

Development of an *In-situ* Calibration System for the TRIDENT Neutrino Telescope

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Tropical DEep-sea Neutrino Telescope (TRIDENT) [1]

A next-generation neutrino observatory under construction in the South China Sea



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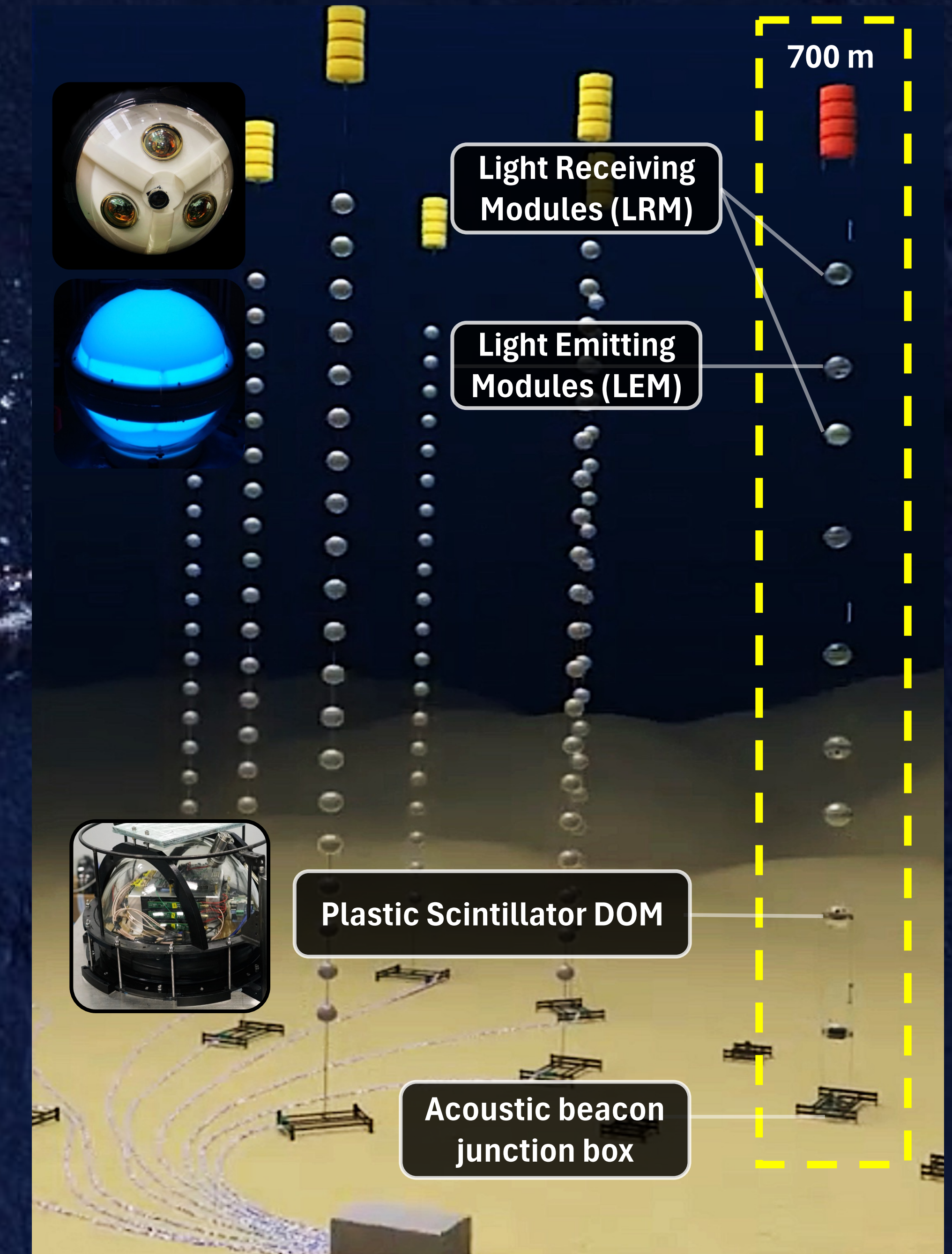
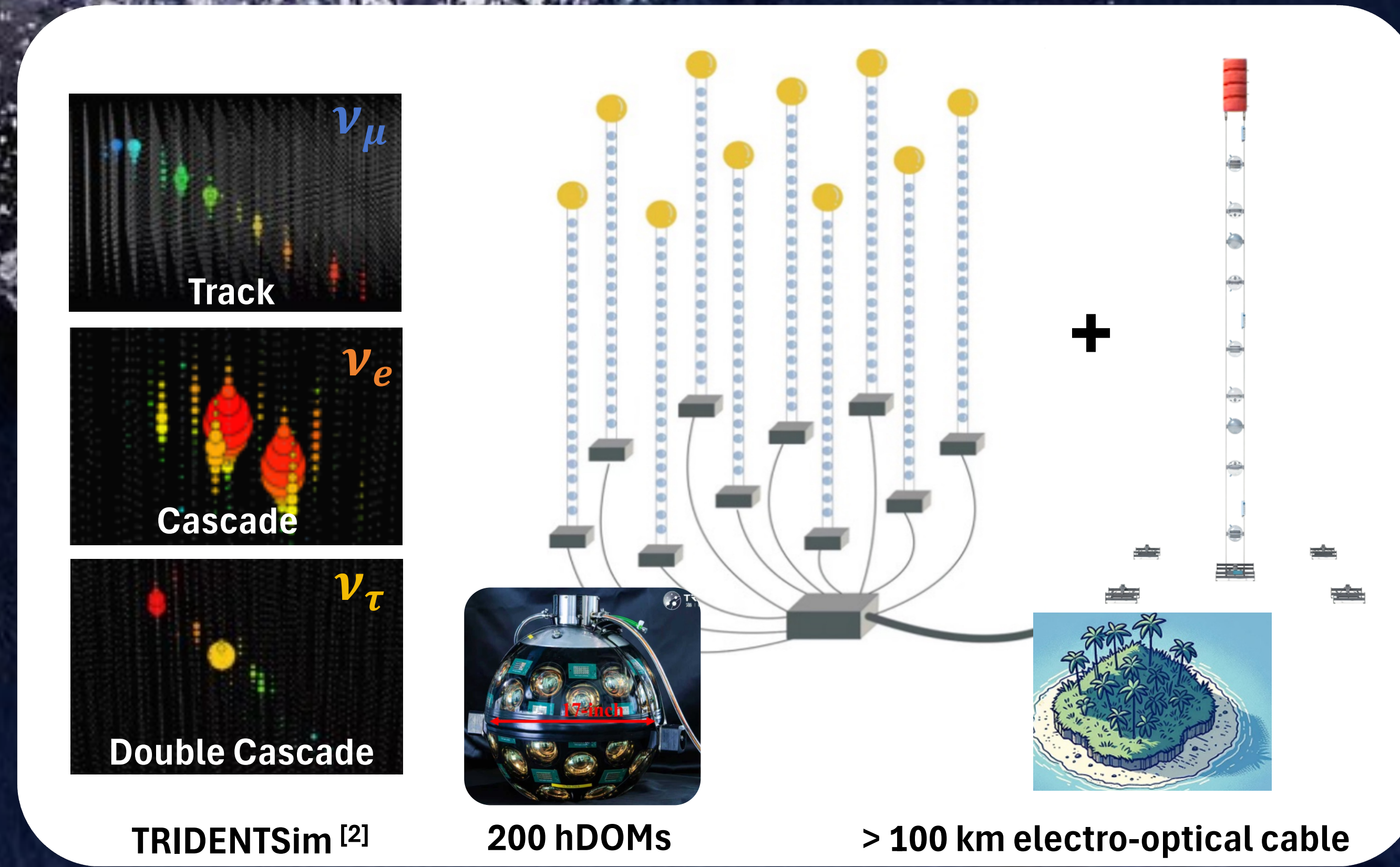
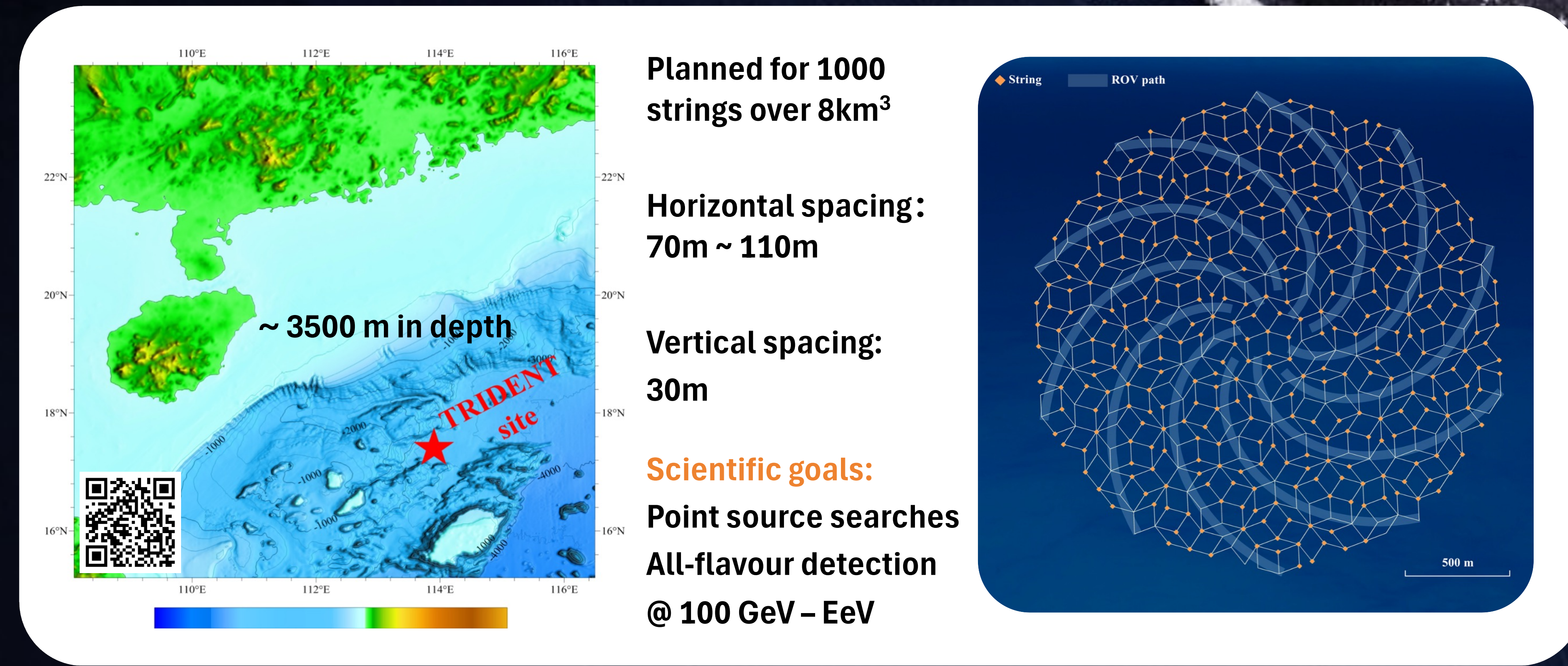
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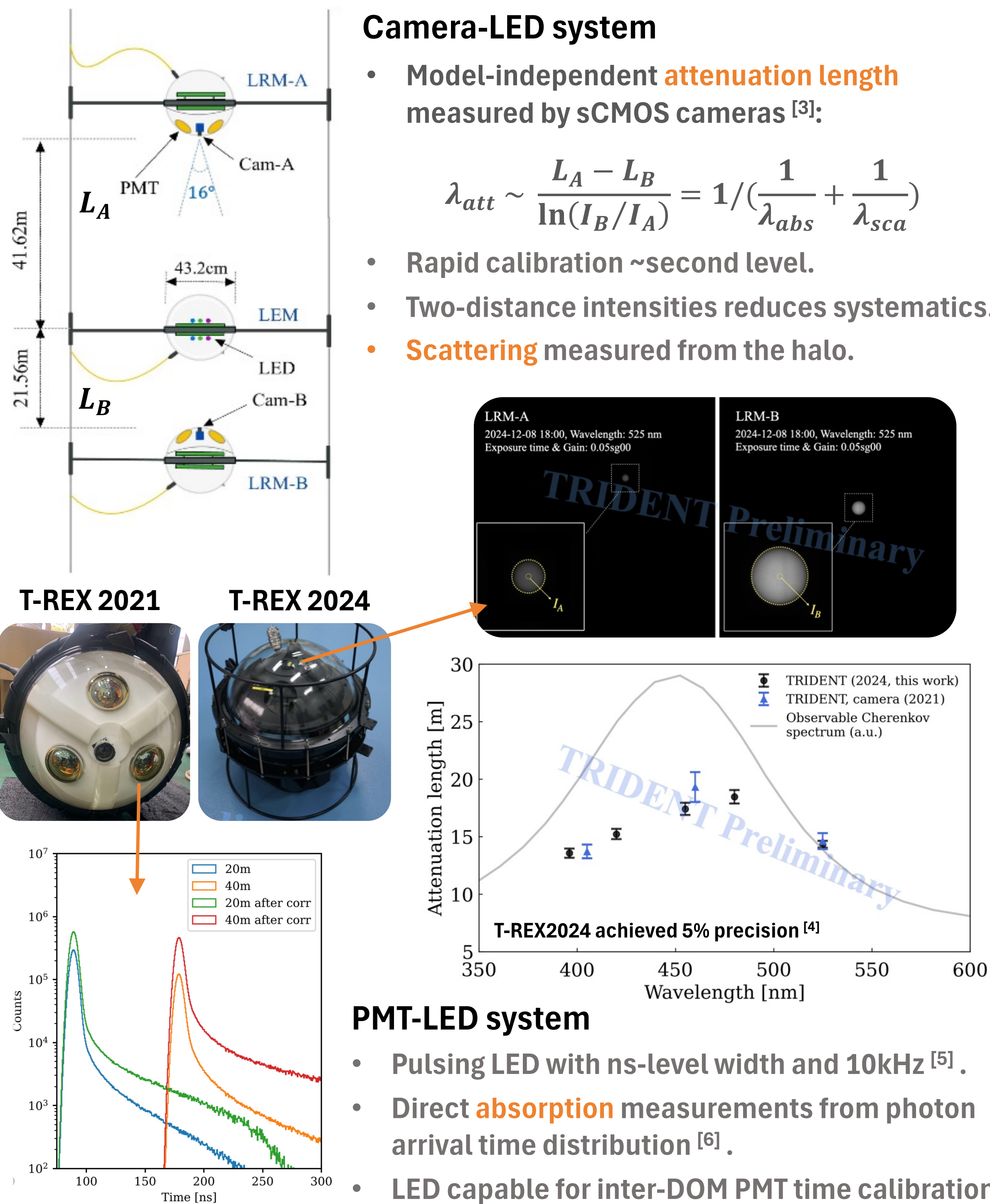
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TRIDENT Phase-I: 10 strings + 1 C-String;
Expected to be deployed in 2027

TRIDENT Calibration System
Dedicated calibration string (C-String)

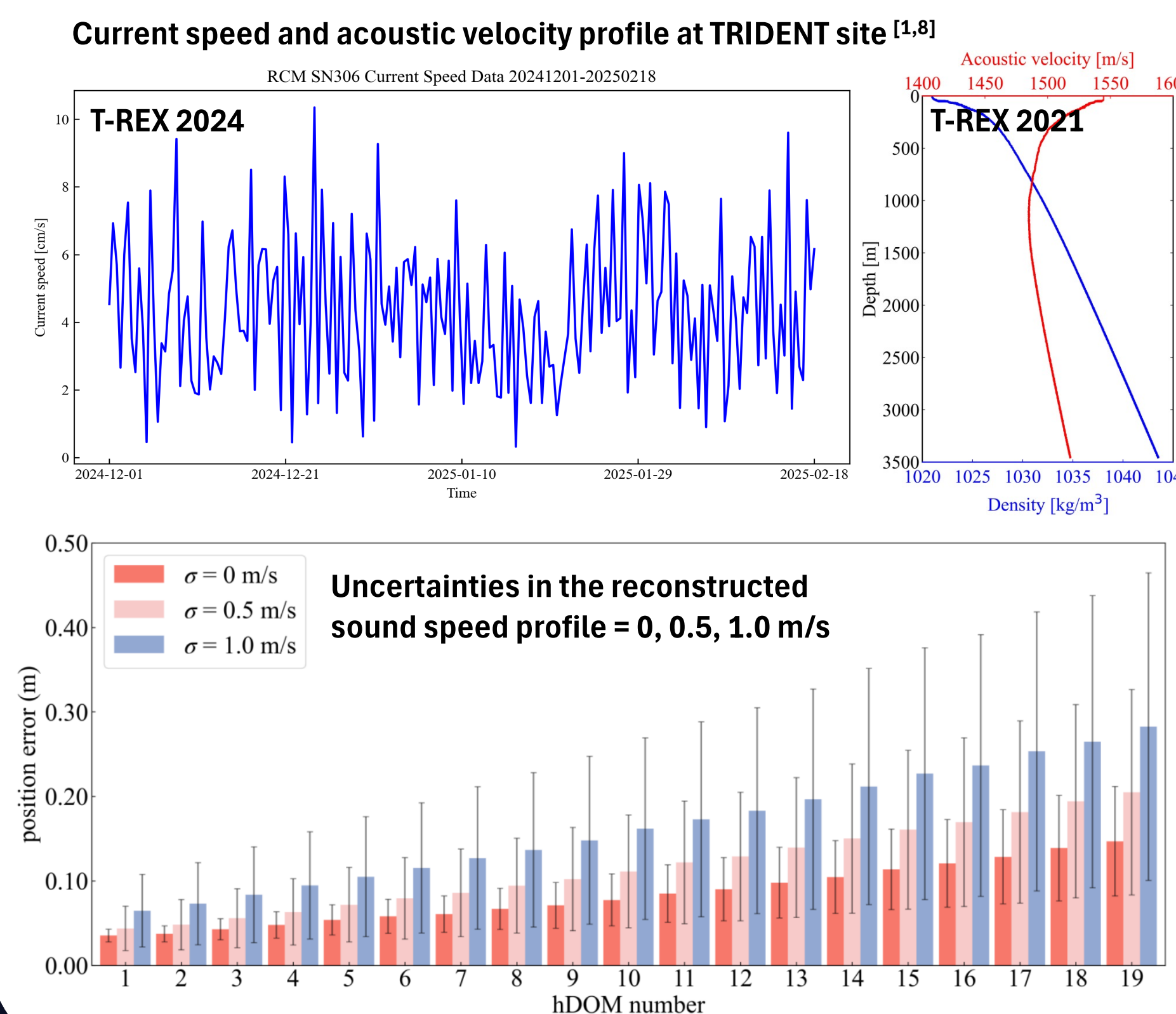


1. Water Optical Properties at Deep Sea:



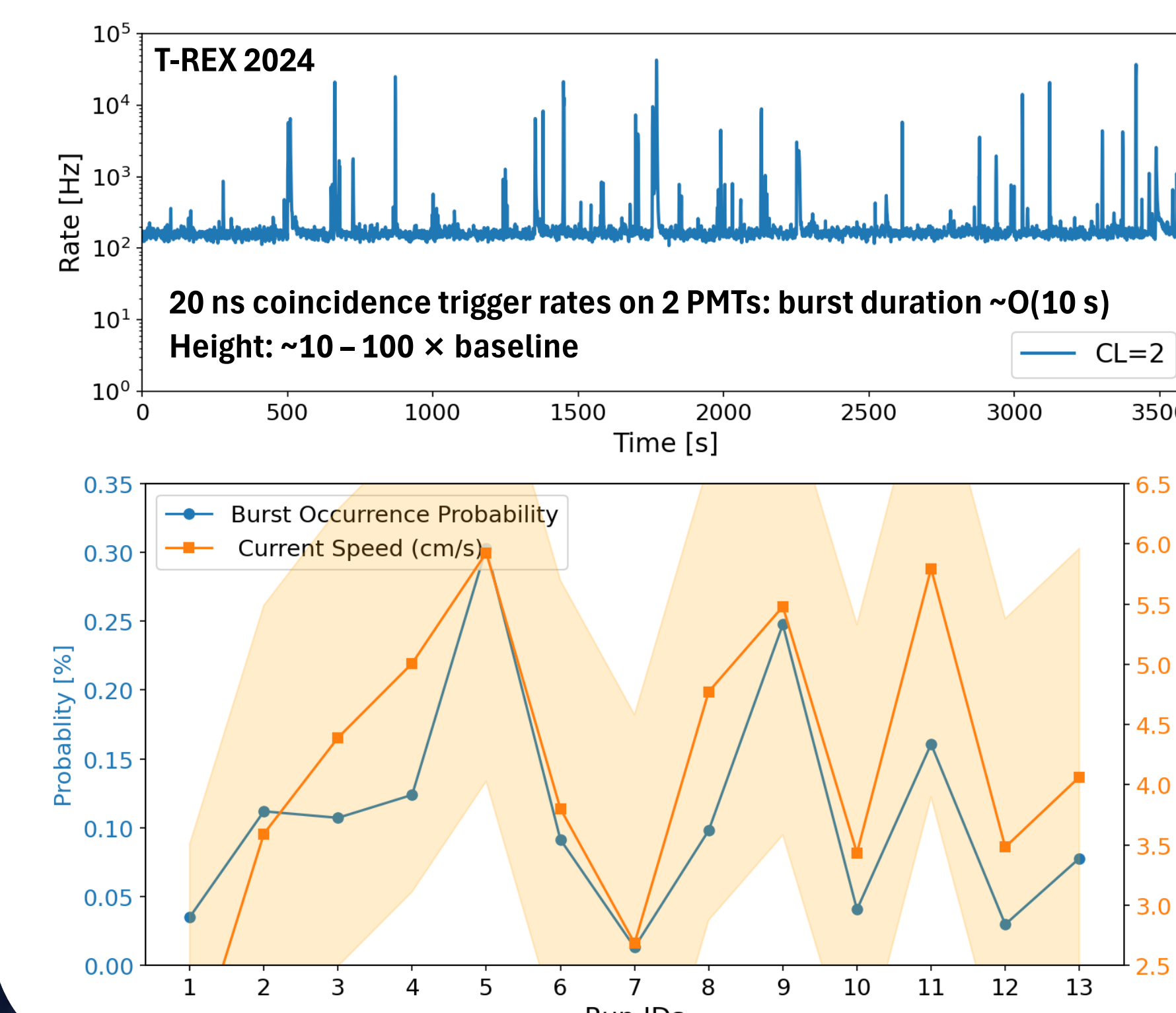
2. Acoustic Positioning Calibration [7]:

- Acoustic signals not interfering with PMTs.
- Sound velocity and current profiles** affect sound propagation paths and positioning uncertainties.
- Sound velocity < 0.06 m/s precision required for 0.2 m positioning.



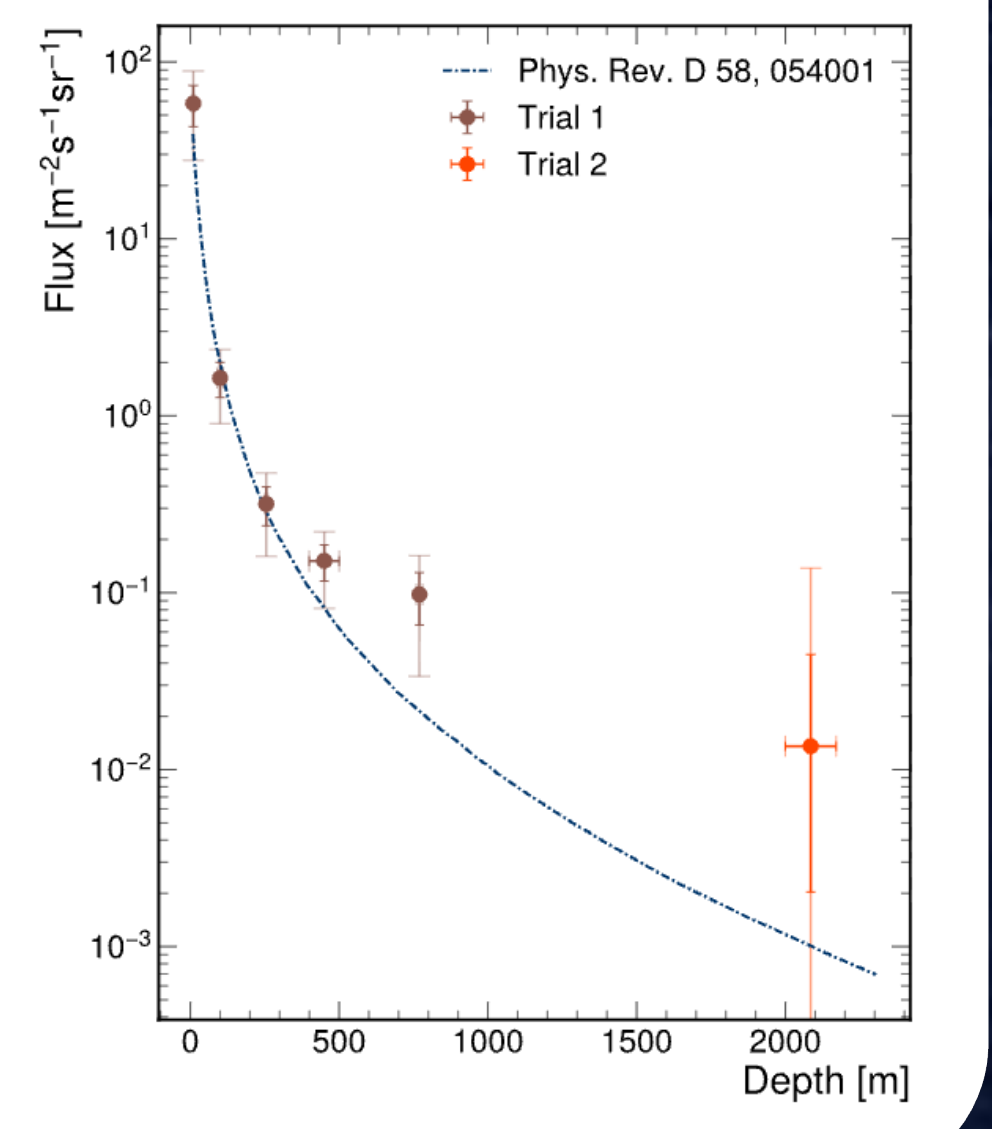
3. Bioluminescence [8]:

- Dominant optical background from deep sea microbes.
- TRIDENT site observed **burst signals** last for seconds.
- 1 burst contains 10³–10⁵ P.E. over 7 PMTs.
- Emission rate appears to **scale with current speed**.
- Developing multi-device monitoring of bioluminescence-related parameters.



4. Plastic Scintillator

- PMT transit time and TTS drift over long-term operation.
- Muon events can offer frontend timing offset corrections.
- MuonSLab enables precise muon counting [9].
- Muon direction** measurements are under developed.



5. Summary

- A multi-purpose calibration string under development for water optical properties, acoustic positioning, atmospheric muons, and bioluminescence measurements at different depths.
- Calibration strategies being optimised based on sea trial results.
- Hardware development and assembly preparation are underway for TRIDENT Phase-I.



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[4] Y. Wang, et al. PoS(ICRC2025) 1209.
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[8] F. Zhang. TAUP 2025.
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