

# Mass composition of ultra-high-energy cosmic rays: latest results from the Pierre Auger Observatory

*Saturday 20 July 2024 08:50 (20 minutes)*

The mass composition of ultra-high-energy cosmic rays (UHECR) is the key input in searches for new physics, understanding the astrophysical processes and hadronic interactions at extreme center-of-mass energies exceeding 400 TeV. At the Pierre Auger Observatory, the largest UHECR observatory ever built, accurate inferences on the UHECR mass composition were recently extended up to cosmic-ray energies of 100 EeV. This breakthrough became possible thanks to the application of machine learning for the estimation of the depth of the maximum of air-shower profiles on an event-by-event basis from the Surface Detector data. Our new findings include the indications of the changes in the mass compositions correlated with the three features of the energy spectrum (ankle, instep, steepening) and hadronic-model independent evidence of heavy and nearly pure primary beam for  $E > 50$  EeV. We discuss the implications of these findings for the astrophysical and hadronic interaction models.

## Alternate track

### I read the instructions above

Yes

**Author:** FITOUSSI, Thomas (IAP - KIT)

**Co-author:** SANTOS, Eva

**Presenter:** FITOUSSI, Thomas (IAP - KIT)

**Session Classification:** Astro-particle Physics and Cosmology

**Track Classification:** 08. Astro-particle Physics and Cosmology