

# Geometry Optimization and Simulation of BAIKAL-HUNT

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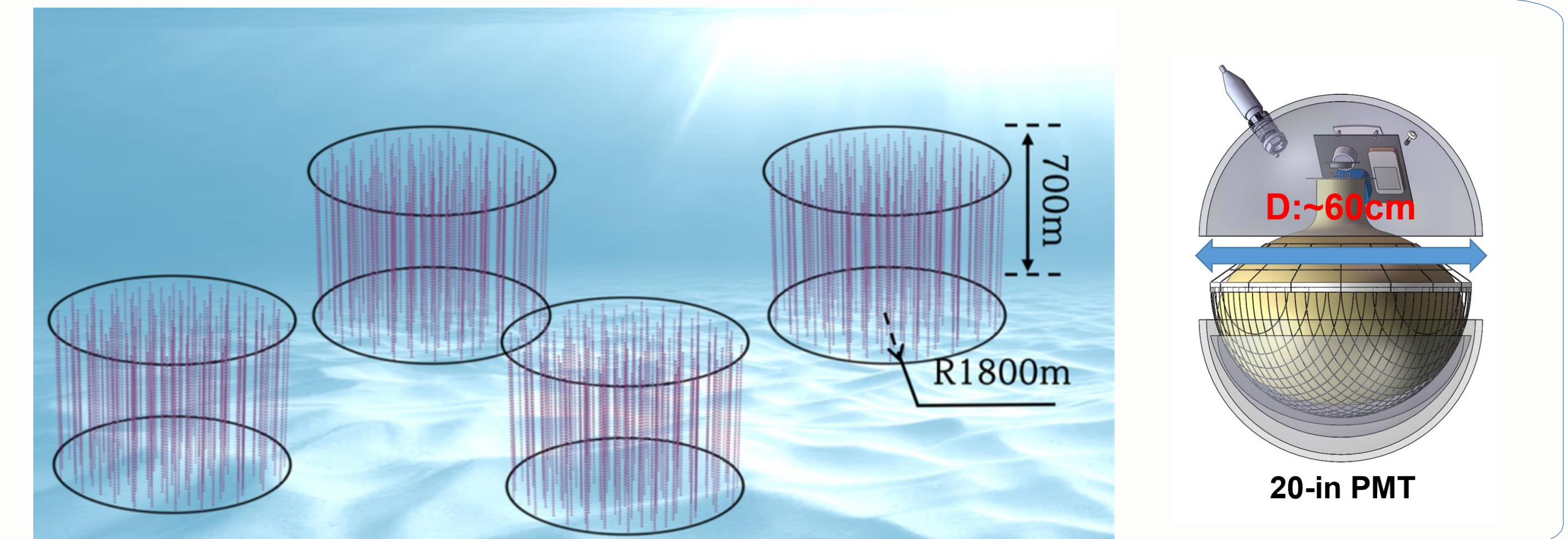
(on behalf of the BAIKAL-HUNT Collaboration)

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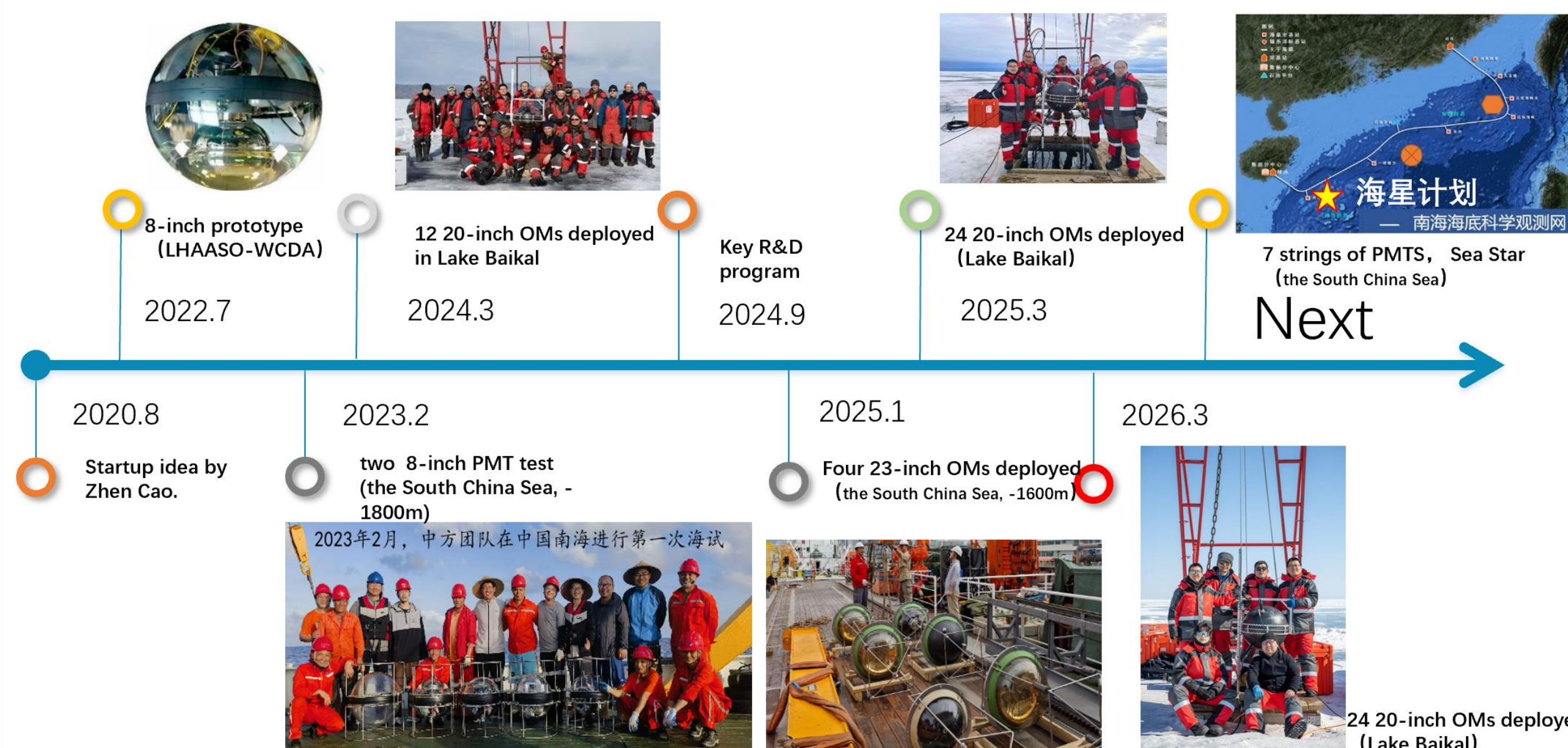
## 1 – Introduction

- BAIKAL-HUNT: A next-generation deep-water neutrino telescope for Galactic and extragalactic high-energy neutrino detection
- Primary Goals: Identifying hadronic PeVatrons ; Resolving neutrino sky ; Understanding propagation of cosmic-rays , new physics
- Location: The candidate site is Lake Baikal, which has a water depth of 1365 m
- Detector Volume: 30 km<sup>3</sup> of 20-inch PMT array, (may be divided into 4 or 6 clusters)
- PMT distance in one volume: Vertical distance 30m and horizontal distance at most 130m



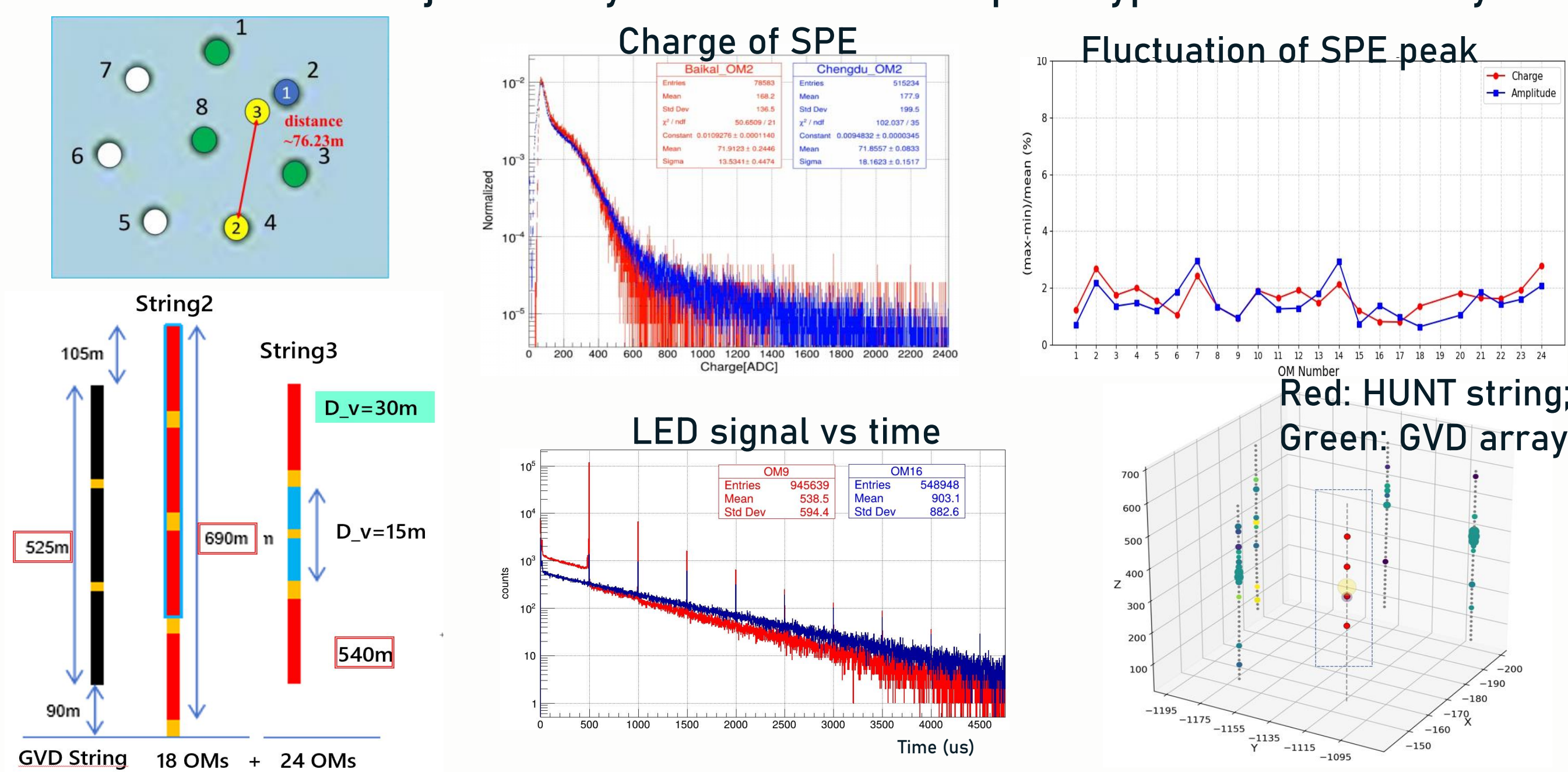
## 2 – Experimental Progress

- Three strings of PMT prototypes were installed in Lake-Bakail
- Twice of prototype tests were done in South China Sea
- Seven prototype strings will be installed in South China Sea this year



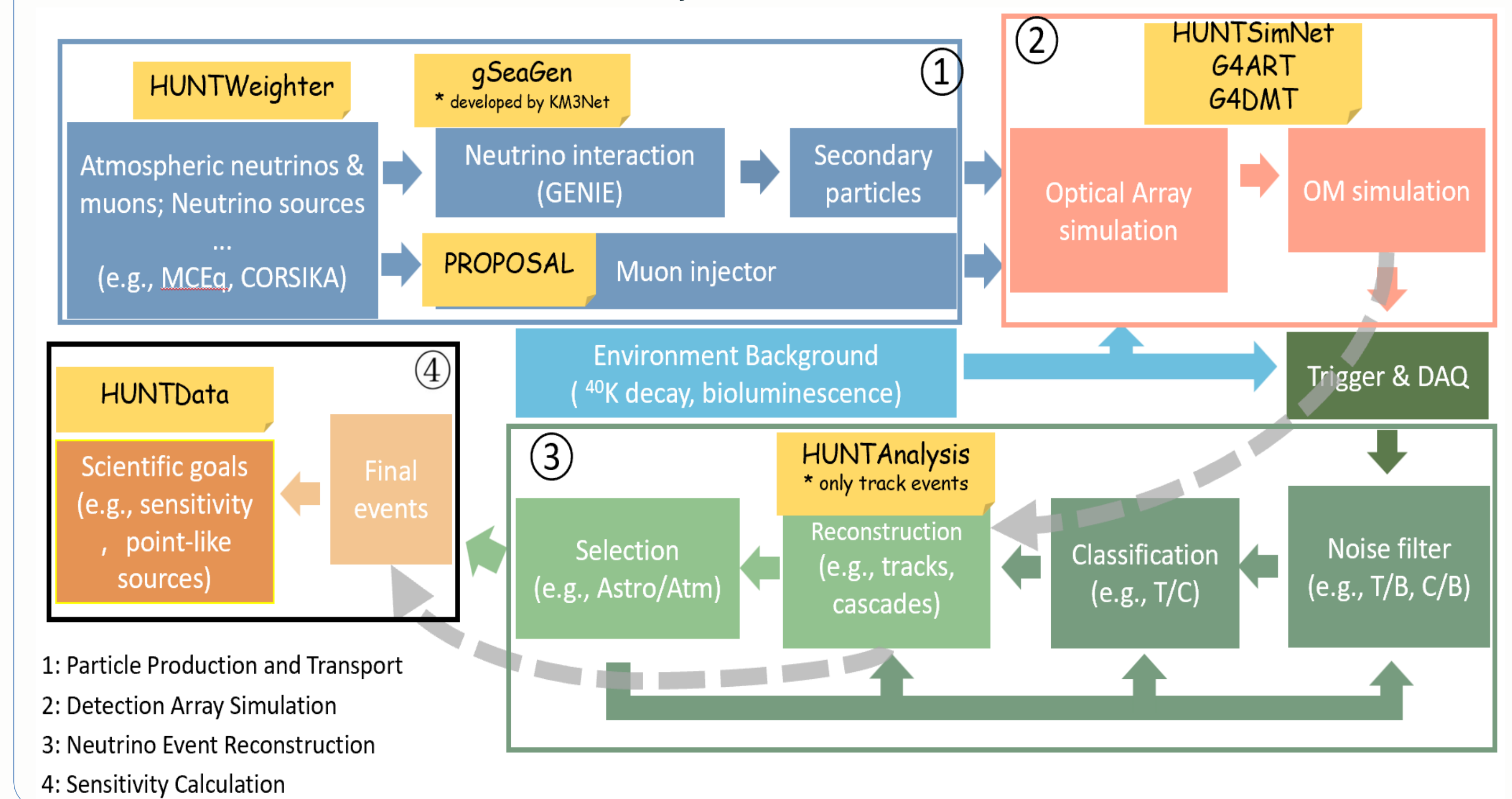
## 3 – Prototype analysis

- The SPE, beta, stability, LED signals and muon signals of PMT prototype are analyzed, with good performance
- Realized the joint analysis between HUNT prototypes and GVD array



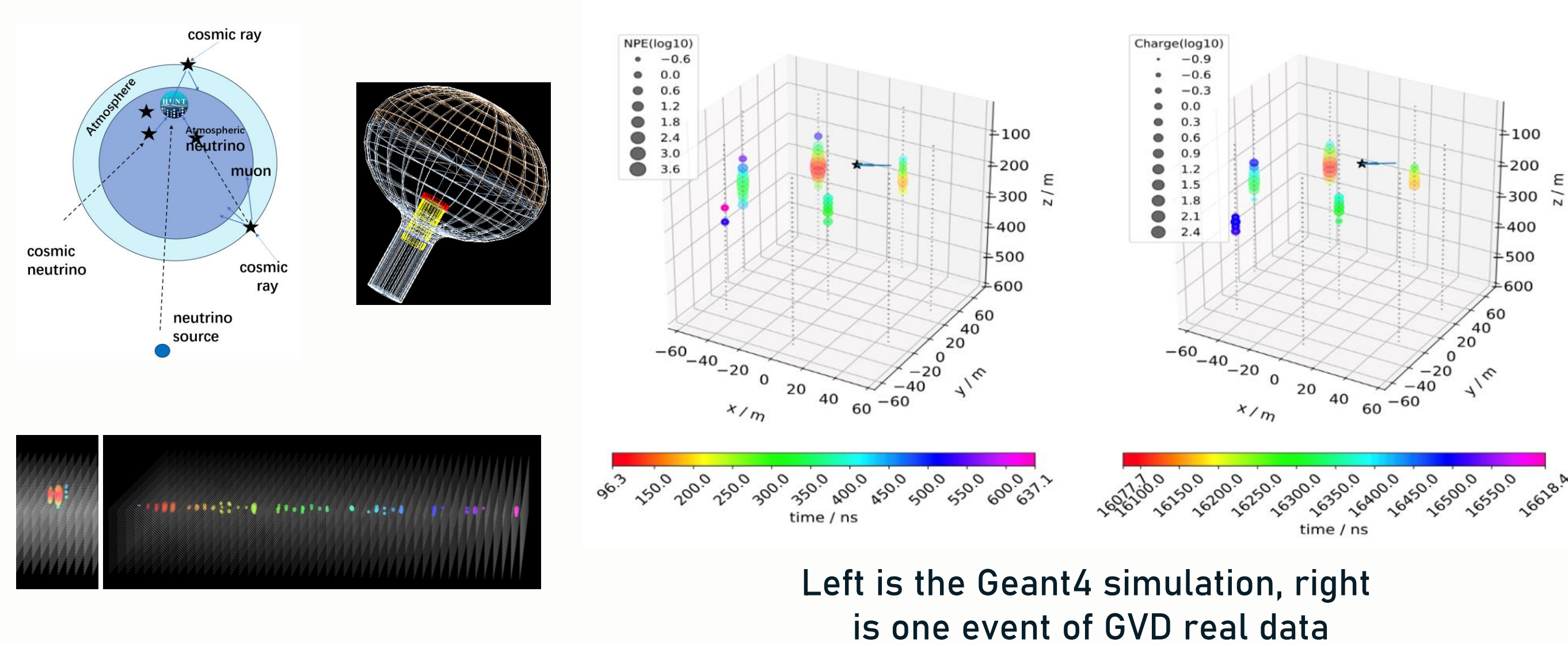
## 4 – Simulation framework

- The total simulation and analysis framework of BAIKAL-HUNT is below.



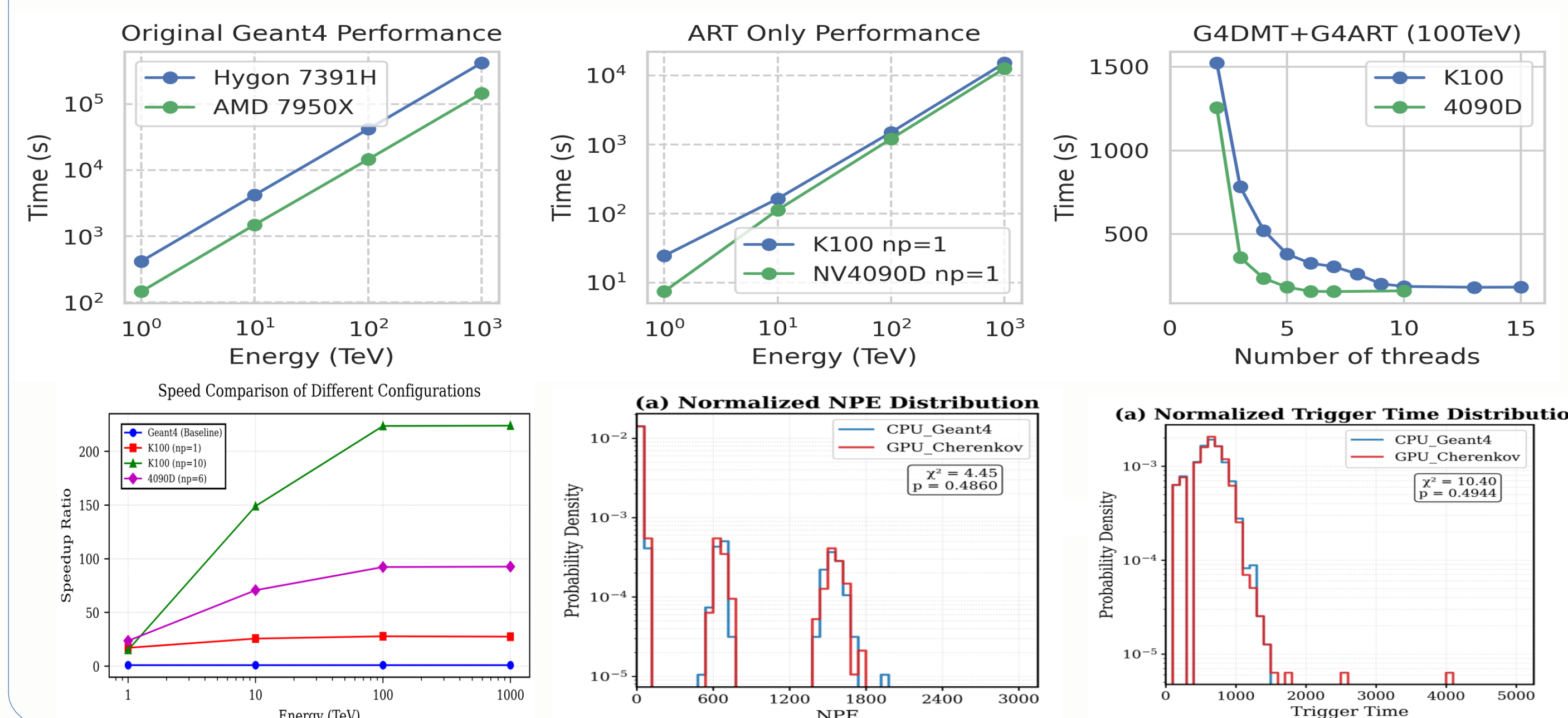
## 5 – Simulation details

- gSeagen**: simulate the neutrino events with given flux and random angles
- Proposal**: simulate atmospheric muon backgrounds
- Geant4**: simulating particle interactions inside the array
- CRMC**: hadronic interactions above 100 TeV



## 6 – Geant4 speed up

- G4ART and G4DMT**, are developed to accelerate the Geant4 simulation
- G4DMT**: Geant4 Distributed Multiple Threads, with cpu parallelization
- G4ART**: Geant4 Accelerated Ray Tracing, with GPU or DCU parallelization



## 7 – Performance and preliminary sensitivity

- The trigger efficiency of neutrino events are estimated
- Track-like and cascade-like  $\nu$  events are reconstructed.
- The sensitivity of neutrino sources are estimated ( $\nu$  only; no atmospheric  $\mu$ , bioluminescence, radioactive background, dark noise, etc.)

