The Top Tracker of the JUNO Experiment

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JUNO overview [1: T1]

- JUNO detector located in Jiangmen city, Guangdong, China
- Underground detector buried 700 m (~2000 m.w.e.)
- JUNO composed of 3 parts:
  - Central Detector (CD)
  - Water Pool (WP)
  - Top Tracker (TT)
- WP & TT primarily for atm. \(\mu\) veto
- JUNO Experiment Goals:
  - determine \(\nu\) mass ordering
  - precision \(\nu\) osc. measurements
  - detect cosmological and geo \(\nu\)
- Data taking to start in 2021

The Top Tracker

- Top Tracker built from OPERA’s Target Tracker \cite{2} walls
- TT placed on top of WP, covering about 60% of area above WP
- TT composed of 63 walls:
  - Placed horizontally in 3 layers
  - Disposed in a \(7 \times 3\) grid
- TT purpose:
  - Study of cosmogenic background (\(^6\text{Li}, ^4\text{He}\))
  - veto atm. muons crossing JUNO when muons have short tracks in WP
  - Precisely reconstruct \(\mu\) tracks to use for CD/WP calibration

Mechanical Structure

- New support structure required to use modules horizontally
- Walls will be installed individually with a crane

Current Status of the Top Tracker Modules

- TT walls arrived to China: July 2017
- Currently stored at warehouse where PMT testing done
- Some TT walls taking data with OPERA electronics for monitoring while JUNO’s being development
- no noticeable ageing of scintillator

Top Tracker Wall

- Trigger goal: reduce rate by \(\sim 50\%\)
- charge readout: \(8–15\) \(\mu\)s
- Permanent Fast OR Trigger
- Trigger done in 2 steps:
  - L1: required at least \(X–Y\) hits
  - L2: select “aligned” triggers from several walls

Expected Rates from JUNO Simulation

- TT \(\mu\) amplitudes before and after correction
- Hit Rate sent to Concentrator Card per PMT (kHz)
- Preliminary
- LNGS/Italy
- China

Reference