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Prototype Testing for TRIDENT: In-Situ Performance of Multi-PMT Optical Modules

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The TRopIcal DEep-sea Neutrino Telescope (TRIDENT) is a next-generation neutrino telescope to be constructed 3.5km deep in the "Hai-Ling Basin"of the South China Sea. The detector aims to have world-leading sensitivity to high-energy astrophysical neutrinos of all flavours, instrumenting multiple cubic kilometres of seawater with advanced photon-detection technology. TRIDENT features innovative Hybrid Digital-Optical-Modules (hDOMs) which integrate multiple small PMTs and SiPMs for efficient and precise Cherenkov light detection. In preparation for the deployment of its first 10 strings in TRIDENT Phase-1, a single string prototype named TRIDENT-Explorer(T-REX) 2024 was deployed at the future detector's site. The string was equipped with multi-PMT DOMs, to assess the performance of a preliminary hDOM in dynamic deep-sea conditions. Month-long operation of the systems enabled continuous monitoring of the optical background and provided important reliability validation data for the detection units in a complex underwater environment. This work presents the design and in-situ performance parameters of the prototype mDOMs. Long-term optical background measurements are also presented.

Collaboration you are representing

TRIDENT

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