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Observations of Ultra-High-Energy Cosmic Rays

Friday 1 September 2023 10:00 (30 minutes)

The study of Ultra-High-Energy Cosmic Rays (UHECR) has dramatically changed in the last 20 years with the advent of the Pierre Auger Observatory and the Telescope Array project. Before the precision of these instruments, there was high uncertainty in whether the UHECR flux dramatically cuts off above 50 or so EeV; now, the cutoff is verified fact, and the details of the spectrum show features begging for astrophysical interpretation. Before their sensitivity, there was a relatively simple expectation of proton domination above an EeV; now, UHECR composition is known to be a rich blend of atomic nuclei that show a complex evolution with energy. Before their shear scale, the isotropy of the data begged the question of whether sources could ever be pinpointed; now, we have discovered large-scale anisotropies and are inching closer to the clear association of the highest energy UHECR with promising source classes. As exciting as these changes have been, the recent hints and observations in UHECR physics- muon excesses, mass anisotropies, spectrum/mass correlations- show promise toward leading again to considerable modifications in how we see the highest energy end of the particle universe. This talk will present the most current picture of the field and then use the current status to frame where UHECR physics is going over the next 10 to 20 years.

Submitted on behalf of a Collaboration?

No

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