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Multi-messengers at ultra-high energies with the Pierre Auger Observatory

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The Pierre Auger Observatory (PAO) is an Ultra High Energy Cosmic Rays (UHECRs) detector studying cosmic particles with energies above and around 10^{18} eV since almost 20 years. It has proved to be the most competitive instrument at these energies and has produced a wealth of valuable results, improving our understanding of UHECRs.

A complete understanding of these highest energy particles is crucial to understand the extreme astrophysical events in which they are produced and accelerated, as well as their propagation to Earth.

In the same range of energies, UHE photons and neutrinos are of paramount importance as, being electrically neutral, they point back to their origin while charged particles are deflected in the galactic and extragalactic magnetic fields.

The flux of extragalactic photons, neutrinos and cosmic rays are believed to be highly linked, by their origin and their interactions. Each messenger provides different information about the potential sources, and having detection means for all four messengers, including gravitational waves, allows us to shed light on energetic sources of astroparticles.

The PAO benefits from a large exposure and a good angular resolution, and is efficient in detecting UHE photons and neutrinos. These performances make possible the follow-up searches for events detected by gravitational waves, such as the binary mergers observed by the LIGO/Virgo detectors, or any other energetic sources of particles.

Choix de session parallèle

2.1 Ondes gravitationnelles et contreparties électromagnétiques

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