Project: 101079696 — ET-PP — HORIZON-INFRA-2021-DEV-02

Horizon Europe:
Coordination and Support Actions

ET-PP WP5
2nd review meeting (RP2)

15/05/2025

Grant agreement: № 101079696

WP 5: Introduction and objectives

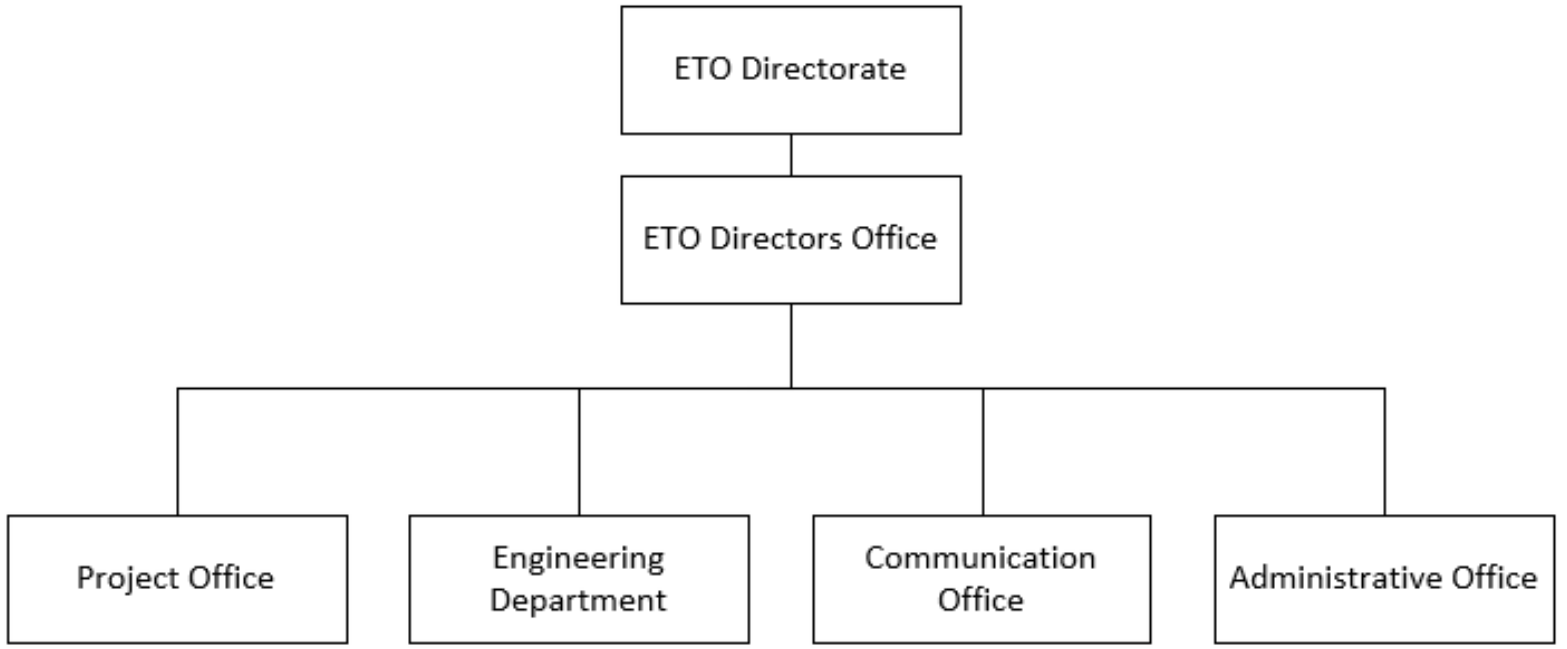
The objective of Work Package 5 (WP5) is to establish the ET Project Office and the corresponding Engineering Department.
This work package is responsible for creating a structured organizational project environment for the construction of the ET research infrastructure.
This environment will be supported by both consultative and executive bodies, equipped with the necessary tools to monitor, control, coordinate, and report on various aspects including technical design, engineering, specifications, risk management, budgeting, and scheduling.

WP5 co-chairs:
- Christian Olivetto, CNRS
- Patrick Werneke, Nikhef
- Alessandro Variola, INFN

WP 5: Tasks

WP	Task	Objectives for the period	Activities carried out in this period with short description of the activities carried out	Significant results (e.g deliverable submission, milestoned, achievement, publication etc..)
5	5.1	Establishing and create document with the Project Office structure and mandate	Hold regular Project Office management meetings in coordination with the TEO and ET-PP management teams.	Submission of D5.1 deliverable and validated
5	5.2	Establish a tool evaluation process and create documentation outlining tool requirements to support Project Management	Coordinate Project Office management meetings and define the evaluation criteria for tools used in each area of expertise covered by the Project Office	Submission of D5.2 deliverable and validated
5	5.3	Establishing and create document with the Engineering Department structure and mandate	Hold regular Engineering Department management meetings in coordination with the TEO and ET-PP management teams.	Submission of D5.1 deliverable and validated
5	5.4	Establish and document the functional description of the Engineering Department	Hold regular Engineering Department management meetings in coordination with the TEO and ET-PP management teams.	Submission of D5.4 deliverable in the process of being validated
5	5.5	Establish and document the functional description of the Project Office	Hold regular Project Office management meetings in coordination with the TEO and ET-PP management teams.	Submission of D5.5 deliverable in the process of being validated

WP 5: Organisation and interfaces of WP5 with the ETO organisation



ET-PP, and consequently WP5, are included in the ETO organization by the integration of the ET-PP Project leader in the ETO Directorate

WP5: Critical risks, deviations from Annex I, contingency plans

Risk Number	Description of the risk	WP	Proposed risk-mitigation measures	Did your risk materialise ?	Did you apply risk mitigation measure ?	Comments
1	Delay in completing process for new full-time engineering positions (low, medium)	5	Assign existing part-time personal from partner institutes to assist in the start-up phase	YES	YES	
2	Difficulty to find personnel in the participant institutions for the leadership and the collaborator positions required for the Project Office and the Engineering Department (low, medium)	5	Provide temporary support from the collaboration and invite experts from external institutes	YES	NO	This worked for the Engineering Department with the collaboration agreement with CERN, but not in the Project Office

WP5: Critical risks, deviations from Annex I, contingency plans

Risk Number	Description of the risk	WP	Proposed risk-mitigation measures	Did your risk materialise ?	Did you apply risk mitigation measure ?	Comments
3	Funding continuity: funding may end before completing the Preparatory Phase	5	Find internal solution of national instutions in order to maintain development activity and expansion of ETO Funders Group by ETO Directors.	YES	YES	Work has started and ETO Funders Group is established.
4	Late with ETO Legal Entity: ETO and ET-PP persons leave because of ending contracts Specificaly for expertise on temporary position	5	Find internal solution of national institutions to maintain these expertises	YES	YES	Discussion will be started as soon as possible in the ETO Funders Group to maintain these expertise inside ET project for potential intermediate phase.

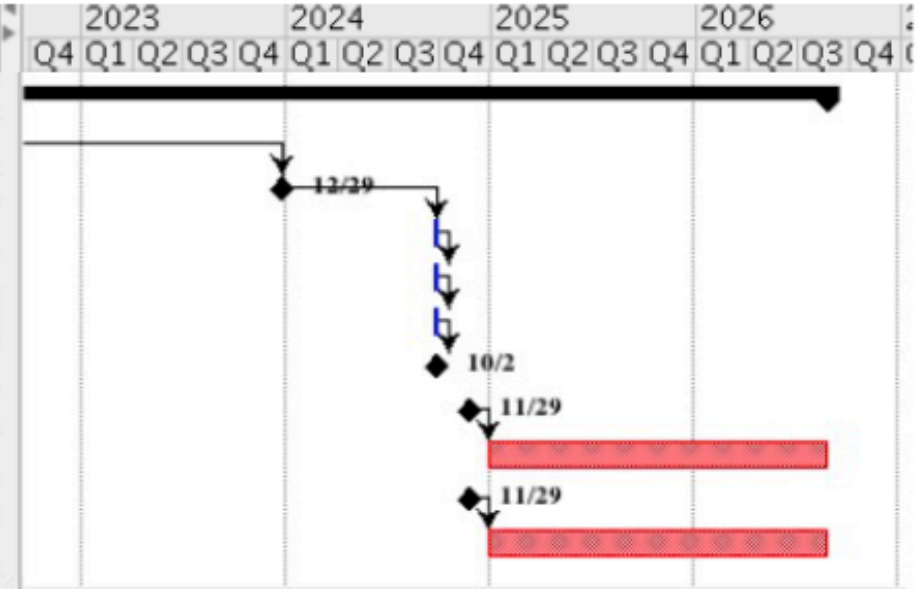
WP5: Critical risks, deviations from Annex I, contingency plans

Risk Number	Description of the risk	WP	Proposed risk-mitigation measures	Did your risk materialise ?	Did yopu apply risk mitigation measure ?	Comments
5	Timeline slippage: Underestimating the amount of work / complexity / dependencies	5	Setting up groups of experts organised into task forces on identified subjects in order to remove as many uncertainties as possible. Organise risk assessement and set-up risk response strategy on the plans to mitigate risk.	Yes	Yes	The ET project setting up these task forces and the results would mitigate these risks

WP5: Deliverables and milestones

The schedule of deliverables and milestones

Name
WP5. Project Office & Engineering Department
Start of ET-PP
M5.1 The recruitment of the Project Office team is completed
D5.1 A document which defines the structure and the mandate of the Project Office
D5.2 A document describing the functionalities required
D5.3 A document containing the structure and the mandate of the Engineering Departme
M5.2 All documents published
M5.3 Engineering Department completed
D5.4 The Engineering Department as a functional unit
M5.4 Project Office completed
D5.5 The operational Project Office as a functional unit



The main deliverables are described in this schedule. Internal deliverables and milestones for Project Office and Engineering Department are illustrated in the following slides.

WP5: Internal Project Office,Deliverables and milestones

Deliverable	Expected Result/outcome	Date	Deliverable-Milestone
ET Roadmap document	Document describing the roadmap of the ET project in phase 1	Q1 2025	Deliverable
ET roadmap methodology document	Document describing the methodology followed to establish the ET roadmap	Q1 2025	Deliverable
ET nomenclature document	Document describing the project nomenclature	Q3 2025	Deliverable
ET PBS (Product Breakdown Structure) update provided	ET PO coordinate the establishment of the new PBS version after the review phase	Q4 2025	Milestone
ET WBS (Work Breakdown Structure) validated	The final version of the WBS, and consequently of the project OBS is approves by stakeholders	Q4 2025	Milestone
ET change process validated	The process for the generic change request for PBS and parameters	Q4 2025	Milestone

WP5: Internal Project Office,Deliverables and milestones

Deliverable	Expected Result/outcome	Date	Deliverable-Milestone
ET Scheduling Management Plan - document	Document describing the process, the methodologies and the roles associated to the scheduling management in ET	Q2 2026	Deliverable
ET Risk Management Plan - document	Document describing the process, the methodologies to the risk managmeent in ET	Q2 2026	Deliverable
ET Requirements Management Plan document	Document describing the process, the methodologies associated to the requirements management in ET	Q2 2026	Deliverable
ET Quality Assurance Management Plan - document	Document describing the process, the methodologies associated to the quality assurance management in ET	Q2 2026	Deliverable
ET Project Management Plan 1st release document	Document describing all the processes defined to ensure the succeful realization of the Project Office Mandate	Q4 2026	Deliverable
Preliminary Cost Book - document	Document describing the costing guilines and providing and approximate cost estimate	Q3 2027	Deliverable

WP5: Internal Engineering Dpt,Deliverables and milestones

Deliverable	Expected Result/outcome	Date	Deliverable-Milestone
The preliminary TDR for research infrastructure	For the Civil Engineering, the main ETO milestone is the delivery of the Preliminary TDR for the research infrastructure, including a cost overview, by the end of 2026. For ET-PP, a first version of the Preliminary TDR is planned for mid-2026	Q2 2026 Q4 2026	Deliverable
TDR for the vacuum beampipe	As part of the ET-PP framework, the Preliminary TDR was completed in January 2025, while the TDR is scheduled for completion in the fall of 2025. Extensive testing and optimization efforts are planned in the updated framework collaboration agreement [5]. A final update of the TDR and cost assessment are foreseen at the end of the agreement in September 2027.	Q4 2025 Q3 2027	Deliverable
Technical Infrastructure TDR	For the technical infrastructure the main milestones do not align yet with the milestones of the civil engineering works. The Preliminary TDR, including a costing overview is expected to be available by September 2027	Q3 2027	Deliverable
Civil Engineering TDR	For the Civil Engineering, the main ETO milestone is the delivery of the Preliminary TDR for the research infrastructure, including a cost overview, by the end of 2026. For ET-PP, a first version of the Preliminary TDR is planned for mid-2026. An updated overall schedule for ET is currently being developed.	Q4 2026	Deliverable

WP5: Contribution from each partner

INSTITUTION		PM as per Annex I	PM in the RP2 period	PM in the RP1 period
IFAE	CONTRIBUTIVES	24	9	6
	REQUESTED EC	0	0	0
NIKHEF	CONTRIBUTIVES	124	51,82	7,9
	REQUESTED EC	36	36,10	11,76
INFN	CONTRIBUTIVES	141	32	25,5
	REQUESTED EC	36	7	0
CNRS	CONTRIBUTIVES	121	20,91	13,3
	REQUESTED EC	108	49,92	12,81
UAntwerpen	CONTRIBUTIVES	5	3	1
	REQUESTED EC	0	0	0
Total Person Months	CONTRIBUTIVES	415	116,73	53,7
Total Person Months	REQUESTED EC	180	93,02	24,57
TOTAL		595	209,75	78,27

WP5: Outlook and perspectives

- For Project Office and Engineering Department lots of progress has been done during this phase 1 and during this period.
- All deliverables have been produced and validated or in the process been validated. (D5.1 to D5.5)
- Lots of process/tools have been deployed for the Project Office and in process been evaluated or validated, a positive feedback from ET collaborators and ETO management of these project management deployments. (PBS, WBS in progress, does not exist for the moment, Configuration Data-Base,Risks assessment, Schedule, QA,…)
- The Engineering Department has made significant progress in establishing itself as a functional entity. While not yet fully operational, it is on the right trajectory. The primary focus remains on Preparatory Phase 1, which ends with the site selection and principal approval for the Einstein Telescope’s construction.
- The risks are identified and mitigation actions in progress.

WP5: Engineering Department

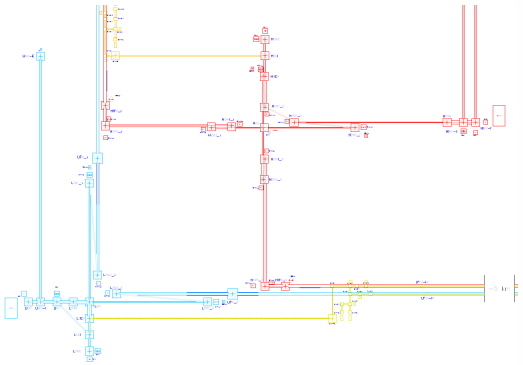
Engineering Department

- **Civil Engineering**
- **Technical Infrastructure**
  - Cooling and Ventilation
  - Access and Alarms
  - Electrical Engineering
  - Cryogenics
- **Engineering Technology**
  - Vacuum
  - Survey
- **Mechanical Engineering**
  - Design and Simulation
  - Fabrication and Installation
- **Coordination and Integration**
  - Integration
  - Operational Safety

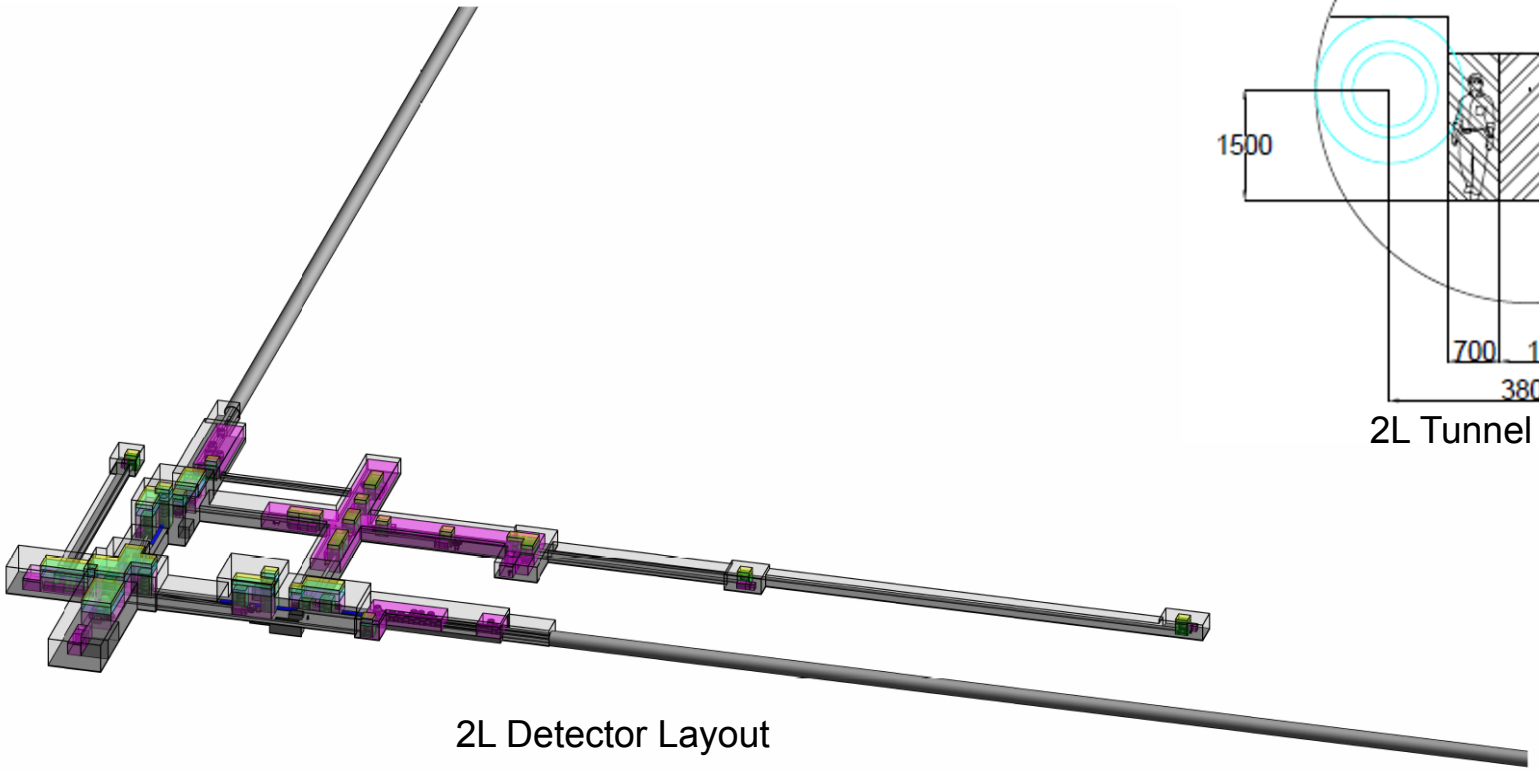
WP5: Engineering Department (Configuration)

Detector Layout Update 2025 for the 2L Configuration

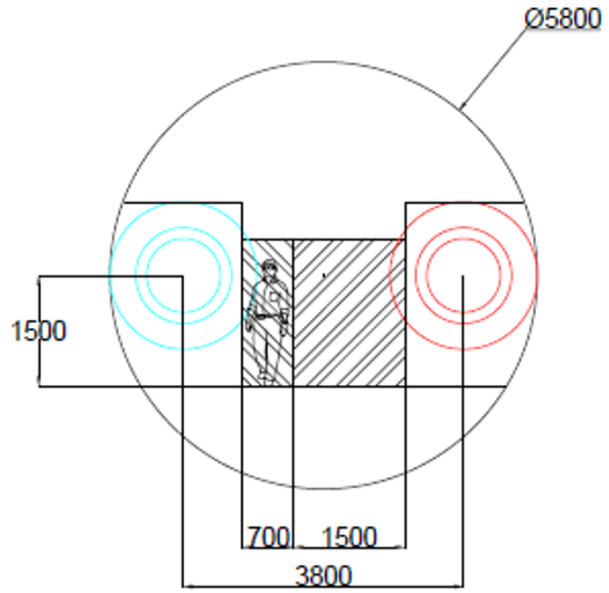
- Optical Layout → Detector Layout
- Result ETO Task Force to be reviewed in June
- Baseline design for Local Teams - minimal requirements



2L Optical Layout



2L Detector Layout

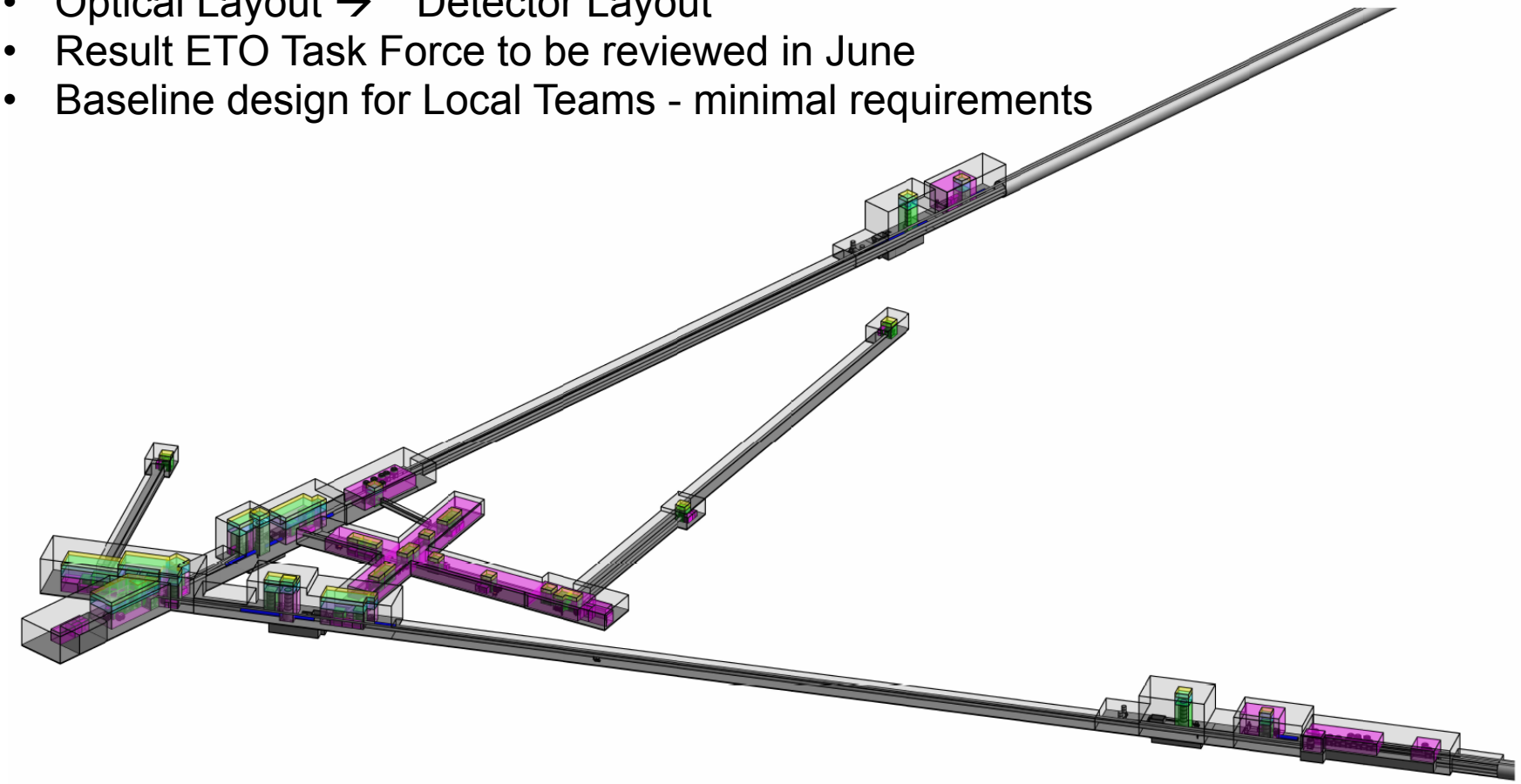


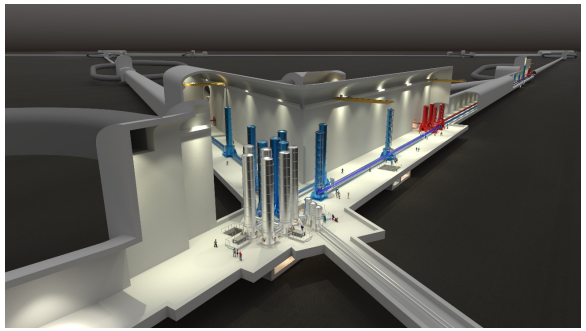
2L Tunnel Envelope 5 – 15 km

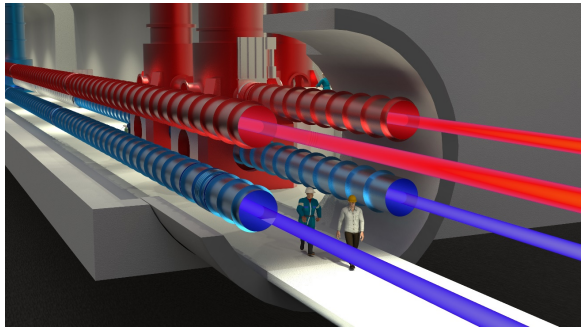
WP5: Engineering Department (Configuration)

Detector Layout Update 2025 for the Triangular Configuration

- Optical Layout → Detector Layout
- Result ETO Task Force to be reviewed in June
- Baseline design for Local Teams - minimal requirements





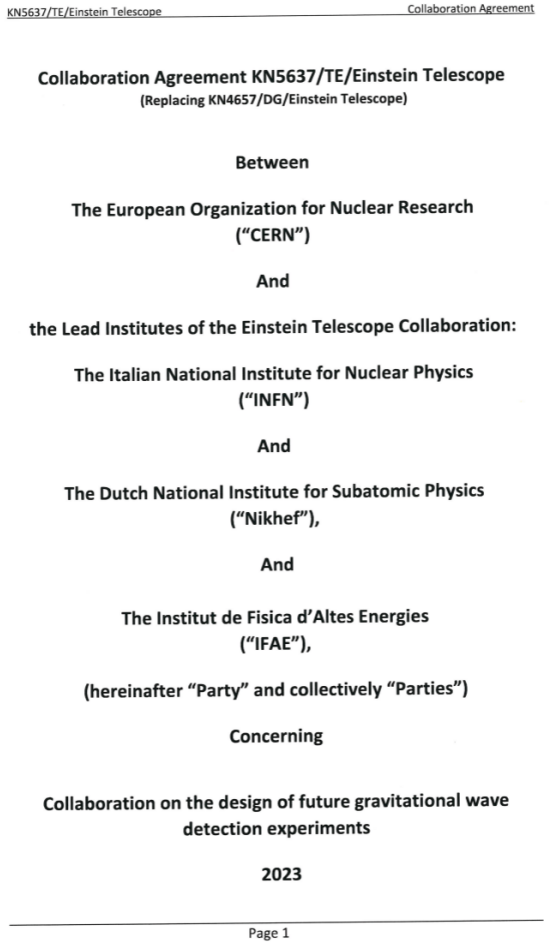


3D images of ET (2020)

WP5: Engineering Department (MoU with CERN)

- Several similarities between ET and CERN projects. Specifically related to vacuum and underground infrastructures.

- ETO has a MoU with CERN for their support on technical topics:
  - *Arm vacuum pipe*
  - *Civil Engineering*
  - Technical Infrastructure
    - HVAC, Electricity, Access & Alarms
  - Safety
  - Integration



KN5637/TE/Einstein Telescope Collaboration Agreement

Collaboration Agreement KN5637/TE/Einstein Telescope
(Replacing KN4657/DG/Einstein Telescope)

Between

The European Organization for Nuclear Research
("CERN")

And

the Lead Institutes of the Einstein Telescope Collaboration:

The Italian National Institute for Nuclear Physics
("INFN")

And

The Dutch National Institute for Subatomic Physics
("Nikhef"),

And

The Institut de Fisica d'Altes Energies
("IFAE"),

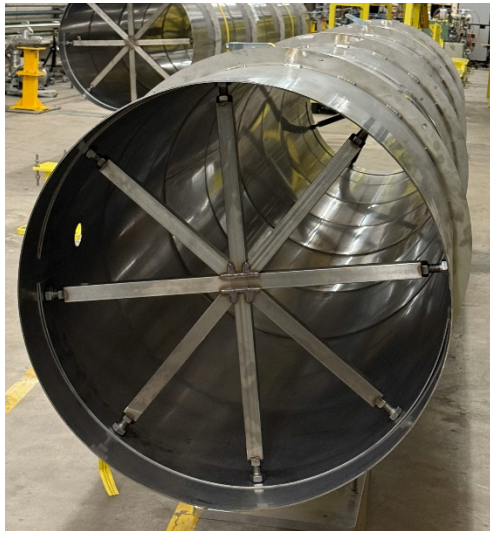
(hereinafter "Party" and collectively "Parties")

Concerning

Collaboration on the design of future gravitational wave detection experiments

2023

Page 1



WP5: Project Office (Scheduling Methodology)

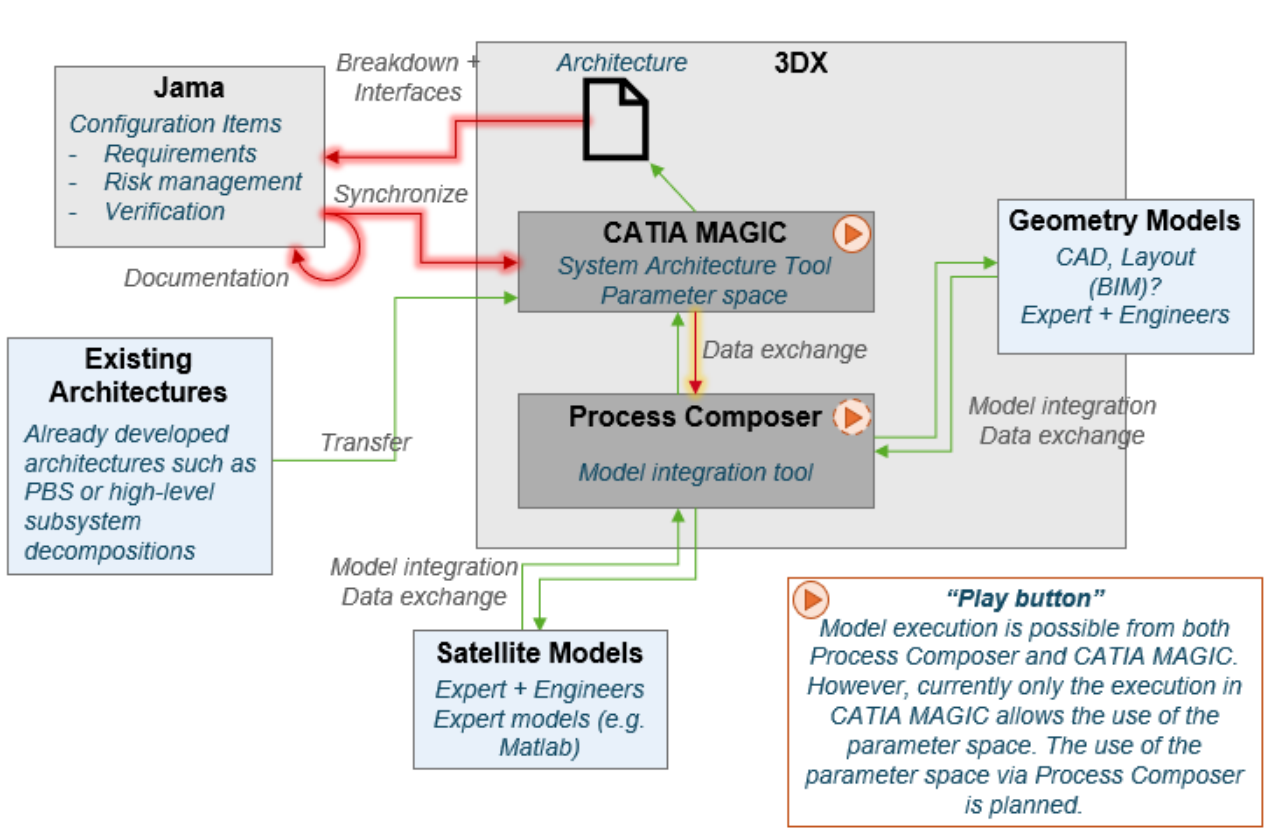
Tuto#10 Gantt View 10 tips

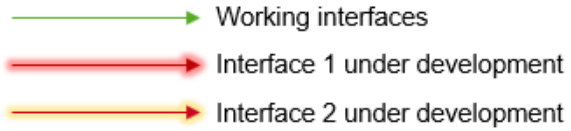
For ET scheduling process we identified and deployed a common methodology to answer Of ET project requirements.

- We identified potential tools
- We deployed some of them
- We communicate to collaboration with
  a) Wiki page
  b) Training Session
  c) Youtube channel with video tutorials

WP5: Project Office (MBSE exercise scope - toolchain)

Focus on three tools: 1) 3DExperience (3Dx):"Hub" | Engineering Platform 2) CATIA Magic (on 3Dx): System architecting
3) JAMA Connect: Requirements Management





To populate the toolchain a database is necessary. There are two scenarios that need to be considered:

- Existing architectures or high-level layouts, that present a **top-down** approach.
- Existing detailed expert models that present a **bottom-up** approach.

The combination of both approaches yields a seamless traceability from **science case** to **detailed components**

WP5: Project Office (Risk Assessment)

Score	Likelihood	Likelihood of occurrence	
L5 = 5	Maximum	*Very likely*	> 50 %
L4 = 4	High	*Likely*	10 % to 50 %
L3 = 3	Medium	*Unlikely*	2 % to 10 %
L2 = 2	Low	*Very unlikely*	0,1 % to 2 %
L1 =1	Minimum	*Rare*	< 0,1 %

Score	Severity	Severity Description
S5 = 5	Catastrophic	*Critical failures that severely compromise project objectives, with potential project abandonment. Severe safety incidents or regulatory issues. Financial impact >20%.*
S4 = 4	Serious	*Major issues that require significant rework, delays up to 2 years, or financial impacts of 10-20%. May impact critical project objectives or require safety interventions.*
S3 = 3	Moderate	*Significant issues requiring additional resources or changes but manageable within project constraints. Delays of up to 6 months; financial impact 3-10%.*
S2 = 2	Minor	*Minor technical or operational issues that slightly affect project outcomes but can be managed within the current budget and schedule. Financial impact of 1-3%.*
S1 =1	Negligible	*Minor issues easily resolved with minimal impact on cost, schedule, or performance. No safety risks, and no delays beyond minor, routine adjustments. Financial impact <1%.*

Likelihood	CRITICALITY (C = P x S)				
L5	5	10	15	20	25
L4	4	8	12	16	20
L3	3	6	9	12	15
L2	2	4	6	8	10
L1	1	2	3	4	5
Severity	**S1**	**S2**	**S3**	**S4**	**S5**

Criticality (C = L x S)	Type of Risk	Review Frequency
10 to 25	**UNACCEPTABLE RISK** Develop and implement a detailed risk mitigation plan. Escalate to senior management and prioritize resource allocation. Communicate regularly with stakeholders and prepare contingency measures as needed. If unresolved, this risk may necessitate major project adjustments.	**Bi-Monthly**
5 to 9	**TOLERABLE RISK under control** Monitor and plan: Develop a response plan to manage this risk, but active mitigation can be minimal. Regularly review and reassess to catch any changes in risk conditions. Keep stakeholders informed.	**Every 6 Months**
1 to 4	**ACCEPTABLE RISK** Routine Monitoring: No significant action required other than periodic monitoring. Include in regular risk assessments, and be prepared to adjust if project conditions shift or if the risk level increases. By convention, the risk is said to be CLOSED when the various project actions are closed.	**Annually or Phase Review**

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