

Multi-Wavelength Study of Blazar PKS 0446+11 in connection with IceCube Neutrino Event IC240105A

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We present a multi-wavelength study of the flat-spectrum radio quasar PKS 0446+11, located within the 90% localization region of the IceCube track-like neutrino event IC240105A, detected on 2024-01-05. Although no significant neutrino excess was found, PKS 0446+11 exhibited a major gamma-ray flare in late 2023 and remained X-ray bright in early 2024, suggesting temporally relevant activity. We performed broadband spectral energy distribution (SED) modeling using both leptonic and lepto-hadronic scenarios. The observed gamma-ray and X-ray emissions are best reproduced by a leptonic model involving external Compton scattering of photons from the broad-line region and dusty torus. In contrast, the lepto-hadronic model could not fully account for the observed SED, although cascade emission from hadronic interactions broadly covers the X-ray and gamma-ray bands at lower flux levels. We also estimate the expected neutrino flux, which peaks at energies beyond IceCube's optimal sensitivity range. The non-detection thus provides meaningful upper limits that help constrain neutrino production models.

These results highlight the importance of continued multi-wavelength and neutrino monitoring to better understand the physical conditions under which blazars may serve as neutrino sources

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