



Contribution ID: 112

Type: **Poster**

An upgraded way to identify sources of ultra-high-energy photons from astrophysical flares

Thursday, 20 February 2025 19:20 (5 minutes)

Identifying sources of ultra-high-energy (UHE) particles is one of the key tasks to understand our non-thermal universe in the extreme energy scales. Flares from some astrophysical objects are one of the prominent candidates for producing such UHE particles. The search for sources of UHE neutral particles is easier than for those of UHE charged particles, as the neutrals are not affected by magnetic fields and thus may be detected as groups of clustered events, correlated temporally and directionally. We present the stacking method, which is an upgrade to the standard unbinned likelihood method by including a time-clustering algorithm, to search for space-time clustering of UHE photons through studies of extensive air showers on Earth. We also include an additional factor to discriminate between the signal (photon-initiated events) and the background (hadron-initiated events), termed as photon tag, based on the probability distribution functions of these events. We demonstrate the effectiveness of the stacking method supplemented with the photon tag in correctly identifying the number of flares and their durations within the given data. We also highlight the robustness of this method in determining a flare as it requires only a few events for its process. This upgraded method can further help in our search for cosmic ray sources by either identifying them or improving the detection limits of the UHE photon fluxes.

Primary author: Dr PRIYADARSHI, Chaitanya (Instytut Fizyki Jadrowej PAN, Kraków)

Co-authors: Dr STASIELAK, Jarosław (Instytut Fizyki Jadrowej PAN, Kraków); Prof. GÓRA, Dariusz (Instytut Fizyki Jadrowej PAN, Kraków); Dr BORODAI, Nataliia (Instytut Fizyki Jadrowej PAN, Kraków); Dr NIECHCIOL, Marcus (Center for Particle Physics Siegen, University of Siegen)

Presenter: Dr PRIYADARSHI, Chaitanya (Instytut Fizyki Jadrowej PAN, Kraków)

Session Classification: Reception and poster session

Track Classification: Cosmic Rays