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Gamma/hadron discrimination at high energies through the azimuthal fluctuations of the particle distributions at ground

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High performant shower discriminators are crucial in the pursuit of PeVatron gamma-ray events. In this contribution, we introduce a novel gamma/hadron discriminating variable that quantifies the azimuthal non-uniformity of the particle distributions at the ground.
The proposed quantity has been tested for showers with energies between 10 TeV and 1 PeV and detector arrays with different fill factors, showing a remarkable discrimination power, similar to the one obtained by estimating the shower muon content. Such implies that the azimuthal non-uniformity in the shower pattern can be an alternative to access the intrinsic differences in the development of electromagnetic and hadronic showers without implementing any costly strategy to absorb the electromagnetic component of the shower.
Additionally, we show that it exhibits a strong correlation with the number of muons at the ground, making it an exceptional tool for studying shower hadronic interactions and the cosmic ray primary composition.
Finally, in this presentation, I shall discuss how this quantity might be easily accessed in present ground-array gamma-ray observatories and how it may significantly increase the effective area of future ones.

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