ETO Task force for ET detector layout - 17th weekly meeting

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Preliminary questions by review committee

- Add an executive summary to present main results
- Low frequency sensitivity: what is the impact of NN cancellation?
- Lack of consistency in terminology & definitions
  - E.g. concept of node
- Inconsistency between number of towers (128) and number of pipes (43)
- Include a discussion on infrastructure needs during repairs/upgrades
  - E.g. how to handle get valves replacement in arm cavity pipes?

Feedback by ETC on Gitlab

- In the text in Section 8.1, references to Figs. 19 and 20 seem to be swapped

Consistency checks & missing information

- All sections
  - please check broken references
  - fix text highlighted in red
  - adjust language for text imported from other documents (e.g. “we believe”, “we expect”, …)
  - fix missing text
- Optical layout
  - Check coherence of FC options with section 6 on detector layout
  - Check flexibility envelope on FC length
- Noise budget/science case
  - Suspension height
    - include the 2024 case (17 m) in fig. 79
    - include discussion of science case for 12 m vs 17 m
  - Run science case analysis on
    - vertical thermal noise vs tunnel tilt for LFI
    - CTN vs beam size for HFI

Supporting document

- Section 2 - List of background information
    a. Include flexibility analysis of the ET-LF Squeezing Filter Cavities (pdf);
- Section 4 - integrated towers
    a. Section 4.4.5 on alternative cooling strategies should be moved to section 6.1 as technical infrastructure
    b. Sections 4.4.2, 4.4.4 and 4.4.6: make logic on baseline and alternative concepts for cryostat and payload consistent
    c. Sections 4.4.7 (optional cryopumps) and 4.4.8 (optional cryogenic infrastructure) should be removed
- Section 6 - detector layout
    a. Bottom access clean rooms
        i. we should include a sketch of mechanical structure connecting tower base to ground
        ii. We should provide a requirement on clean room height - 5 m underneath tower opening, 3 m elsewhere
    b. clean rooms
        i. indicate whether ISO7 rooms are permanent or moveable
        ii. Provide requirement on simultaneity factor for clean air operations
- Section 10 - External files
    a. Include Guideline how to read the documents? (also in main document)

Cryostat and cryogenic payload

1. Sections 4.4.2 and 4.4.4: the baseline design is with bottom access and operator inside the cryostat;
   a. for baseline design the base of the inverted pendulum must be placed above the cryostat, and the mechanical transfer function for ground motion can be an issue;
2. an alternative concept would be to anchor the IP in the main cavern floor sharing the same footprint with the cryostat
   a. in principle compatible with bottom access
3. in the ET Pathfinder concept this is done with IP legs inside the same tower vessel, and cryogenic vacuum nested inside a larger chamber at room temperature
   a. would require lateral access to payload
   b. smaller cryostat would likely require less power during cooldown
   c. main potential issues include separation of cryogenic and room temperature vacuum
4. **both the baseline 1. and the alternative 4. would require a vessel with about 5 m footprint;**
   a. but this has **no impact on tunnel size for 2L**, and **very little impact on tunnel diameter for triangle**
5. a solution to **avoid the interface** between cryogenic vacuum and seismic isolation system would be the **double cavern**. Estimating the impact of double cavern on civil infrastructure cost goes beyond the task force work
   a. we should add a reference to section 6.2.2 (double cavern) in section 4.4 (cryogenic tower)

Timeline

- Complete feedback by review team expected by tomorrow
  - we will immediately forward questions to task force
  - writing tasks owners to promptly update document
- updated documents by Monday 16/6 morning
- discussion on open points during next weekly meeting on Monday 16/6 afternoon
- original deadline would be on 17/6, but we are asking for a 1-week extension
- if accepted:
  - final adjustments before Friday 20/6
  - last weekly meeting on Monday 23/6
  - final delivery on Monday 23/6