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Exploring the privileged status of TXS 0506+056 as an emitter of astrophysical neutrinos

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Among the various categories of AGN, blazars, and especially BL-Lacs, are the prime candidate sources of TeV astrophysical neutrinos, due to their high luminosity
at very high-energy (VHE) range, and high and frequent activity periods. In their flaring state, non-thermal emission is expected through the Synchrotron Self-Compton (SSC) of the electron populations, however a contribution related to protons is also expected through the photopion interaction, releasing neutrino and gamma rays in the process.

We present the annually and semi-annually binned differential fluxes of 3 blazars: TXS 0506+056, OP 313 and Mkn 421, over the entire observation period of the Fermi experiment (3FGL catalog). We extrapolate the emission to higher energies (looking at the spectral features), obtain the expected corresponding neutrino fluxes (under the hypothesis of fully hadronic emission) and compare them with the point-source sensitivity of IceCube neutrino telescope. While Mkn 421 is a well monitored and relatively close BL-Lac, OP 313 and TXS 0506+056 were selected due to their similar characteristics and spatial coincidence with the direction of two extraterrestrial neutrino track events in IceCube. The latter-most has also been reported by Fermi and MAGIC to have been observed in a flaring state during the time of the spatially coincident neutrino event of IceCube. We calculate the duty cycles and the total power emitted during the flaring states for these sources, and show that although being sensitive to all three sources during their active states, IceCube does not observe the expected neutrino signal from OP 313 and Mkn 421 during their flares while TXS 0506+056 seems to show a positive multi-wavelength correlation. Possible reasons for this unique correlation are also discussed.

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