

JUNO-TAO event display based on PHOENIX

Xuesen Wang(王学森) Minghua Liao(廖明华) Yujie Zeng(曾宇杰)
Yumei Zhang(张玉美) Zhengyun You(尤郑昀)

wangxs7@mail2.sysu.edu.cn

Sun Yat-sen University

2026/7/17



Why choose Phoenix



➤ **Phoenix** is extensible, experimental-agnostic and has a wide compatibility since it is based on TypeScript.

➤ Comparing to ROOT:

- Superior interactivity & visualization
- **Lightweight** and easy development
- **Web browser deployment**

An event consisted of visual components (for example:
Tracks, Vertices, Hits...)

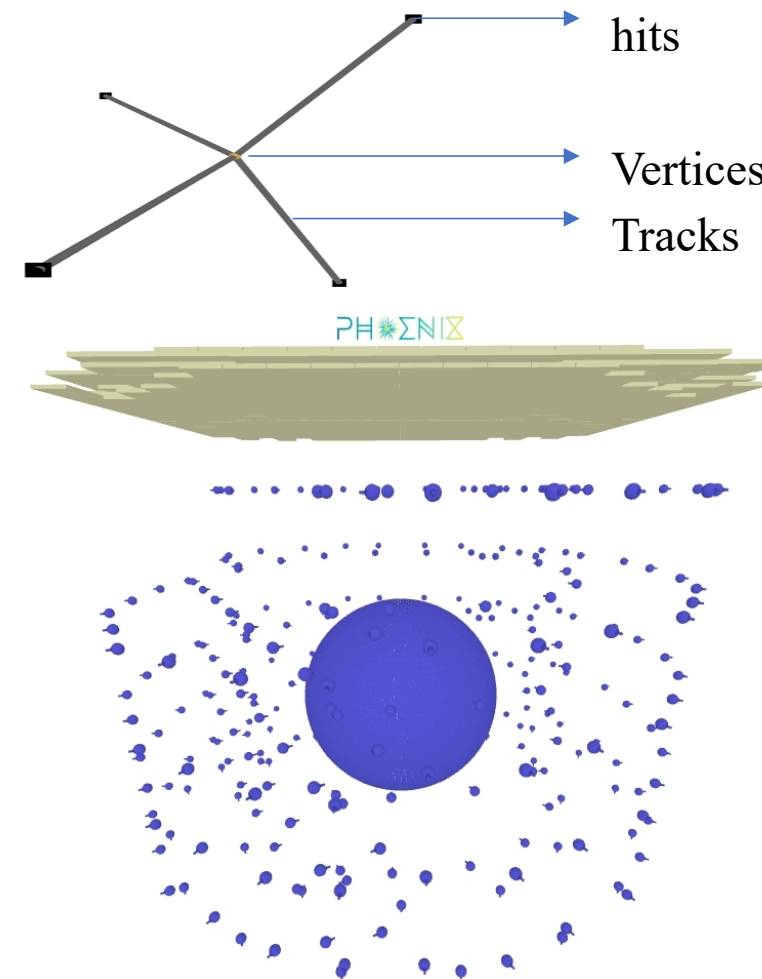


Fig 1. TAO Geometry in Phoenix

Visualization in Phoenix

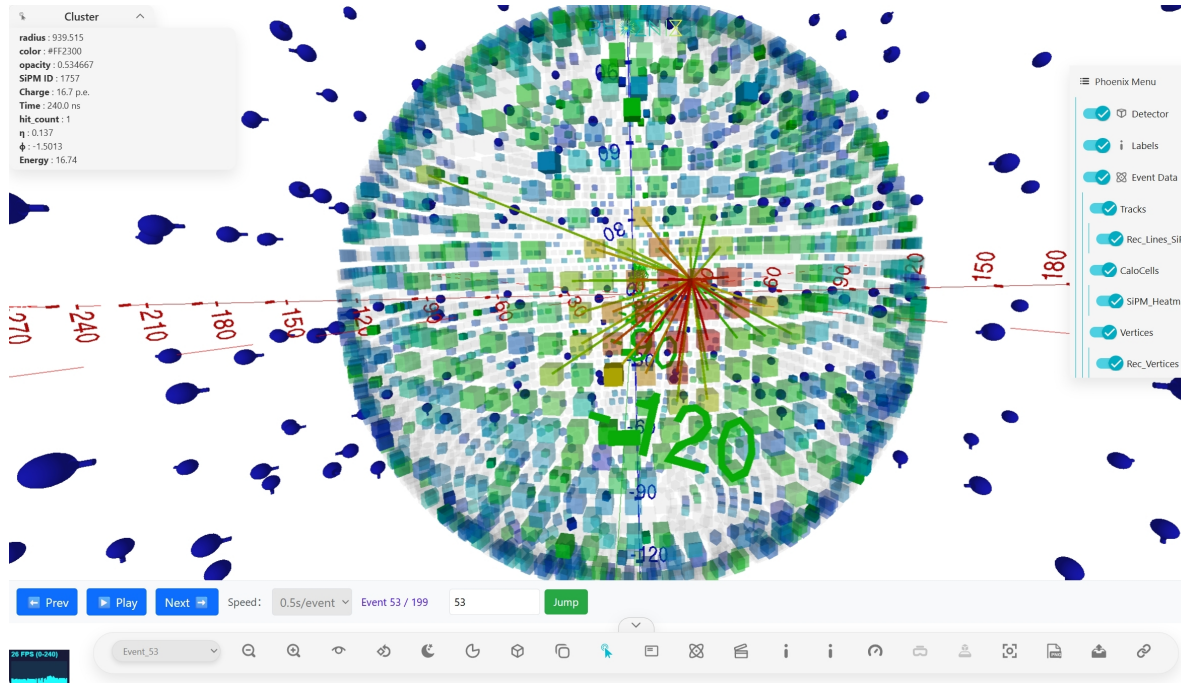


Fig 2.TAO event display in Phoenix

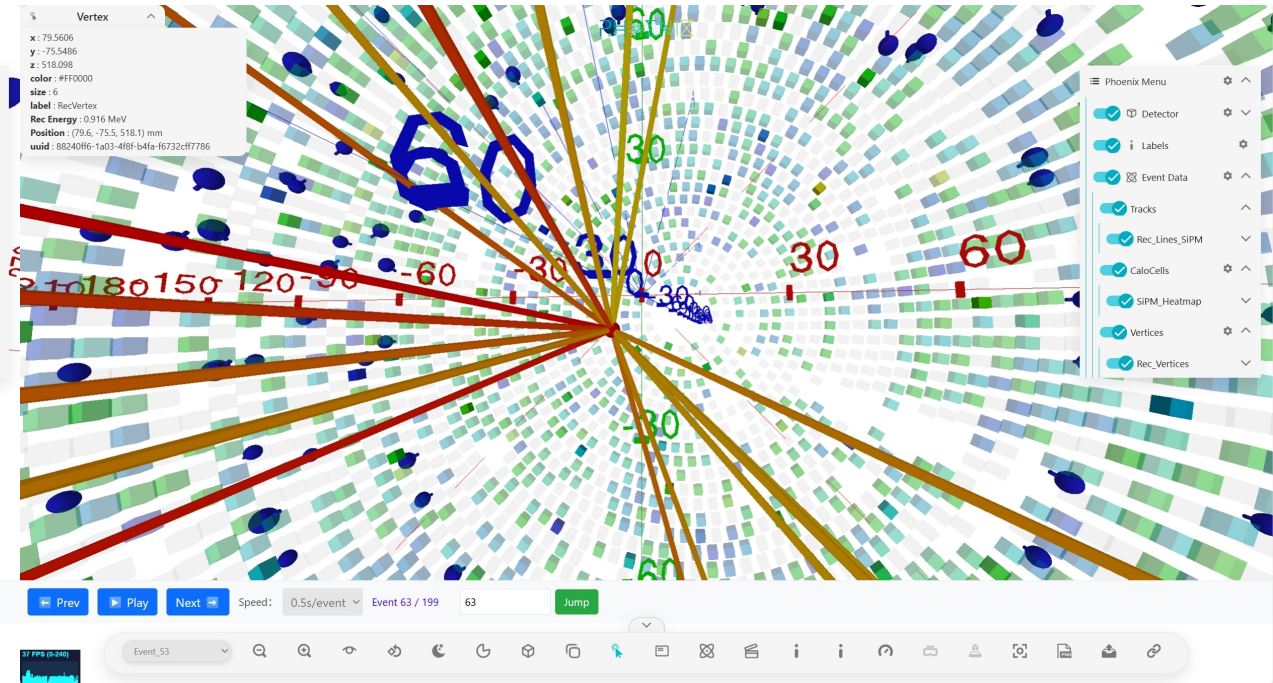


Fig 3. Internal details: Rec Vertice and Tracks

►SiPM/PMT Hits Heatmap:

- **Logarithmic Color Mapping:** Maps **Charge (p.e.)** to color (**Blue to Red**) using a log scale to visualize high-dynamic-range energy deposits.
- **Time-Encoding:** Applies Opacity based on **hit time (TDC)**, creating a "**fading**" effect for late hits.

Features and Applications



- **Precise 3D Geometry Visualization:** Full integration of TAO detector components (CD, WT, TVT) with accurate coordinate alignment and correction, supporting visibility toggle for each subsystem;
- **Unified Data Compatibility:** Seamless support for both **Monte Carlo (MC) simulation data (ROOT format)** and **real commissioning data (ESD format)**;
- **Advanced Event Rendering:**
 - SiPM/PMT hit heatmap with **logarithmic charge scaling** and **time-dependent opacity**;
 - Clear display of **reconstructed vertices** and **muon tracks**.
- **Detector Commissioning:** Visual inspection of real data hits, muon events, and detector performance during commissioning runs.
- **Online Real-Time Monitoring:** Embedded into the **TAO Data Quality Monitoring platform** and real-time display of detector status and event data via DQM for prompt anomaly detection.

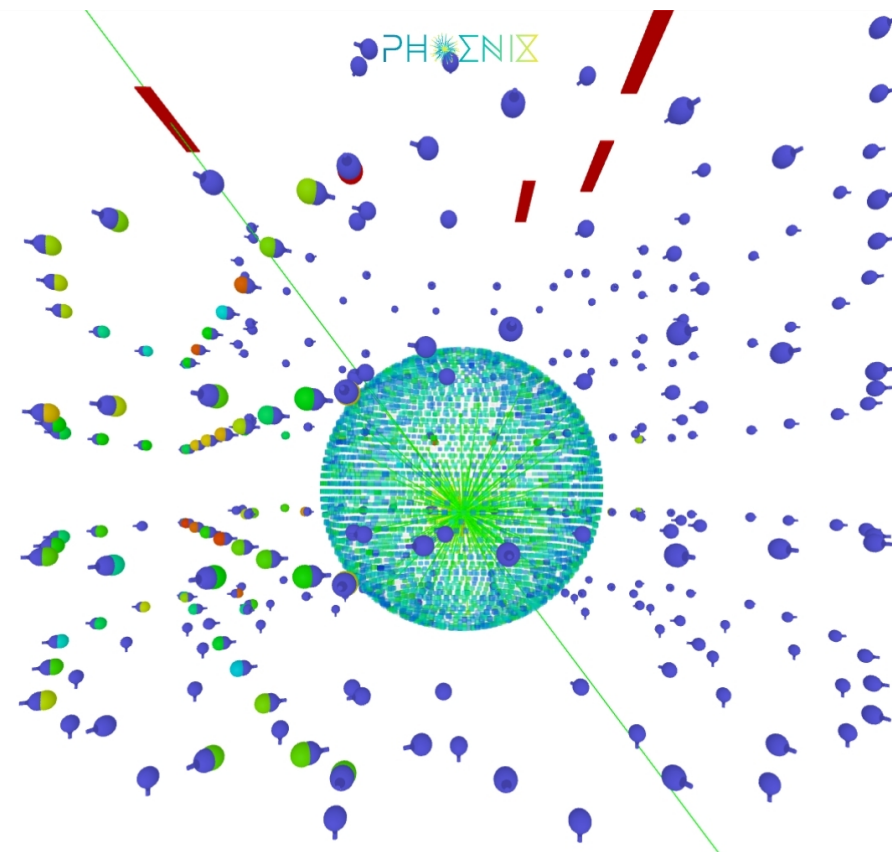


Fig 4. SiPM (CD) and PMT (WT and TVT) Heatmap with Muon Track