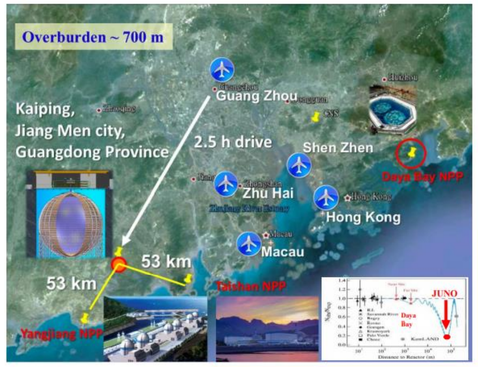
JUNO DETECTOR DESIGN AND STATUS

Marta Colomer Molla, on behalf of the JUNO collaboration

marta.colomer@ulb.be, Inter-university Institute for High Energies, Université libre de Bruxelles (ULB)

JUNO overview

- JUNO is a multi-purpose neutrino experiment located in China, placed 700 m underground.
- JUNO's main goal is to measure the reactor neutrinos produced by eight cores from two nuclear plants, at ~52 km.
- JUNO will cover a broad range of physics: : the determination of the neutrino mass ordering and the sub-percent measurement of three oscillation parameters from reactor neutrino oscillations, detection of solar, atmospheric and supernova neutrinos as well as the search for physics beyond the Standard Model.

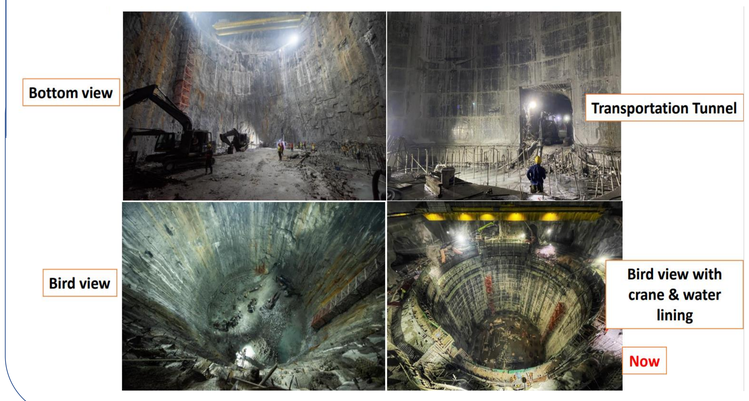


~3% $\sqrt{E\,(\mathrm{MeV})}$ energy resolution
With huge LS target volume

Experiment	Daya Bay	Borexino	KamLAND	JUNO
Liquid scintillator [tons]	8 x 20	~300	~1,000	20,000
Photocathode coverage [%]	12	34	34	75+3
Eff. Light Yield [p.e./MeV]	**~160**	**~500**	**~250**	**~1345**
Energy resolution [%]	~8.5	~5	~6	~3
Energy calibration uncertainty [%]	0.5	1	2	<1

Cores	YJ-1	YJ-2	YJ-3	YJ-4	YJ-5	YJ-6	TS-1	TS-2	DYB	HZ
Power (GW)	2.9	2.9	2.9	2.9	2.9	2.9	4.6	4.6	17.4	17.4
Baseline(km)	52.74	52.82	52.41	52.49	52.11	52.19	52.77	52.64	215	265

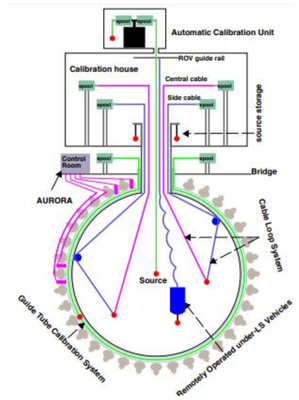
JUNO detector status and timeline

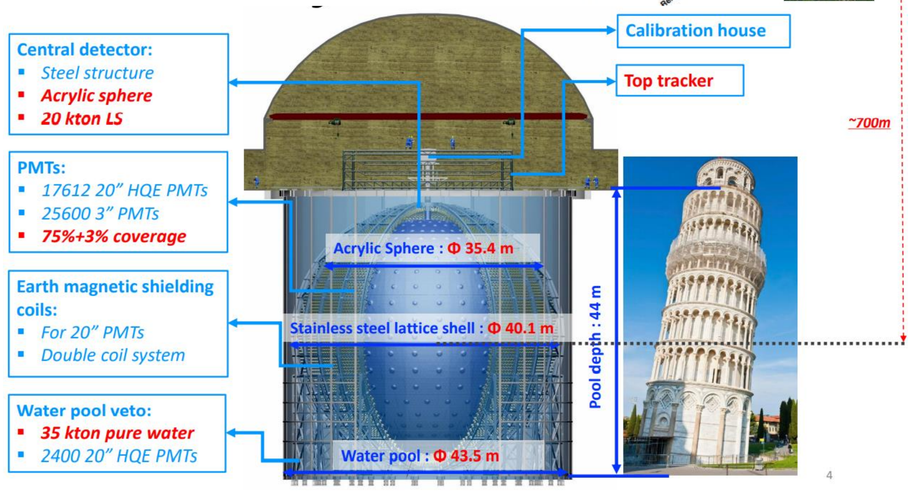


- 20-inch PMTs all produced potted and tested.
- 3-inch PMTs all produced and the majority of them potted and tested.
- Experimental cavern dug almost ready for detector installation.
- All detector components produced or in the production stage, in time for the installation.
- TAO is expected to start taking data in 2022.
- Detector installation will happen next year and data taking will start in 2023.

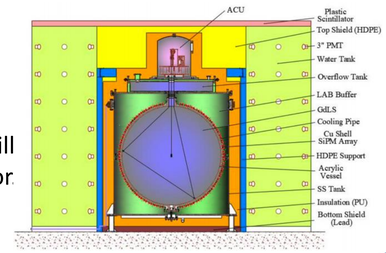
JUNO detector design

- Central detector: acrylic sphere with 20 kton liquid scintillator.
- Two PMT systems for unprecedented energy resolution and better calibration: 20-inch (large) and 3-inch (small).
- Two electronics systems: wet (large and small PMTs) and dry (readout electronic cards, trigger and DAQ).
- Four complementary detector calibration subsystems:
  - Automated Calibration Unit (ACU)
  - Guide Tube Calibration System
  - Cable Loop system
  - Remotely operated (under-LS) vehicle (ROV)
- Top tracker detector and water pool (Cherenkov detector): veto and better reconstruction of atmospheric muon events.





- TAO: satellite detector (1 ton LS) of JUNO (30 m from one Taishan core) for a precise an independent measurement of the reactor neutrino spectrum. It will also serve for monitoring and safeguard of the reactor.



Conclusion:

JUNO will be the largest LS detector operating in the world with unprecedented performance and will contribute to a broad range of physics results. It will start taking data in 2023.