Contribution ID: **220** Type: **Oral**

Study of Muon Evolution in very High Energy Cosmic Ray Air Showers with LHAASO

Monday 25 August 2025 14:00 (17 minutes)

The Large High Altitude Air Shower Observatory (LHAASO) has accomplished comprehensive and precise measurements of very-high-energy cosmic ray air showers. Leveraging data from the electromagnetic detector array and the muon detector within the KM2A array, accurate and composition-insensitive reconstruction of cosmic ray energies in the knee region has been achieved by measuring the numbers of secondary electromagnetic particles and muons produced in air showers. For the first time, the logarithmic shower muon number has been employed to derive the mean logarithmic mass ($\langle \ln A \rangle$) of cosmic rays, while fluctuations in the logarithmic shower muon number have been utilized to construct the variance of the logarithmic mass ($\sigma^2_{\ln A}$). The analysis provides a clear depiction of the cosmic ray mass composition evolution with energy and explicitly illustrates the energy-dependent trend of $\sigma^2_{\ln A}$. These results not only deepen the understanding of the cosmic ray source composition and acceleration mechanisms but also offer essential experimental constraints and robust validation for theoretical models regarding the mixed nature of cosmic ray compositions.

Collaboration you are representing

LHAASO

Authors: FENG, Cunfeng (Shandong University); ZHANG, Hengying (Yunnan University); MA, Lingling (Institute of High Energy Physics, Chinese Academy of Sciences); FENG, Xiaoting (Shandong University)

Presenter: FENG, Xiaoting (Shandong University)

Session Classification: High-Energy Astrophysics and Cosmic Rays

Track Classification: High-Energy Astrophysics and Cosmic Rays