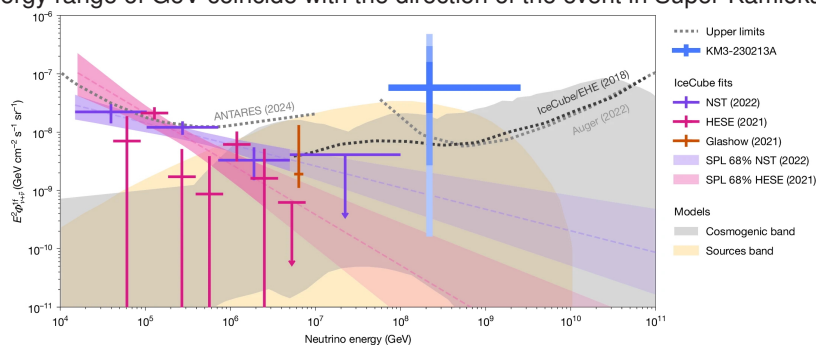


1. Introduction

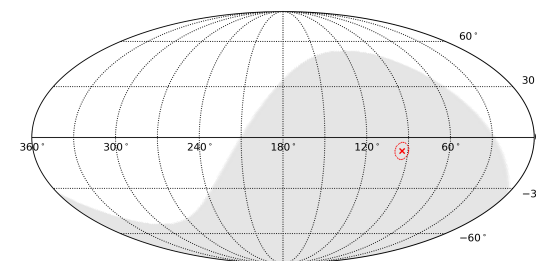
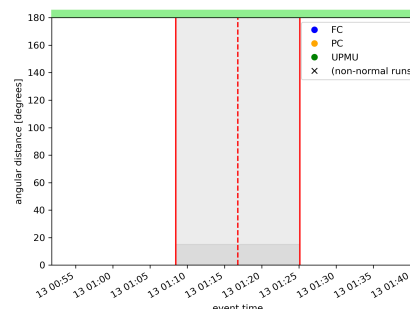
- 2023/02/13 01:16:47 UTC, KM3NeT ARCA detector observed an extremely high-energy astrophysical neutrino, with estimated energy 220^{+570}_{-110} PeV, which is the neutrino with the highest energy that has ever been observed.
- The origin of this neutrino is still unknown: either it is from a different kind of accelerator source, or the it indicate the first evidence of cosmogenic neutrino.
- This study assumes a point source origin for this event, and looks for excess of neutrino in the energy range of GeV coincide with the direction of the event in Super-Kamiokande.



Reproduced from KM3NeT Collaboration [1].

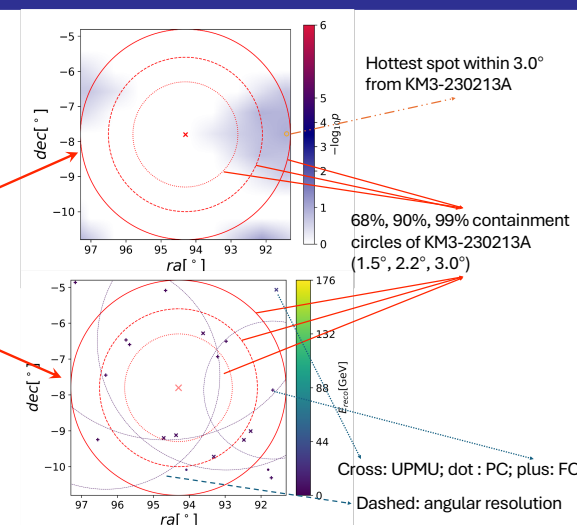
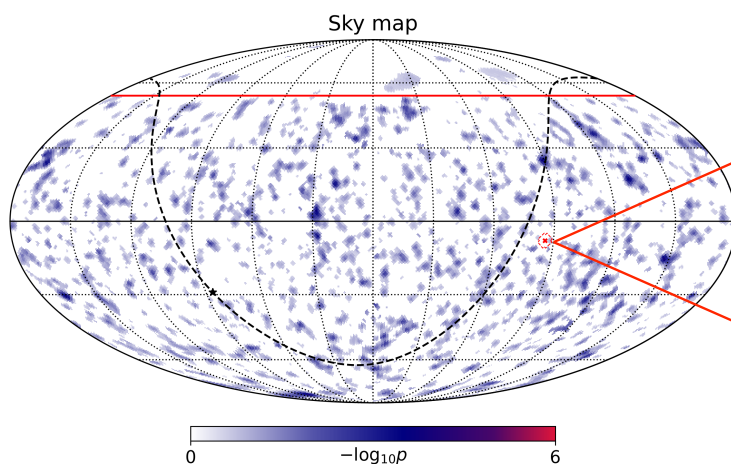
2. Follow-up Search

- Search for neutrino event coincident with KM3-230213A in time in SK.
- Time window: $\pm 500s$ at MJD=59988.05
- FC: visible $E > 30.0$ MeV; PC: visible $E > 350.0$ MeV; UPMU: fit momentum > 1.6 GeV or fit length > 700 cm.
- Time window is in normal run with no dead time. Live time is 1000s.
- Direction of KM3-230213A is in UMPU sensitive region 100% in time window.
- No event from any sample is observed in this time window.



3. Time-integrated Point Source Search

- Search for continuous excess of neutrino from the KM3-230213A direction in SK data.
- Data: SK-I to SK-V, 1996/05-2019/07, 6619.1 days of live time
- Fully contained (FC): visible $E > 3.5$ GeV; partially contained(PC): visible $E > 1.0$ GeV; upward-going muon (UPMU): fit momentum > 1.6 GeV or fit length > 700 cm.
- Search uses unbinned maximum likelihood. Test statistics is calculated for background fluctuation rejection. P value is obtained from trials with toy Monte Carlo.
- No significant excess regarding atmospheric neutrino is found at this direction.
- Neutrino flux upper limit $\Phi_{1\text{GeV}}^{90\text{CL}}$ is set to $5.8 \times 10^{-8} \text{ GeV}^{-1} \text{ cm}^{-2} \text{ s}^{-1}$ for power spectrum assuming spectral index γ is $2 \left(\frac{d\Phi}{dE_\nu} = \Phi_{1\text{GeV}}^{90\text{CL}} \left[\frac{E_\nu}{1\text{GeV}} \right]^{-2} \right)$.



REFERENCES