**Taskforce Weekly Plenary Meeting**   
***Minutes and Actions, 8 January 2025***

**Meeting time:** 16:00 – 17:30 CET

**Zoom meeting room:**

<https://cern.zoom.us/j/64071474060?pwd=ZjZSaGJwVUZJSjU0b1p3WHllU3Nudz09>

Attendees: All task force members

Chair: Fiodor Sorentino

* **Summary of triangle and 2L detector layout**

***16:00-16:50 CET***

**Point presented by:** Max Majoor

**Point submitted for:** information

The Einstein Telescope consists of numerous complicated layouts and systems, but as the Einstein Telescope project is still in its Preparatory Phase, the designs of these systems are immature. As a primary step, the Instrument Science Board (ISB) of the Einstein Telescope Collaboration (ETC) has produced an update of the Optical Layout. The optical layout provides the whole set of optical components with their locations, orientations and flexibility of each. These locations, hereinafter referred to as nodes, drive the positions of mirror vessels. Together with the functionality at these nodes, these identified locations primarily determine the detector layout. The detector layout provides the volumes for suspension systems, vacuum envelopes, scaffolding, cleanrooms, auxiliary (un-isolated) optical tables and logistics.

The aim of the detector layout is to provide the minimum dimensions required for the detector layout to be used in the infrastructure layout studies for e.g. cost calculations. It describes the overall logic used in designing a reference detector layout block model, specifically the ET Reference Detector Layout - 10km Triangle model [M.B. Majoor and J. Bratanata, “(Draft) ET Reference Detector Layout - 10km Triangle”, Einstein Telescope Reference Detector Layout block model for 10km triangle configuration on Trimble (2024).]. The LHTs receive the ”Optical Layout 2024 Update” report [D. Bersanetti et al., “ET Optical Layout Update 2024”, (2024)] along with the layout drawing [M.B. Majoor, ET Optical Layout 10km Triangle - Layout Drawing, tech. rep. ET-0368A-24 (May 2024)] and this detector layout document accompanied by the block-model [M.B. Majoor and J. Bratanata, “(Draft) ET Reference Detector Layout - 10km Triangle”, Einstein Telescope Reference Detector Layout block model for 10km triangle configuration on Trimble (2024]. This detector layout will be a reference layout. LHTs are expected to exploit certain flexibilities in the optical layout for their designs optimized around site-dependent conditions. The detector layout document provides volume envelopes surrounding the optical layout nodes, however altering aspects of the optical layout within the given flexibility envelope will result in a different overall layout. This detector layout takes the optical layout 2024 update as a reference layout.

A similar document is under finalization for the 2L geometry.

**Summary of discussion:**

Max Majoor provided a detailed summary of the preliminary detector layout, including the objectives, the volume claims for the tower envelope, vacuum pipe envelope, and logistics envelope, as well as how these volumes were mapped onto the triangle and 2L optical layouts. He highlighted some key issues and discrepancies that need to be resolved.

The key components of the layout include the **tower envelopes**, **vacuum pipes**, and **logistics envelopes**:

* **Tower Envelope**: The tower envelope encompasses the base structure, suspension system, scaffolding, and access/clean rooms. These elements are designed to ensure stability, functionality, and ease of maintenance.
* **Vacuum Pipe Envelope**: This is defined based on the specifications outlined in the beam pipe requirements document. It ensures compatibility and adherence to the necessary standards for optimal performance.
* **Logistics Envelope**: The logistics envelope specifies transport paths and clearances to facilitate smooth operations and the efficient movement of materials and equipment.

Additionally, the **2L layout models** are now ready for distribution, with the accompanying documentation to be released within a week.

The group discussed the tunnel cross-section dimensions, particularly the impact of the low frequency filter cavity on the tunnel size. There was a recognition that the current dimensions may not be compatible with the CERN design, and that optimization is needed.

**Actions:**

* Max Majoor will distribute the 2L configuration detector layout once finished;
* All taskforce members are asked to review the triangle detector layout (and the 2L configuration detector layout when distributed).
* All taskforce members are expected to help identifying the constraints and flexibilities of the detector layout.
* **Plan for risk analysis**

***16:50-17:05 CET***

**Point presented by:** Ghada Mahmoud

**Point submitted for:** information

A simplified risk analysis will be carried out across the task force work in order to assess potential risks for the different configurations under study. The risk analysis will be done in comparative mode. Interviews will be carried out to different groups in the task force in order to analyse different types of risks, namely:

* technical and scheduling risk: suspensions, cryogenics, vacuum, optics
* financial risk: civil engineering
* scope risk: OSD (with input from suspensions, optics, cryogenics to generate sensitivity curves)

The simplified risk analysis will only include risk assessment and scoring; the possibility to include mitigation strategies for sample cases will be considered. The main steps will be:

* Produce the likelihood and impact scoring matrix;
* Organize a first kick off (explanations);
* Organize a first interview with stakeholders (also remote). Prepare a template;
* Internal evaluation of the first review;
* Second review for final release;
* Release.
* Methodology:
  + Start form the baseline risk definition;
  + Then for all the risks assessed for the baseline, score the alternatives;
  + Then add the new risks for alternatives;
  + Score the baseline for the new risks.

**Summary of discussion:**

Ghada Mahmoud presented the plan for a comparative risk analysis between the triangle and 2L configurations. Key features of the approach include:

* **Evaluation Criteria**: Assesses technical, schedule, financial, and scope risks for each configuration.
* **Scoring System**: Utilizes 5-point scales for both likelihood and severity, enabling the calculation of overall criticality.
* **Configuration Comparison**: Will be used to compare risks among different detector configurations, in both the triangle and 2L geometry.

A suggestion was made to incorporate mitigation strategies into the assessment process and to adopt this approach as an ongoing tool for risk management.

**Actions:**

Expected from this discussion is that there will be a process/tool/tutorial to indicate what is the change in risk when changing a part of the design and what is the mitigation. Ghada Mahmoud, together with the Project Office, will provide us such a tutorial or tool.

* **Configuration brainstorming**

***17:05-17:20 CET***

**Point presented by:** Fiodor Sorrentino

**Point submitted for:** discussion

We have a baseline detector layout for each geometry (triangle & 2L). Updating the layout will be our main task, with the rationale discussed at the kickoff meeting.

Preliminary brainstorming will help in the coarse identification of main paths to look for reduced financial risk by preserving performance.

We will collect ideas on possible solutions to mitigate major offenders on infrastructure costing

These can address much different aspects:

* Optical layout, e.g.
  + position of filter cavities and mode cleaner cavities (in main tunnel, in same tunnel, etc.); to reduce the amount of tunnel excavation
  + Number of core/auxiliary optical elements to reduce the amount of cavern excavation
* Structure of caverns, e.g. stacked caverns to reduce amount of cavern excavation
* Size of vacuum tanks, e.g. reduced height for LF TM towers and/or HF core optics towers to reduce amount of cavern excavation

We set up a Gitlab issue to let task force members propose solutions. We’ll use part of the next two weekly meetings to discuss proposed options. We’ll later organize the collection of ideas to prepare viable layout configurations to be studied during in-person meetings

Feedback is welcome on how collecting/organizing proposals first iteration of brainstorming

**Summary of discussion:**

Fiodor Sorrentino proposed starting a brainstorming process to collect ideas for potential configuration changes that could reduce civil infrastructure costs, such as modifying the optical layout, reducing the number of optical elements, or optimizing the tower and vacuum tank designs.

The group discussed next steps, including setting up a GitLab project to collect ideas, scheduling separate meetings with subgroups to discuss specific tasks, and planning for the next weekly meeting to continue the brainstorming and configuration discussions.

**Actions:**

* GitLab will be set up and taskforce members will be invited to join by Benoît Tuybens;
* Separate meetings will be set up by Fiodor Sorrentino to discuss specific tasks;
* All taskforce members are asked to answer the poll regarding the in-person task force meetings.
* **Update on structure of documentation**

***17:20-17:25 CET***

**Point presented by:** Benoît Tuybens

**Point submitted for:** information

The document structure in Teams will be explained. The Overleaf and Gitlab links will also be shared after the meeting.

* **A.O.B**

***17:25-17:30 CET***