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# Stacking search for KM3NeT/ARCA neutrinos using theoretical blazar models

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Following IceCube's identification of the blazar TXS 0506+056 as the first cosmic neutrino source candidate, blazars have emerged as some of the most promising neutrino source classes. This research area is set to advance significantly with the advent of next-generation neutrino telescopes like KM3NeT/ARCA, a deep-sea Cherenkov neutrino telescope currently under construction in the Mediterranean Sea. When completed, KM3NeT/ARCA will encompass a volume of one cubic kilometer and detect neutrinos across a wide energy range, from 100 GeV to multi-PeV. Its modular design allows partial detector operation even during construction. This study introduces a novel framework that integrates theoretical blazar models—developed using the LeHa-Paris code—into binned likelihood stacking analyses based on KM3NeT/ARCA's data. These models simulate proton-photon interactions and associated radiative processes, employing sophisticated numerical methods to predict neutrino spectra accurately. In parallel, advanced statistical likelihood techniques are being developed to distinguish neutrino signals from background noise. By combining theoretical blazar models with statistical analyses, this methodology aims to enhance the sensitivity of neutrino searches across different blazar subclasses with a particular focus on High-frequency-peaked BL Lacs (HBLs), known for their distinctive emission properties. This approach provides a critical step toward unveiling the connection between photon and neutrino emissions from astrophysical sources, providing insights into the fundamental processes driving high-energy phenomena in the universe.

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