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Searches for ultra-high-energy photons with the Pierre Auger Observatory: Current status and future perspectives

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Despite being known for several decades now, the origin of cosmic rays in the ultra-high-energy (UHE, $E > 10^{17}$ eV) region remains uncertain, owing to the rapidly diminishing particle flux and magnetic deflection. The possibility of detecting UHE neutral particles, among them photons, produced in close proximity to the source regions of UHE cosmic rays would provide an opportunity to trace their origin and evaluate current models of their propagation. Moreover, UHE photons are also theorized to be emitted during transient events, offering an additional channel to further study these complex astrophysical processes in the context of multimessenger astronomy. Giant air shower arrays, such as the Pierre Auger Observatory, are primarily designed to effectively observe cosmic rays at the highest energies. However, they are also capable of reliably detecting UHE photons, providing an unparalleled exposure to these events. The diverse detector systems of the Observatory have been utilized to place stringent, world-leading upper limits on the diffuse, i.e. the direction-independent, unresolved, integral flux of UHE photons across several orders of magnitude in energy. In addition to these, there have also been efforts focussing on directional searches. This contribution aims to provide an overview of the most recent UHE photon searches by the Pierre Auger Collaboration, while also discussing future perspectives in view of the ongoing AugerPrime detector upgrade, which will further enhance the sensitivity of the Observatory to UHE photons.

Internet talk

No

Is this an abstract from experimental collaboration?

Yes

Name of experiment and experimental site

Pierre Auger Observatory / Pierre Auger Collaboration

Is the speaker for that presentation defined?

Yes

Details

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