

ETO Task force for ET detector layout - 5th weekly meeting

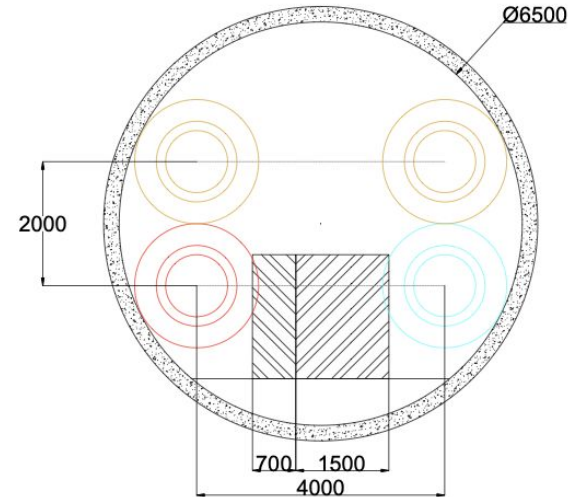
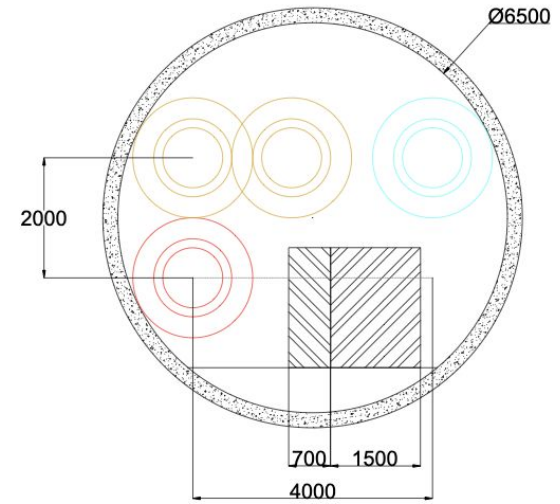
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Preliminary brainstorming

- Latest suggestions from [GitLab issue](#)
 - Reducing number of core optics (J. Casanueva)
 - the LF version of the detector has already the minimum mirrors possible.
 - The HF version instead has more mirrors, in order to decouple the BS of both detectors. If we would decouple completely the detectors, then we could reduce the number of mirrors in the HF
 - Excavation sizes vs installation (F. Ricci)
 - The ET Cryostat will be the largest and heaviest mechanical component to be installed in the underground facility. Its installation should take priority over the other vacuum chambers, similar to the approach followed in KAGRA

Preliminary brainstorming

- Recent discussion with SQZ team and ED
 - Down-selection of options related to FC positioning
 - Most promising option(s) are to move both LF FCs inside one single arm tunnel
 - Either on same plane of LF ITF (moving the HF ITF to a lower plane)
 - No periscope needed
 - A couple of crossings with CITF beam
 - Or above the plane of ITFs
 - Periscope needed
 - Separate the LF FCs into two arm tunnels seems less convenient
 - No big gain in tunnel diameter
 - Several crossings with ITF beams in vertex



Preliminary brainstorming - tentative wrap-up

- It's time to combine ideas to identify a few global configurations **for 2L geometry** to be studied during the Pisa and Amsterdam in-person meetings, e.g.:
 - Options 1 and 2
 - detailed study during Pisa meeting
 - Options 3 and 4
 - preliminary study during Pisa meeting
 - detailed study during Amsterdam meeting
- For each proposed configuration, we must determine:
 - needs for additional preliminary design work (optical layout, suspension, cryogenics, vacuum)
 - rough identification of impact on civil infrastructure
 - rough identification of impact on performance

Preliminary brainstorming - tentative wrap-up

- Configurations **for 2L geometry**, possible wrap-up for Pisa meeting
 - Option 1 - LF filter cavities in one arm tunnel (+ HF filter cavity & IMC in the other arm tunnel?)
 - Option 2 - minimize cavern excavation by properly grouping and aligning towers + KAGRA-like double cavern + choose tower access to minimize cavern volume
- Needed background information for Pisa meeting:
 - Coarse optical layout for each option (OPT)
 - Baseline choice for tower access (VAC, CRYO)
 - Updated detector layout according to updated tower categorisation (ED)
 - identification of baseline design and available options for towers (SUSP, CRYO and VAC experts)
 - preliminary criteria/tools for civil infrastructure - evaluation of main cost drivers (CE experts)
 - tools for fast/coarse generation of detector layout (ETO ED)
 - tools for fast/coarse evaluation of performance risk (OSD)

Preliminary brainstorming - tentative wrap-up

- Configurations **for 2L geometry**, possible wrap-up for Amsterdam meeting
 - Option 3 - reduced number of towers by merging secondary optics + IMC and HF FC in same tunnel
 - Option 4 - separate HF and LF detectors + FC in main tunnel + folded IMC

Draft schedule of first in-person workshop

- Workshop schedule
 - 1st day - morning
 - Plenary - review of identified working configurations - assignment of design tasks
 - 1st day - afternoon
 - Parallel 1 - update on optical layout according to working configuration 1 (OPT)
 - Parallel 2 - verification of scientific requirements on baseline and optional technologies technology groups, OPT)
 - 2nd day - morning
 - Plenary - summary of results from first day
 - Parallel 1 - update on detector layout according to updated optical layout 1 (ED + OPT)
 - Parallel 2 - coarse evaluation of performance risk (OSD + technology groups)
 - 2nd day - afternoon
 - Parallel 1 - cost breakdown evaluation according to detector layout 1 (CE + ED)
 - Parallel 2 - update on optical layout according to working configuration 2 (OPT)
 - 3rd day - morning
 - Plenary - summary of results from first day
 - Parallel 1 - update on detector layout according to updated optical layout 2 (ED + OPT)
 - Parallel 2 - technical risk analysis (PO, technology groups)
 - 3rd day - afternoon
 - *Parallel 1 - cost breakdown evaluation according to detector layout 2 (TBC)*
 - *Parallel 2 - coarse evaluation of performance risk (TBC)*
 - Plenary - wrap up, conclusions, next steps

Next steps

- Add pictures directory and bibtex file for shared Overleaf document
- People in charge of tasks please keep editing the sections to describe background information
- Risk analysis
 - Interviews are being organised with expert groups (SUSP, CRYO, VAC) to perform risk analysis on technological options (tasks 13.2, 13.3, 13.4)
 - Additional risks for the global configurations should be studied by a mixed group
 - volunteers are welcome for tasks 13.5 and 13.7
 - dedicated slot during Pisa meeting
- Flexibility evaluation
 - we propose to set up a group to study flexibility gain on global configurations, see Nathan's [comment on GitLab](#)
 - volunteers are welcome for task 13.6
 - Metric based on Penalty Of Change
 - $POC = \sum(i) [(penalty\ cost\ of\ the\ ith\ potential\ change) * (probability\ of\ the\ ith\ potential\ change\ to\ occur)]$
 - Identify a set of potential changes
 - For each change, estimate probability
 - Choose a metric for cost, and for each change estimated corresponding cost
- proposed topics for next weekly meeting:
 - Towers categorisation
 - Preparatory work for Pisa meeting