

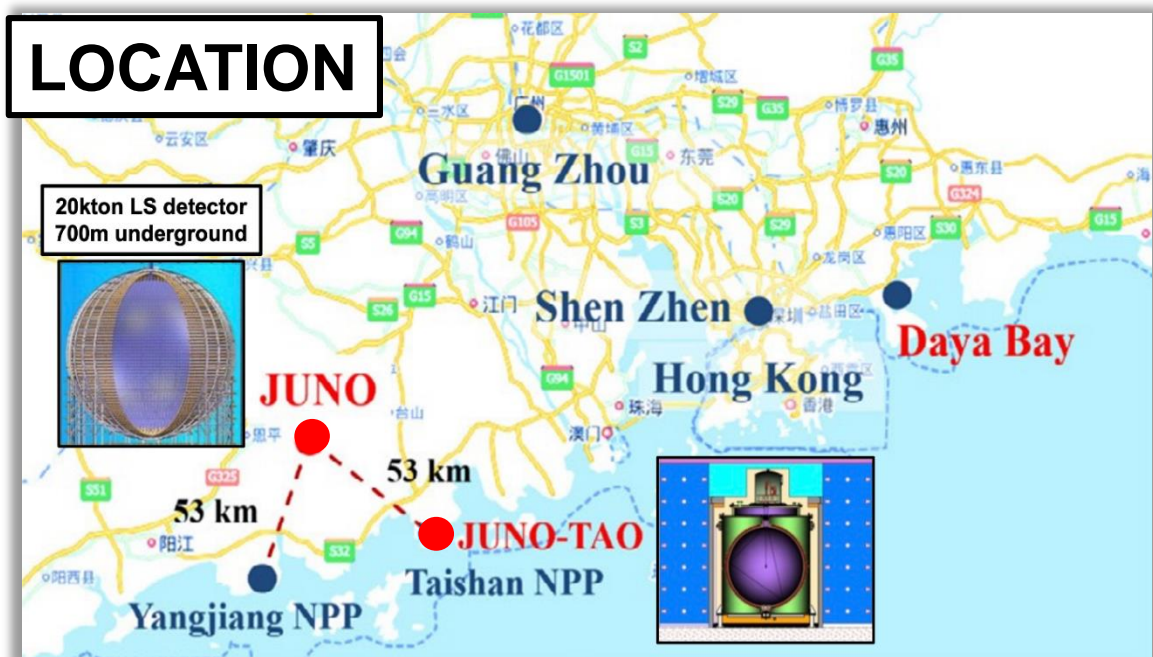
Precise detector of JUNO-TAO Experiment

Zhimin Wang, wangzhm@ihep.ac.cn, institute of high energy physics, Beijing



- Taishan Antineutrino Observatory (TAO): a satellite experiment of JUNO
- A spherical ton-level Gadolinium-doped Liquid Scintillator (Gd-LS) detector (1.8 m diameter, -50°C) at ~ 30 m from a reactor core of the Taishan Nuclear Power Plant (4.6 GW)
- 10 m^2 SiPM, reactor antineutrino measured with a sub-percent energy resolution ($\leq 2\% / \sqrt{E\text{ MeV}}$).
 - ✓ Provide a model-independent reference spectrum for the JUNO neutrino mass-hierarchy measurement.
 - ✓ Provide a new benchmark measurement to test nuclear databases.
 - ✓ Reactor monitoring: status/fuel.

LOCATION

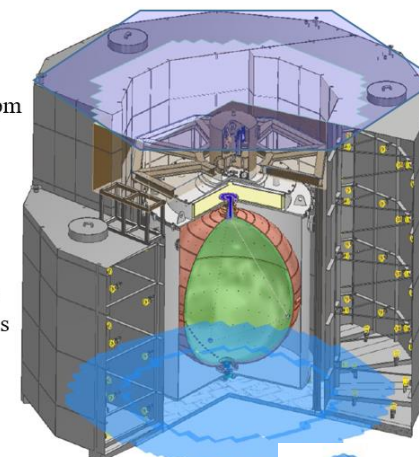


Highlights:

- Energy resolution $< 2\% @ \sqrt{E\text{ MeV}}$
- SiPM PDE $> 50\%$ ($\sim 4000\text{ p.e./MeV}$)
- SiPM coverage: 94% of $\sim 4\pi$, $\sim 10\text{m}^2$
- SiPM DCR: $< 100\text{ Hz/mm}^2 @ -50^{\circ}\text{C}$
- Dewatering Low-temperature LS : $< 10\text{ppm}$

Central detector

- Acrylic sphere 1.8m (ID), 20mm-thick with 2.8 t Low-T Gd-LS
- Copper shell 1.886m (ID), 12mm-thick with 4024 pieces of $50^{\circ}50\text{mm}^2$ SiPM tiles
- SS tank 2.09m(ID), 10mm-thick with 3.2 t LAB/Gd-LAB
- Cryogenic system with 4.5kW cooling power and 150mm-thick melamine foam full covering keeping -50°C running condition



Top Veto Tracker (TVT)

4-Layer PS, 160 strips
2 m \times 20 cm \times 2 cm/strip

Top Shield(HDPE)

ACU & CLS

6 types of exemption sources

Water Tank

3 irregular water tanks
 ~ 300 3" PMT

Overflow Tank

Cu Shell
SiPM Array
Acrylic Vessel
SS Tank
Insulation (MF) Bottom
Shield(Lead)

Internal vessels



Installed SiPM

