

Diffuse gamma-ray and neutrino background from Galactic Ridge

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We show that the IceCube observation of the Galactic neutrino flux component confirms the hint of detection of neutrinos from the Galactic Ridge (the inner part of the Milky Way disk within the Galactic longitude $|l| < 30$ degrees), previously reported by the ANTARES collaboration. This confirmation indicates that the bulk of the high-energy flux from the Galactic Ridge in multi-TeV band is produced by interactions of high-energy protons and atomic nuclei, rather than electrons. We show that both ANTARES and IceCube measurements agree with the Fermi-LAT telescope measurements of the gamma-ray emission from the Ridge. The multi-messenger (neutrino plus gamma-ray) spectrum of the Ridge over a broad energy range from 10 GeV to 10 TeV is consistent with a model of pion decay emission produced by a power-law distribution of protons with a slope $\Gamma \sim 2.5$, harder than that of the locally observed cosmic ray spectrum. This provides for the first time an unambiguous multi-messenger demonstration of the variability of the spectrum of cosmic rays across the Galactic disk.

<https://arxiv.org/pdf/2307.07978.pdf>

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