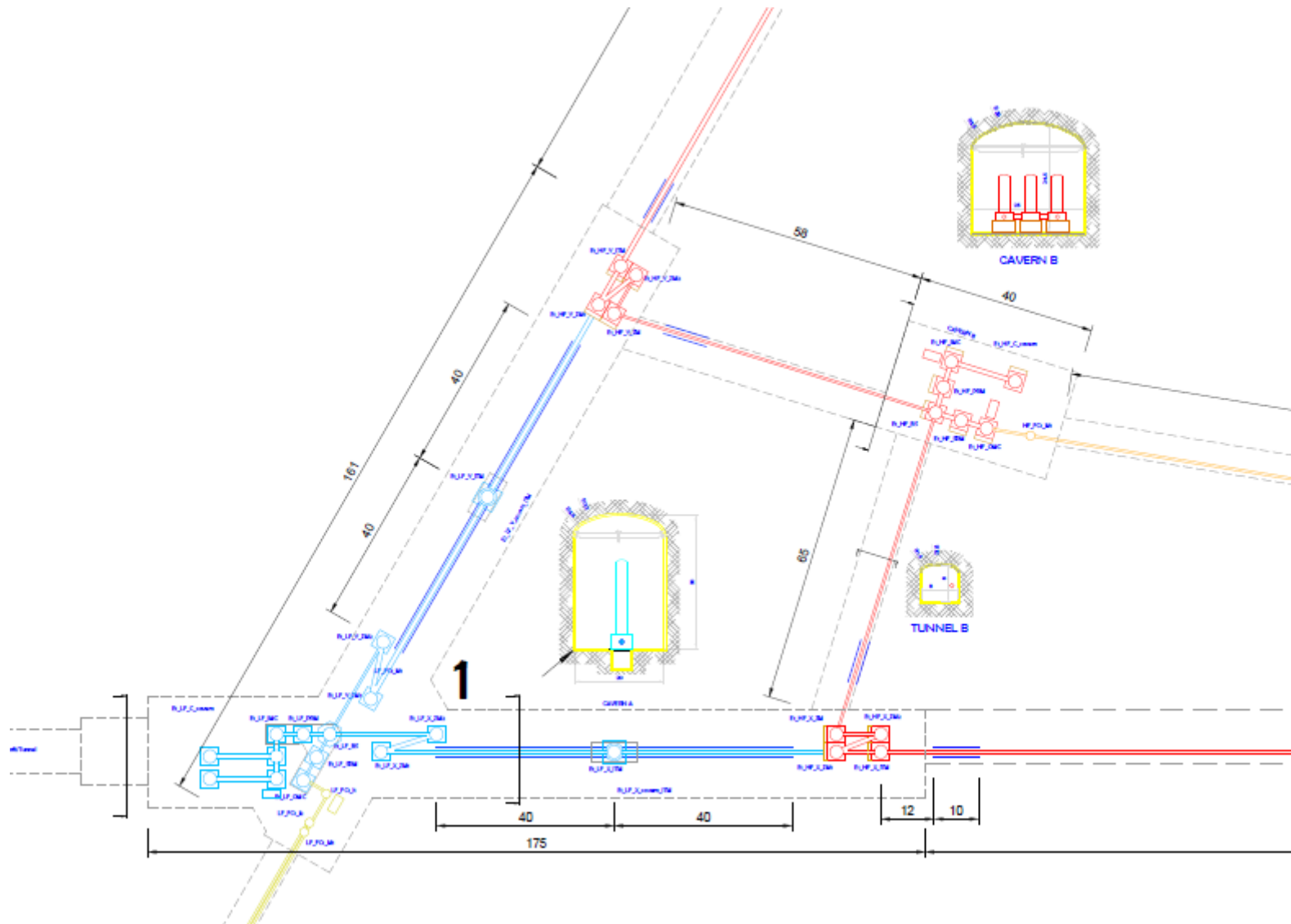
- Started with identifying issues related to civil engineering
- Functional and Integration parameters (PO)
- Δ is the baseline (2L is compared as a change to the Δ)
- ET Vacuum & Cryogenics group started to identify issues for CE: space requirements - size cryostat, access, cryopumps, caverns,...

End

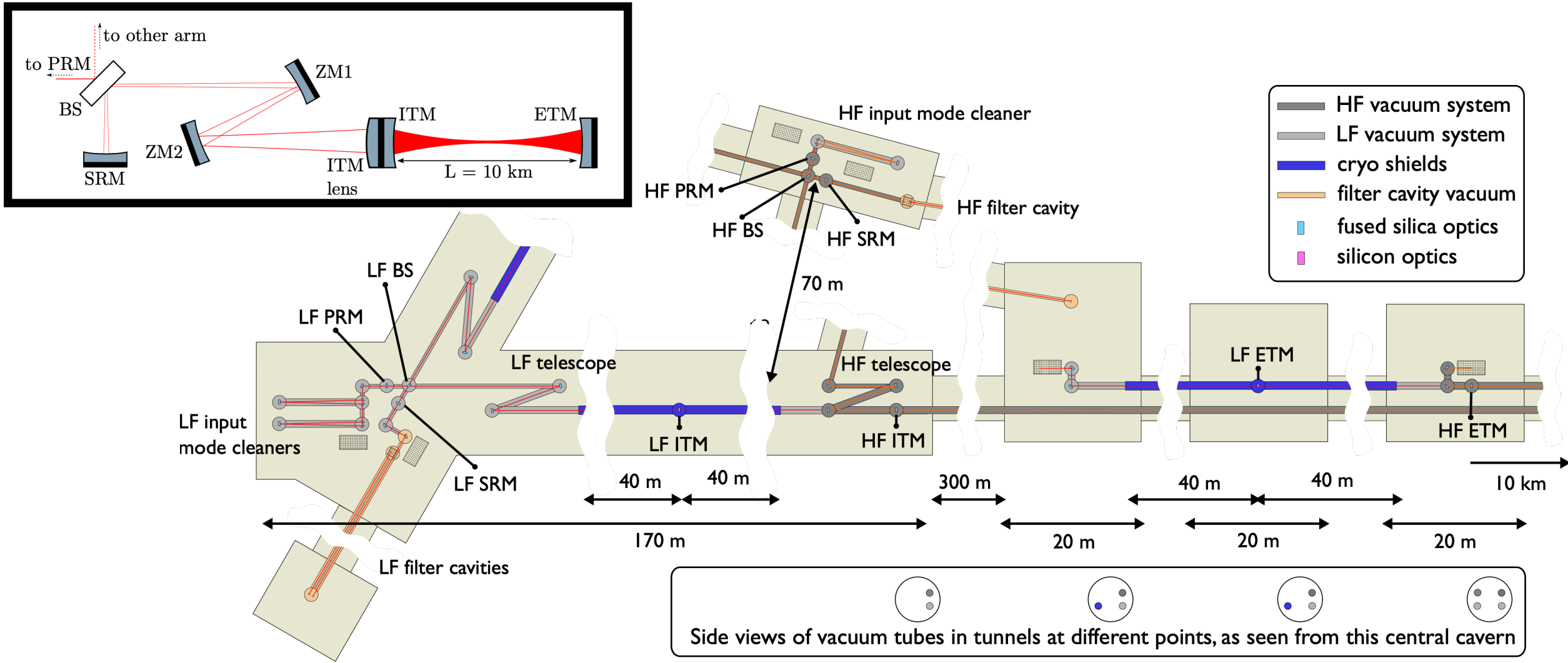


Tunnel layout from Design Report Update 2020



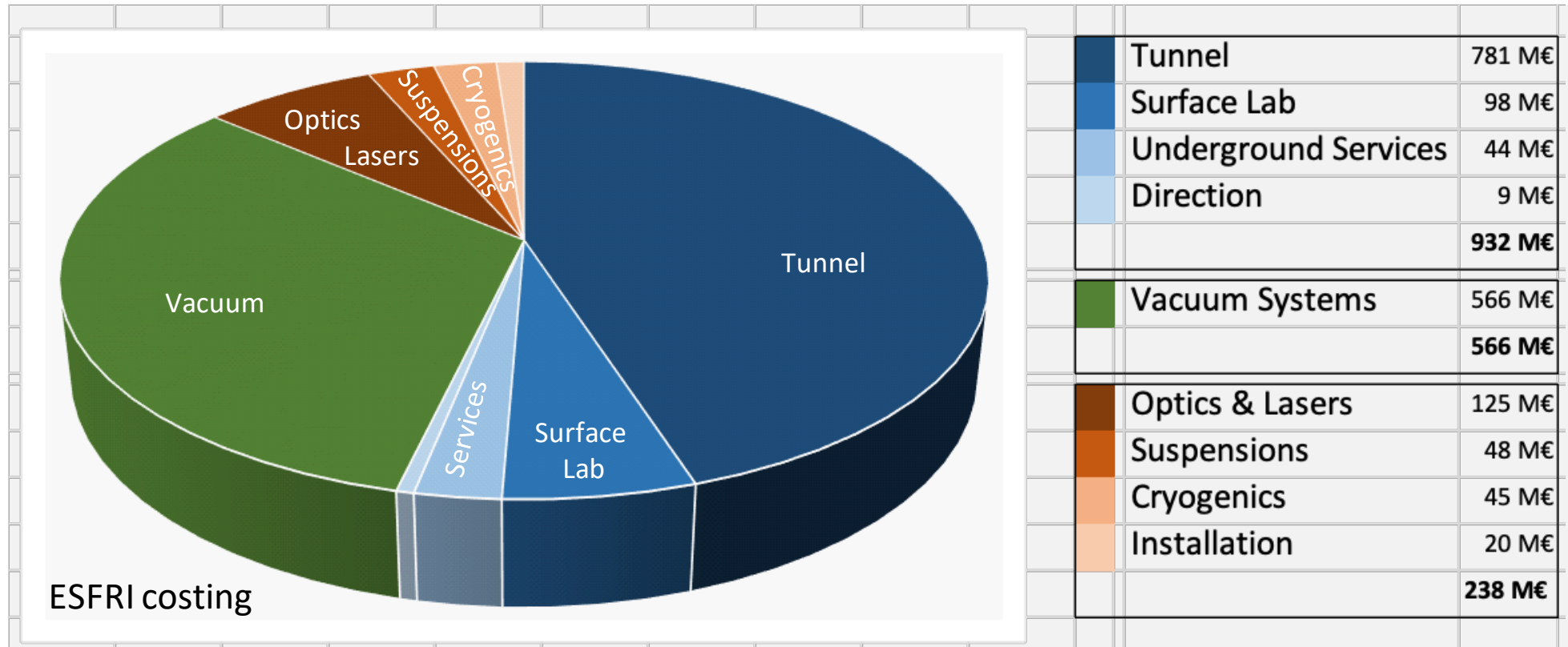


Optical layout



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

Einstein Telescope: construction costs

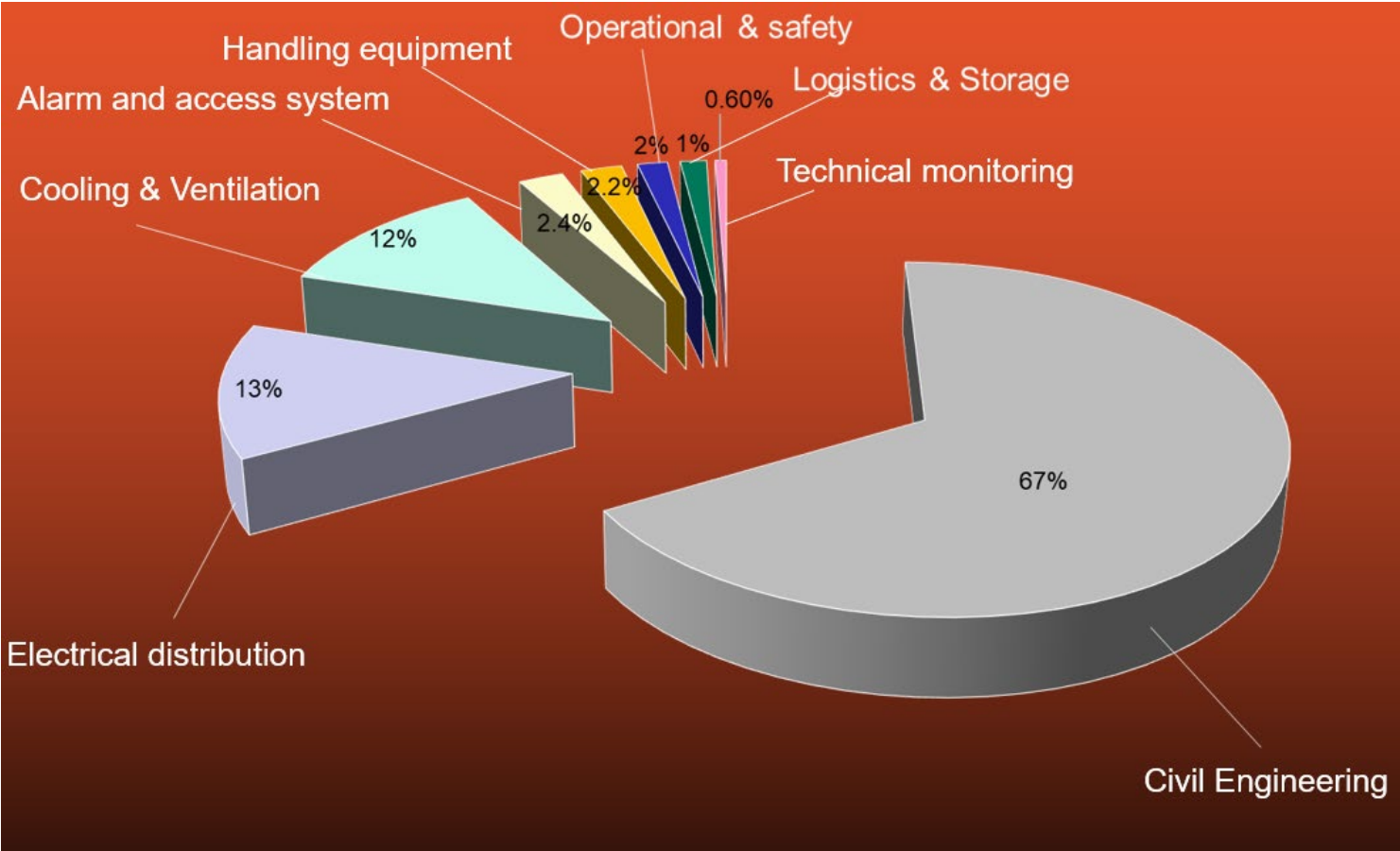


Underground infrastructure for more than 50 years of operation

Plus design and development cost: ~200 M€
Total cost (excluding personnel): ~1.900 M€

Costing is based on conceptual design, requires updates based on technical designs!

Hi-Luminosity LHC Upgrade Costs



Slide copied from: John Osborne, 03/02/2023 Einstein Telescope Civil Engineering