



Contribution ID: 18

Type: **not specified**

Cosmic ray physics in the CTA era

Thursday, 24 October 2019 13:30 (30 minutes)

In this talk I will discuss some of the main open questions in cosmic ray physics that the upcoming Cherenkov Telescope Array is likely to help answer. Gamma-ray photons are a privileged channel to study cosmic ray physics, since gamma-ray emission associated with neutral pion decay offers the most direct probe of relativistic hadrons.

With its unprecedented sensitivity and spatial resolution over a wide spectral range, CTA will discover many new sources both inside and outside the Galaxy and at the same time allow detailed studies of known sources. We expect its results to have a major impact on our understanding of the origin and propagation of high cosmic rays and to help unveil the processes of particle acceleration in a variety of sources. I will discuss what our expectations are for some of these, including star forming regions, Supernova Remnants, the central region of our Galaxy and, on a much larger scale, Clusters of Galaxies.

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