

PhD abstract

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Calibration of the cameras of the H.E.S.S. gamma-ray experiment
and observations of the Galactic Centre.

The H.E.S.S. experiment (High Energy Stereoscopic System) consists of four imaging atmospheric Cherenkov telescopes to study the southern astrophysical sources above 100 GeV. This thesis presents the detector as well as the analysis chain. The calibration methods are described in details and the systematic errors on the image amplitude are derived. Then, an analysis based on a semi-analytical model of the electromagnetic shower development in the atmosphere is presented. Tools to reconstruct the energy spectrum and the morphology of the very high energy γ -ray sources are presented and applied to the Crab Nebula. Systematic errors associated to the spectrum analysis are estimated.

All these techniques were applied to study the Galactic Centre emission above 100 GeV. The nature of the source detected in 2003 and 2004 observations is still unknown and its spectrum, variability and morphology are studied. Various candidates are proposed, among them the supermassive black hole Sgr A* located at the dynamical centre of the Milky Way, the supernova remnant Sgr A East or interactions of accelerated particles with the dense medium of this region. In this thesis, the signal was interpreted in terms of dark matter annihilation (neutralinos or Kaluza-Klein bosons) in a dense halo located at the Galactic Centre. This analysis showed that, in the framework of these models, dark matter annihilation alone can not explain the H.E.S.S. signal. The main component would thus come from astrophysical sources.