Baikal-GVD

Gigaton Volume Detector

Neutrino Telescope

a novel tool for neutrino astronomy

Yury Malyshkin, on behalf of the Baikal-GVD collaboration

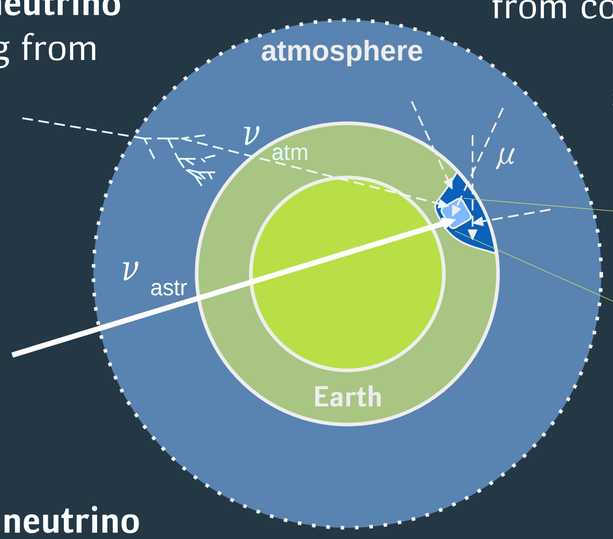
Purpose

Observe TeV-PeV neutrino of astrophysical origin and identify their sources.

Signal and backgrounds

Atmospheric neutrino also originating from cosmic rays – irreducable background

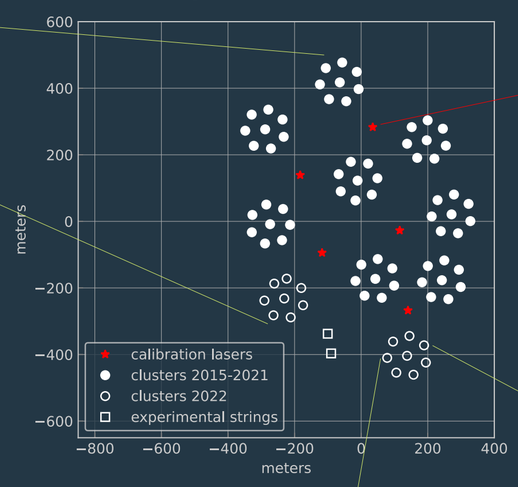
Muons originating from cosmic rays – directional suppression



Astrophysical neutrino

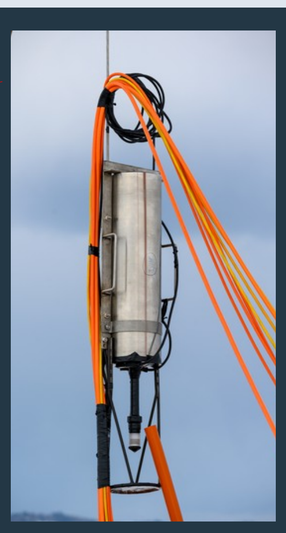
- Excess over predicted atmospheric neutrino flux
- Directional and temporal correlation with astrophysical objects and events seen by other detectors

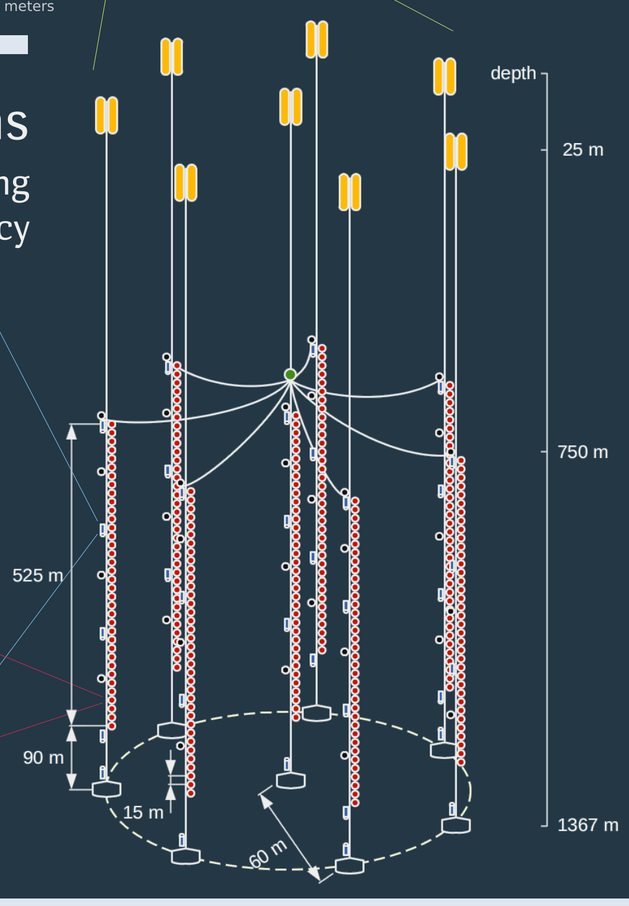
Telescope structure (2022, top view)



Lasers

measurement of water optical properties, calibrations





2022: 10 clusters
2025: 16 clusters

Each cluster:
8 strings

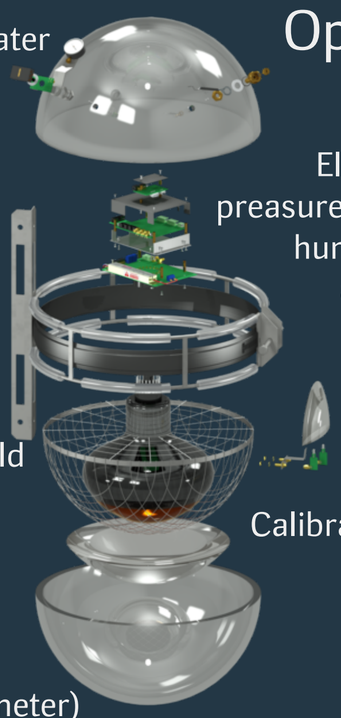
Each string:
36 optical modules
4-5 acoustic modules

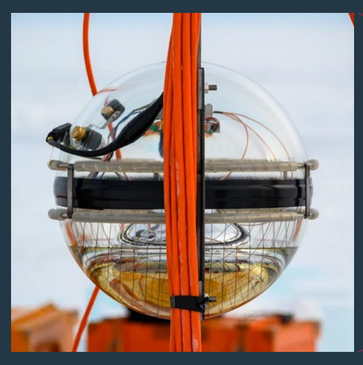
+ 2 experimental strings
+ 5 calibration lasers

~ 3000 optical modules
~ 350 acoustic modems

Time precision:
~2 ns within cluster
~4 ns between clusters

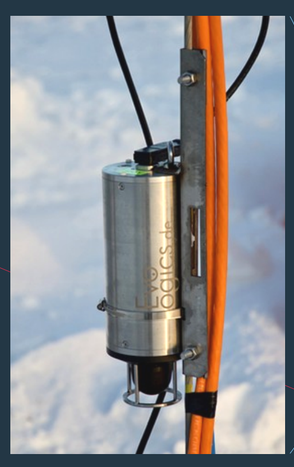
Optical modules





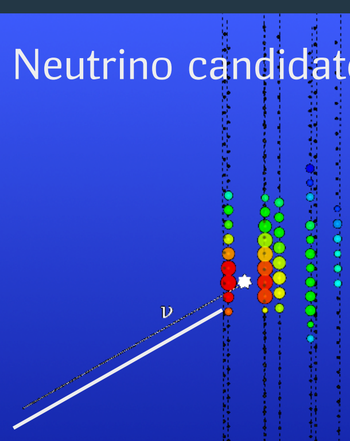
Acoustic modems

provide real-time positioning with 20-30 cm accuracy



Selected results

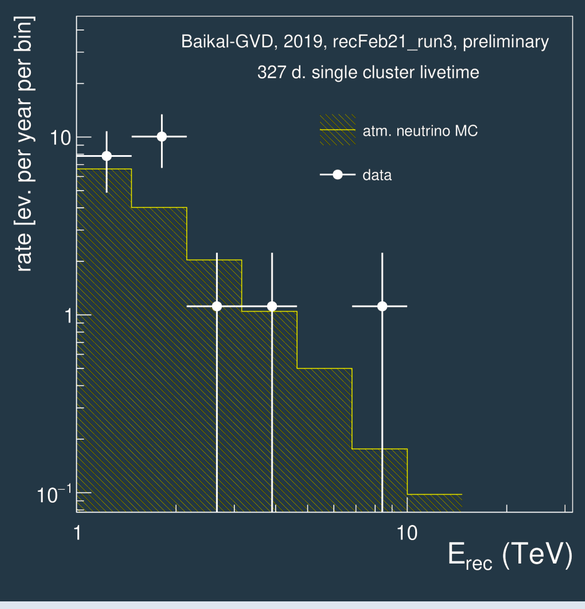
Neutrino candidate event



energy: 91 TeV
date: 23.05.2019
cluster: 1
code name: GVD2019_1_114_N

Track-like event spectrum

[V.A. Allakhverdyan et al., PoS ICRC2021 1177 (2021)]



Cascade events (neutrino candidates, 2018-2020 Baikal-GVD data)

[Igor Belolaptikov et al., PoS ICRC2021 002 (2021)]