

Photon decay in UHE air showers: a stringent bound on Lorentz violation

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In extensive air showers induced by ultra-high energy (UHE) cosmic rays, secondary photons are expected to be produced at energies far above those accessible by other means. It has been shown that the decay of such photons, as possible in certain theories allowing the violation of Lorentz invariance, can lead to significant changes of the shower development. Based on observations of the average depth of shower maximum $\langle X_{\max} \rangle$, a stringent bound on the violation of Lorentz invariance has been placed in a previous work. In this contribution, we include the shower-to-shower fluctuations $\sigma(X_{\max})$ as an additional observable. The combined comparison of $\langle X_{\max} \rangle$ and $\sigma(X_{\max})$ to shower observations allows a much stricter test of the possible decay of UHE photons, improving the existing bound by a factor 50.

Keywords

Lorentz-violation; UHE air showers; cosmic rays; photon decay; CONEX

Collaboration

other Collaboration

Subcategory

Experimental Results

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