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Photo-Hadronically Produced IceCube Neutrinos from TXS 0506+056?

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We present a systematic study of the feasibility of photo-hadronic production of IceCube neutrinos in the jet of the BL Lac object TXS 0506+056 during the extended 2014 - 2015 neutrino flare. Starting with the measured neutrino flux and spectrum, we study the effect of electromagnetic cascades initiated by pion decay, necessarily accompanying neutrino production. Depending on the relative energy densities of the co-moving target photon fields and the magnetic field, these cascades can either be synchrotron or Compton dominated. We find that the synchrotron-dominated case can be ruled out by existing observational constraints from TXS 0506+056, while in the case of Compton dominated cascades, the opacity of the emission region to gamma-gamma absorption is so high that any emanating gamma-ray flux is expected to be far below the observed Fermi spectrum. A further study of possible target photons for such a scenario indicates that it requires a UV - X-ray target photon field that is stationary in the rest frame of the AGN.

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