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Search for Neutrinos from the Galactic 4FGL Sources with the Pion-bump Signature with IceCube

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The IceCube Neutrino Observatory, located at the South Pole, covers a cubic kilometer of Antarctic ice, designed to detect astrophysical neutrinos in the TeV-PeV energy range. While IceCube has recently identified a diffuse flux of neutrinos originating from the Galactic Plane, specific sources of astrophysical neutrinos within the Milky Way remain elusive. Hadronic gamma-rays, produced through the decay of neutral pions, display a characteristic “pion bump” or “spectral break” around 200 MeV. Recent studies by the Fermi-LAT Collaboration highlight 56 sources from the 4FGL Catalog exhibiting a spectral break in the MeV energy range. Detecting astrophysical neutrinos from these sources would provide compelling evidence for cosmic-ray acceleration in their vicinity. In this analysis, we search for astrophysical neutrino emission from 56 sources showing characteristics of a pion bump using 13 years of IceCube data. Our findings could enhance our understanding of potential cosmic-ray acceleration sites in the galaxy.

Collaboration(s)

IceCube

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