Overview of JUNO-TAO Detector

Claudio Lombardo on behalf of the JUNO collaboration

Measure reactor anti-neutrino spectrum with high resolution

- provide **model-independent reference for JUNO**
- benchmark to **test nuclear databases**
- provides increased reliability in measured **isotopic antineutrino yields**
- improve nuclear physics **knowledge of neutron-rich isotopes**
- shed light on **reactor spectrum anomaly** (5 MeV bump)
- searching for **light sterile neutrinos** with a mass ~1 eV
- ~36 × JUNO statistics

TAO Design Features:

- **2.6 ton Gd-LS** as target material (1 ton fiducial mass)
- Detector placed at **30 m distance** from a **4.6 GW_{th}** reactor core
- **10 m^2 SiPM, HPK 4x8 arrays**, with **50% PDE, Coverage: > 95%**
- ***SiPMs and LS cooled down to -50 °C***

Expected Performance:

- **~ 4500 p.e. / MeV** collected charge
- Energy Resolution: $< 2\%/\sqrt{E[MeV]}$

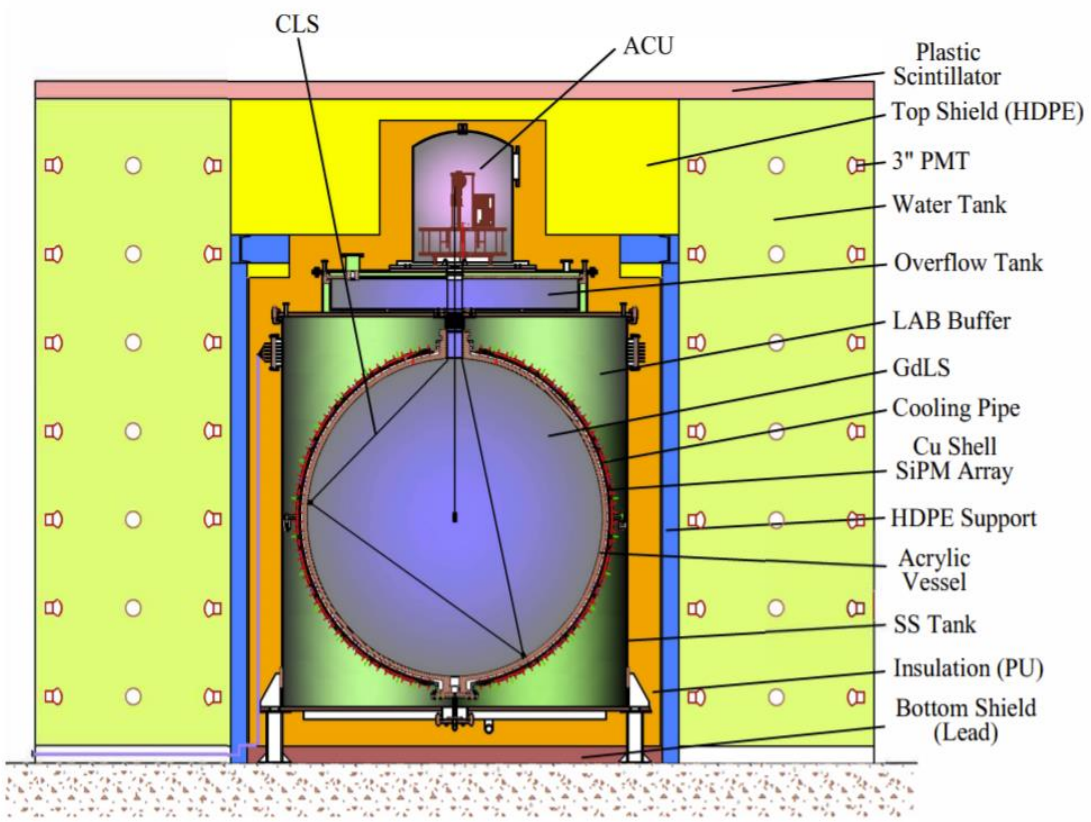
Calibration system

- **ACU** (*Automated Calibration Unit*), can deploy 3 different sources inside the LS: an ultraviolet (UV) light source, a ^{68}Ge source and a combined source that contains multiple gamma sources and one neutron source
- **CLS** (*Cable Loop System*), can deploy one source off-axis

Veto & Shielding

- **Top Plastic Scintillator**
- **Water Tank + Passive Shielding**

Planned to be online in 2023



[1] Abusleme, Angel, et al. "TAO Conceptual Design Report: A Precision Measurement of the Reactor Antineutrino Spectrum with Sub-percent Energy Resolution." arXiv preprint arXiv:2005.08745 (2020).
[2] Xu, Hangkun, et al. "Calibration Strategy of the JUNO-TAO Experiment." arXiv preprint arXiv:2204.03256 (2022).