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KM3NeT/ARCA stacking search for high-energy neutrinos from blazars

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Blazars are promising targets for neutrino astronomy, as highlighted by IceCube's identification of TXS 0506+056 as a cosmic neutrino source candidate. High-frequency-peaked BL Lacs (HBLs), a subclass of blazars, stand out due to their distinctive high-energy emission properties. Therefore, HBLs are promising candidates for the production of high-energy neutrinos. Such neutrinos could be detected by KM3NeT/ARCA, a next-generation deep-sea Cherenkov detector under construction in the Mediterranean Sea. Once completed, KM3NeT/ARCA will feature a cubic-kilometer detection volume capable of observing neutrinos across a wide energy range, from 100 GeV to multi-PeV. Its modular design ensures that partial operation and data acquisition are possible even during construction.

This contribution presents a binned likelihood stacking analysis framework to investigate high-energy neutrino emissions from HBLs using KM3NeT/ARCA data. The approach combines advanced statistical techniques with theoretical blazar models developed using the LeHa-Paris code. These models simulate the complex proton-photon interactions and radiative processes responsible for neutrino production, providing precise predictions of the resulting neutrino spectra. This particular analysis searches for cumulative (stacked) neutrino signals by comparing theoretical expectations with observational data for a subsample of HBLs from the 3HSP Catalogue. The aim of a stacking analysis is to increase the neutrino detection sensitivity, that may not be reached from individual sources alone.

Collaboration(s)

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