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Active galactic nuclei as neutrino sources in the PeV and EeV regimes

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Active galactic nuclei (AGNs) are amongst the most promising neutrino source candidates, due to their potential to accelerate cosmic rays in their relativistic jets. The IceCube observatory has already detected several events from the direction of known gamma-ray blazar AGNs, like TXS 0506+056 and, more recently, PKS 1502+106. Through numerical modeling, we can show that neutrino emission is compatible with the available multi-wavelength observations from these sources. By generalizing these models, we can show that the diffuse IceCube flux can, under certain conditions, be fully explained by low-luminosity BL Lacs, while the contribution from bright gamma-ray quasars is severely constrained by the IceCube limits. On the other hand, it is also possible that AGNs accelerate cosmic rays up to ultra-high energies. In that scenario, detailed modeling shows that the AGN population can produce large fluxes EeV neutrinos, while still obeying the current IceCube stacking limits in the PeV regime. I will also argue that the flux of EeV neutrinos produced inside AGN jets can outshine the cosmogenic contribution, which has important implications for the search strategy of future radio neutrino telescopes.

Keywords

AGN; blazars; IceCube neutrinos; leptohadronic models; multi-messenger connection; TXS 0506+056; PKS 1502+106

Collaboration

other Collaboration

Subcategory

Theoretical Results

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