Status of Virgo_nEXT

VIR- 1127A-23

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for the Virgo Collaboration

Outline

- Where we are and ongoing activites
- Next steps
- Final considerations

Where we are

- Concept Study integrated by two documents on the relevance of stable recycling cavities for VnEXT operability (VIR-0047A-23) and on the coating plans (VIR-0132A-23) ✓
- Preliminary VnEXT R&D plan (VIR-0678B-23) ✓
  - Initial discussion at July ’23 EGO Council
  - to be followed by an internal review
- Next step: Baseline Design Report (target: December ’24 EGO Council)

Ongoing activities

- A discussion in the Collaboration took place to evaluate the opportunity to go ahead, given
  - the present priorities (Commissioning and O5 preparation)
  - the possible impact of the ongoing considerations on stable cavities on the proposed R&D plan
- VSC outcome:
  - The review of the R&D plan will continue as planned

Ongoing activities

- Constraints to be taken into account:
  - The review must not interfere in any way with the commissioning activity and with the preparation for O5. In the event of interference, priority will be given to commissioning and preparation for O5
  - No member of the collaboration with roles of responsibility in the project organization (e.g. system or sub-system manager) or strongly involved in commissioning will be involved in the review

Ongoing activities

- Considerations on the interactions with O5 plans:
  - The global picture on the post-O5 upgrades is not significantly impacted by the possible installation of stable recycling cavities in view of O5
  - The technological developments described in the R&D plan are in any case needed to achieve a post O5 improved sensitivity.
  - Their relevance for the development of VnEXT emerges from clear limitations of the present instruments.
  - With the stable cavities, we are anticipating one of the upgrades needed to increase the Virgo sensitivity. Their main achievements will be making further upgrades possible.

Ongoing activities

- The internal review of the Preliminary VnEXT R&D plan has started.
- The review team has been set up
- The following mandate has been given to the reviewers:
  - Clarity of the stated objectives
  - Overall coherence and completeness of the proposed R&D
  - Consistency and motivation of the financial requests and of the proposed timeline
  - Potential overlaps with topics already included in other projects (AdV+ or ET)
  - The added value of the VnEXT R&D outcomes

Next steps

- Conclude the internal review
- Set up a light project structure to go ahead with the Baseline Design (always considering the boundary conditions)

Final considerations

- The VnEXT activities are progressing, considering the boundary conditions given by the commissioning to join O4 and the preparation for O5
- In order to keep Virgo competitive in the international scenario it is crucial to upgrade the detector in view of O5 **AND** to start preparing the post-O5 detector.
- Many technologies on which VnEXT is based are also relevant for ET…
- … but, in order to finalize the developments for VnEXT implementation, specific investments are needed.

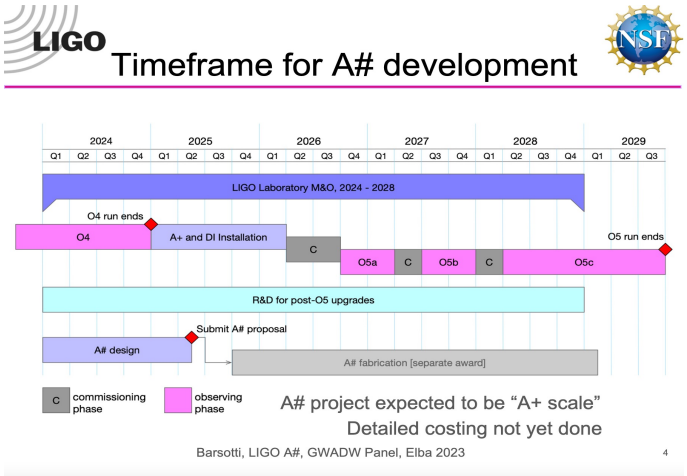
Final considerations

- Most of the activities proposed for VnEXT do not constitute breakthrough technologies, but incremental improvements.
- Most of them are characterized by a level of maturity with a potential impact at the VnEXT time horizon, and compatible with each other, within an integrated detector design.
- There might be alternative high-gain-high-risk routes not considered in this preliminary R&D plan(*), which may benefit from appropriate national or international funding tools and which could be incorporated into the reference design at a later stage, if they have proven their effectiveness and their compatibility with the overall detector design.

(*) that could actually be more suitably called VnEXT preparatory phase

Final considerations

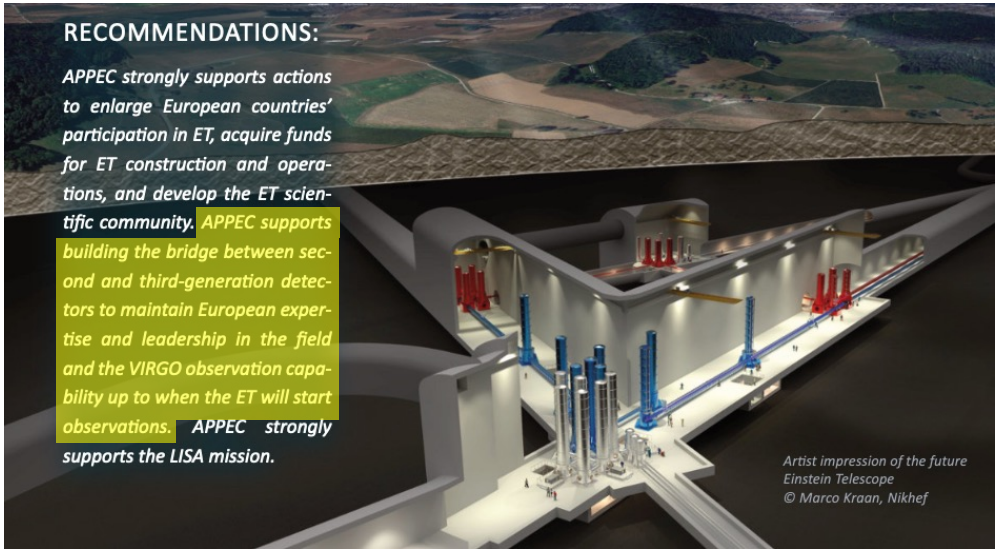
- LIGO is moving ahead.
- As a Collaboration we are working to prepare a plan to secure the Virgo relevance on the mid/longer term.
- O5 is supposed to end around 2030.
- ET plans are not yet defined, but could we bet on scientifically meaningful ET data taking starting before the 2040's?



- Would it be possible to envisage a role for Virgo in the initial 3G network?
- Virgo has potentially many years ahead for continued research and exploration
- It is crucial to start promptly defining the new strategic plan to maximize investment and scientific output achievable in the EGO/Virgo infrastructure.

Final considerations

… Until these new missions(*) are in operation, it will be important to keep improving Virgo with the Advanced VirgoNEXT programme.



(*) ET, CE, LISA, PTA