Cosmic and atmospheric background stability with (stopping) muons in the SoLid experiment

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on behalf of the SoLid collaboration

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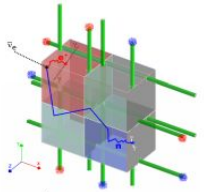
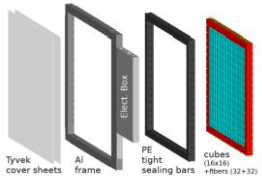
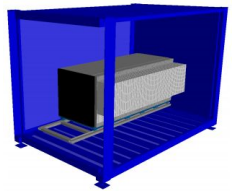
SoLid

SoLid
Phase 1 detector

- 12800 Cubes
  - PVT → EMs (e/γ/μ)
  - ^{6}LiF:ZnS(Ag) → neutrons
- 50 Planes
  - 16x16 cubes
  - 64 wavelength shifting fibres
  - Fibres read out with SiPMs
- Detector
  - 5 modules of 10 planes each
  - Cooled to 5-10℃
- Goals
  - Measure neutrino oscillations at a 5-10m baseline
  - Measure ^{235}U anti-neutrino energy spectrum







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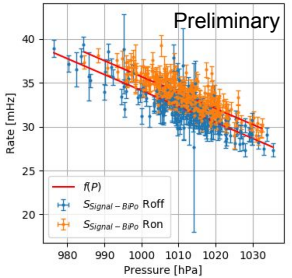
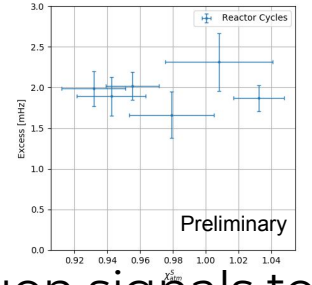
Analysis
Atmospheric Background

- Cosmic particles are the main source of background for reactor neutrino experiments with low overburden
  - The IBD selection ($S_{Signal - BiPo}$) is parametrized with the atmospheric pressure
  - Subtract reactor on from reactor off to get IBD excess
  - Define independent atmospheric selection (S_{atm})
  - Ratio between reactor on and off (χ^{S}_{atm}) gives atmospheric asymmetry for each reactor cycle
    ⇨ **excess is stable**

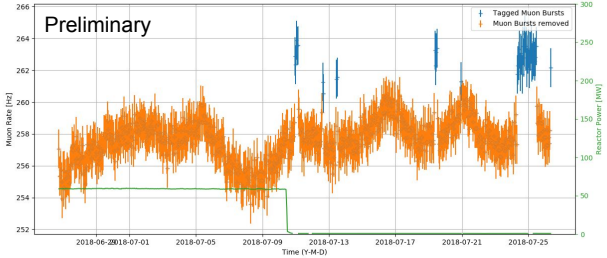




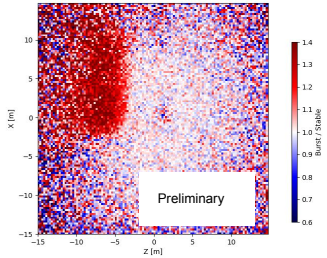
- Check the stability of the background with muon signals too

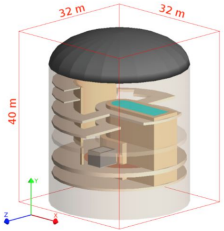
Stability
Muon Trending

- Muon rate variations due to changes in atmospheric conditions
  - Also sudden bursts are observed



- SoLid detector is perfectly fit for muon tomography
  - Bursts are due to drainage of reactor pool





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