

Neutrino Target-of-Opportunity Observations with Space-based and Suborbital Optical Cherenkov Detectors

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Executive Summary

Cosmic-ray accelerators capable of reaching ultra-high energies are expected to also produce very-high energy neutrinos via hadronic interactions within the source or its surrounding environment. Many of the candidate astrophysical source classes are either transient by nature or exhibit flaring activity; hence, Target-of-Opportunity observations will play a central role within the emerging multimessenger landscape for the coming era and beyond.

Using the Earth as a neutrino converter, suborbital and space-based optical Cherenkov detectors, such as EUSO-SPB2 and POEMMA, will be able to detect upward-moving extensive air showers induced by decay tau-leptons generated from cosmic tau neutrinos with energies ~ 10 PeV and above. Both EUSO-SPB2 and POEMMA will be able to quickly repoint, enabling rapid response to astrophysical transient events.

In this poster, we calculate the transient sensitivity and sky coverage for both EUSO-SPB2 and POEMMA, accounting for constraints imposed by the Sun and the Moon on the observation time. We also calculate both detectors' neutrino horizons for a variety of modeled astrophysical neutrino fluences. We find that both EUSO-SPB2 and POEMMA will achieve transient sensitivities at the level of modeled neutrino fluences for nearby sources. We conclude with a discussion of the prospects of each mission detecting at least one transient event for various modeled astrophysical neutrino sources.

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