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Simulation study of shower profiles from ultra-high energy cosmic rays

The identification of the primary particle type can provide important clues about the origin of ultra-high energy (UHE) cosmic rays above 10^{18} eV.
The depth of shower maximum of the air shower profile offers a good discrimination between different primaries. This observable, which was recently used to obtain a limit to photons from data taken by the Pierre Auger Observatory, is usually extracted from a fit to the observed shower profile.
We study the fit quality that is obtained with different functional forms for simulated shower profiles of nuclear and photon primaries. The impact of the functional form on the extrapolation to non-observed parts of the profile is commented on.
We also investigate to what extent additional profile parameters such as the width of the profile or a reconstructed "first interaction" of the cascade can be exploited to improve the discrimination between the primaries.

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