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On the challenging problem to estimate the energy of the Ultra High Energy Cosmic Rays

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Ultra High Energy Cosmic Rays (UHECRs) are rare nuclei that collide in the atmosphere with energy larger than 10^{18} eV producing a shower cascade made by billions of particles. An estimation of the shower energy with a good control of the systematic uncertainties is attained with the fluorescence detector technique. The two largest observatories built to date, the Pierre Auger observatory and the Telescope Array project, use a hybrid detection technique in which the integral of the longitudinal profile, measured using the fluorescence telescopes, is used to calibrate a shower-size estimate made with the surface detector. Another technique that can provide a good estimate of the primary energy is recently emerging and it is based on the detection of radio emission in air showers.

In this contribution we critically review the experimental techniques for estimating the shower energy, trying to address current limitations, the potential improvements that can be developed in the coming years and the implications in those physical observables that require a precise measurement of the shower energy.

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