

## **Seminarium Astrofizyczne**

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### **Investigating ultra-high energy cosmic rays with gamma-ray telescopes**

The observation of ultra-high energy cosmic rays (UHECR -  $10^{18}$  eV and beyond) has opened a new window on the non-thermal Universe, providing us with new insights about the physical processes occurring at the highest energies. Nevertheless, despite decades of measurements by state-of-the-art experiments, many questions remain to be answered. How are these particles produced and what are they made of? Which mechanism(s) are responsible for their tremendous energy and what propagation effects are they affected by? To answer these fundamental questions, one may search for messengers such as UHE photons and neutrinos that are associated with UHECR phenomena. In this endeavor, a multi-messenger strategy is strongly encouraged and gamma-ray astronomy has a role to play in it. Indeed, we will show that gamma-ray telescopes used in a non-standard mode of observation are capable of detecting UHE photons with energies well beyond the standard energies studied (GeV-TeV). After briefly introducing the paradigms of UHECR astronomy and the physics of atmospheric air showers, we will discuss how UHE photons may be observed by gamma-ray telescopes, taking the example of the future Cherenkov Telescope Array in La Palma, Spain, and how machine learning tools help us identify them as their signal is hidden in the pervading low-energy cosmic-ray background.

Serdecznie zapraszam,  
Agnieszka Majczyna