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On the direct correlation between gamma-rays and PeV neutrinos from blazars

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We study the frequently used assumption in multi-messenger astrophysics that the gamma-ray and neutrino fluxes are directly connected because they are assumed to be produced by the same photohadronic production chain. An interesting candidate source for this test is the flat-spectrum radio quasar PKS B1424-418, which recently called attention of a potential correlation between an IceCube PeV-neutrino event and its burst phase. We simulate both the multi-waveband photon and the neutrino emission from this source using a self-consistent radiation model. We demonstrate that a simple hadronic model cannot adequately describe the spectral energy distribution for this source, but a lepto-hadronic model with sub-dominant hadronic component can reproduce the multi-waveband photon spectrum observed during various activity phases of the blazar. As a conclusion, up to about 0.3 neutrino events may coincide with the burst, which implies that the leptonic contribution dominates in the relevant energy band. We also demonstrate that the time-wise correlation between the neutrino event and burst phase is weak.

Primary author(s) : Dr. GAO, Shan (DESY)

Co-author(s) : Prof. POHL, Martin (DESY and U Potsdam); Prof. WINTER, Walter (DESY)

Presenter(s) : Dr. GAO, Shan (DESY)

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