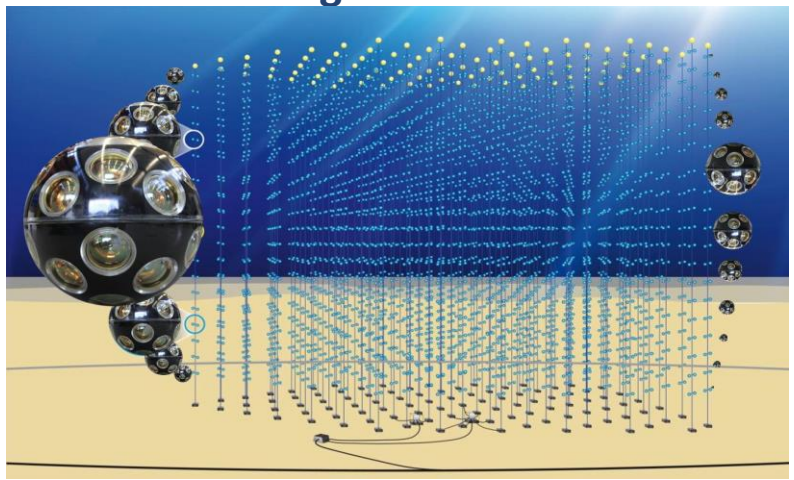
Analysis of vertex-contained high energy neutrino events for the KM3NeT/ARCA detector.

KM3NeT/ARCA:

- Currently under construction.
- 2 Building blocks.
- 115 DUs per block.
- 18 DOMs pre DU.
- 31 3'' PMTs + electronics per DOM.
- **Excellent angular resolution**.



Astrophysical ν flux:

$\Phi = 2.3 \cdot 10^{-18} \left(\frac{E_\nu}{100\ \mathrm{TeV}}\right)^{-2.5}$ GeV^{-1} · cm^{-2} · s^{-1} · sr^{-1}.

Atmospheric ν fluxes: Honda + Enberg.

Atmospheric muons with MUPAGE.

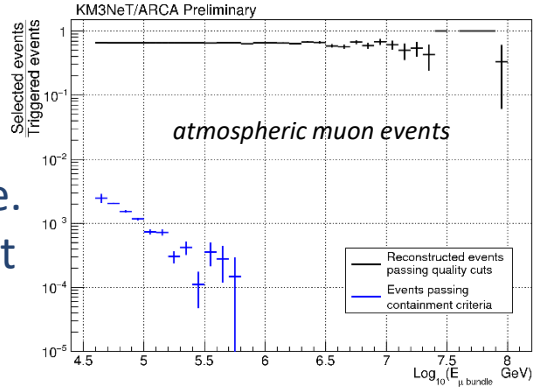
High Energy Starting Track (HEST) Analysis

Event Selection:

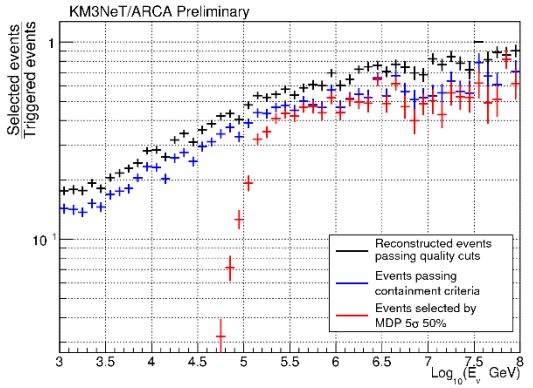
- Well reconstructed tracks.
- Events with reconstructed vertex inside a fiducial volume.
- Final step - BDT using 10 event based variables.

➢ High rejection power on incoming events

➢ High efficiency on truly contained events.



Ratio of the number of events surviving each of the selection requirements over the number of triggered events with respect to E_{bundle}



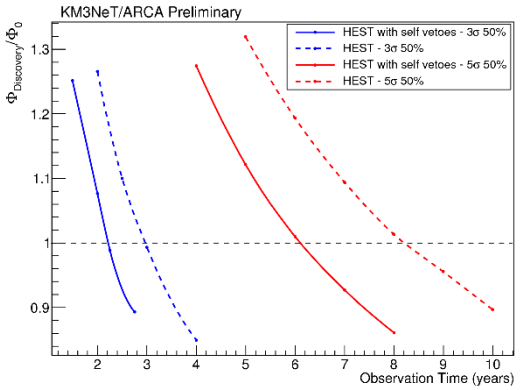
Ratio of the number of events surviving each cut over the number of triggered events for ν_μ and $\overline{\nu_\mu}$ with respect to true E_ν

Discovery potential:

- MDP minimization.
- Cut and count approach.

Exploring self vetoes:

- CORSIKA sample (downgoing atmospheric showers).
- **Practically all** ν accompanied by μ eliminated.
- **32% reduction of total ν background**.



Ratio of the discovery flux normalization factor over Φ_0 for 3σ (blue) and 5σ (red) with 50% probability with respect to the observation time in years.

Analysis of vertex-contained high energy neutrino events for the KM3NeT/ARCA detector.

Contained shower sample

Event Selection:

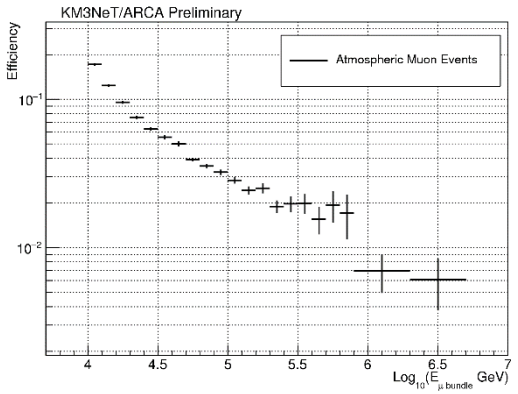
- Well reconstructed showers with the reconstructed vertex inside the detector volume.
- Differentiation of shower events from tracks based on the event topology.
- Final step - BDT using 12 event based variables.

➢ High rejection power on track-like events

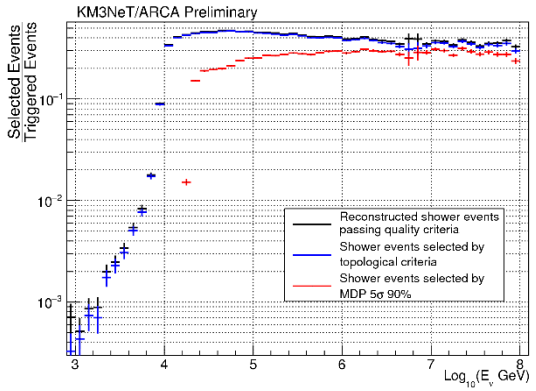
➢ High efficiency on true shower events.

Discovery potential:

- MDP minimization.
- Cut and count approach.



Efficiency of the selection criteria with respect to events characterized as well reconstructed for atmospheric muon events.

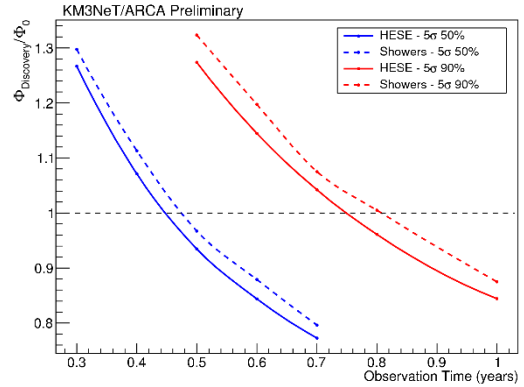


Ratio of number of events surviving each cut over the number of triggered events for all true showers events with respect to the true E_ν

High Energy Starting Events (HESE) Analysis

Combining HEST with contained shower events

- **5σ discovery with 50% probability in 0.5 years.**
- **5σ discovery with 90% probability in 0.8 years:**
  HEST: > 92% correct identification
  Shower-like events: > 85% correct identification



Ratio of the discovery flux normalization factor over Φ_0 for 5σ with 50% probability (blue) and 90% probability (red), as a function of the observation time in years. Solid lines: HESE analysis, dashed lines: only the shower sample.