



Contribution ID: 14

Type: **Talk**

Tests and modifications of hadronic interactions in cosmic-ray showers

Tuesday 3 September 2024 17:00 (20 minutes)

One of the fundamental questions in physics is the origin of the most energetic cosmic rays. This has been obscured mainly by uncertainties in their mass composition arising from the modelling of hadronic interactions in the air showers that these particles induce. For some time now, discrepancies between model predictions and measured air-shower data have been complicating our efforts. A deficit of the simulated signal relative to the measured signal in ground detectors is an inconsistency that is usually interpreted as a deficit of the muon signal induced by the hadronic component of a simulated shower. Recently, a new global method to simultaneously determine the mass composition of cosmic rays and variations in the simulated depth of the shower maximum, hadronic and electromagnetic signals on the ground has been applied to the combined data from the surface and fluorescence detectors at the Pierre Auger Observatory, providing interesting results on model deficiencies in a broader perspective.

I will review past and present attempts to test models of hadronic interactions and prospects for better understanding the origin of these discrepancies. In particular, I will focus on our recent work in the MOdified Characteristics of Hadronic Interactions (MOCHI) project, which aims to explore the phase space of combinations of modifications in the cross section, multiplicity and elasticity of hadronic interactions to find possible solutions that would explain the discrepancies between the Pierre Auger Observatory measurements and model predictions.

Is this an abstract from experimental collaboration?

No

Name of experiment and experimental site

N/A

Is the speaker for that presentation defined?

Yes

Details

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Internet talk

No

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Session Classification: Cosmology, Astrophysics, Gravity, Mathematical Physics

Track Classification: Main topics: Cosmology, Astrophysics, Gravity, Mathematical Physics