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High-Energy Gamma Rays and Neutrinos from Nearby Radio Galaxies

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Radio Galaxies are the most likely class of sources for the diffuse flux of high-energy neutrinos reported by the IceCube Collaboration as suggested by multi-messenger data. Here, the gamma-ray spectrum from four nearby radio galaxies (Centaurus A, PKS 0625-35, NGC 1275, and IC 310) is analyzed in order to constrain the spectral shape and intensity of their respective injected emission. Our analysis handles gamma ray propagation though galactic and extragalactic environments accounting for the effects of electromagnetic cascades. Assuming interactions of cosmic ray protons with gas are the origin of this gamma-ray emission, we calculate the resulting neutrino flux for the selected sources. While the predicted neutrino fluxes are consistent with constraints published by the IceCube and ANTARES Collaborations, they consistently fall within an order of magnitude below the current point source sensitivity. The prospects appear very encouraging for the future detection of neutrino emission from the nearest radio galaxies.predicted from each of these sources. Although this scenario is consistent with the constraints published by the IceCube and ANTARES Collaborations, the predicted fluxes consistently fall within an order of magnitude of the current point source sensitivity. The prospects appear very encouraging for the future detection of neutrino emission from the nearest radio galaxies.

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