Variability of Active Galactic Nuclei at Very High Energy with H.E.S.S. : the flaring activity of PKS 2022-077 in 2016 and 2017

G. Emery
Sorbonne Université, Université Paris Diderot, Sorbonne Paris Cité, CNRS/IN2P3, Laboratoire de Physique Nucléaire et de Hautes Energies, LPNHE, 4 Place Jussieu, F-75252 Paris, France

Active Galactic Nuclei (AGN) are powerful photon and particle emitters located at the center of some galaxies. Emissions from AGNs are powered by the accretion of matter on a central super massive black hole. In some AGNs, a fraction of the infalling matter is ejected in a relativistic jet. This jet is a beam of particles moving at speeds close to the speed of light. Emissions by particles in the jet are concentrated in the jet direction by relativistic effects. Hence, high energy emissions can only be observed if the jet point in Earth direction.
PKS 2022-077 is a Flat Spectrum Radio Quasar, a sub-category of AGN, located at a redshift z=1.388, farther than any source currently detected at Very High Energy (VHE, E>100 GeV). At such energies, absorption by the Extragalactic Background Light (EBL) renders the detection of distant sources particularly challenging. The High Energy Stereoscopic System (H.E.S.S.) observed the source following reports from AGILE (April 2016) and Fermi-LAT (April 2016, October and November 2017) on high flux states in gamma-rays. The H.E.S.S. experiment is an array of Cherenkov telescopes located in Namibia. This experiment is designed to indirectly detect VHE photons reaching Earth atmosphere over a large effective area. During each of the three flaring periods, near-simultaneous observations were obtained with H.E.S.S., Fermi-LAT and multiple telescopes at other wavelengths. Though the source was not significantly detected by H.E.S.S., upper limits were derived for each observation period. Through constraints given by Fermi-LAT in the MeV-GeV domain and upper limits by H.E.S.S., we searched for an intrinsic cutoff in the EBL corrected gamma-ray spectrum of PKS 2022-077.

Key words : High energy astrophysics, Black Holes