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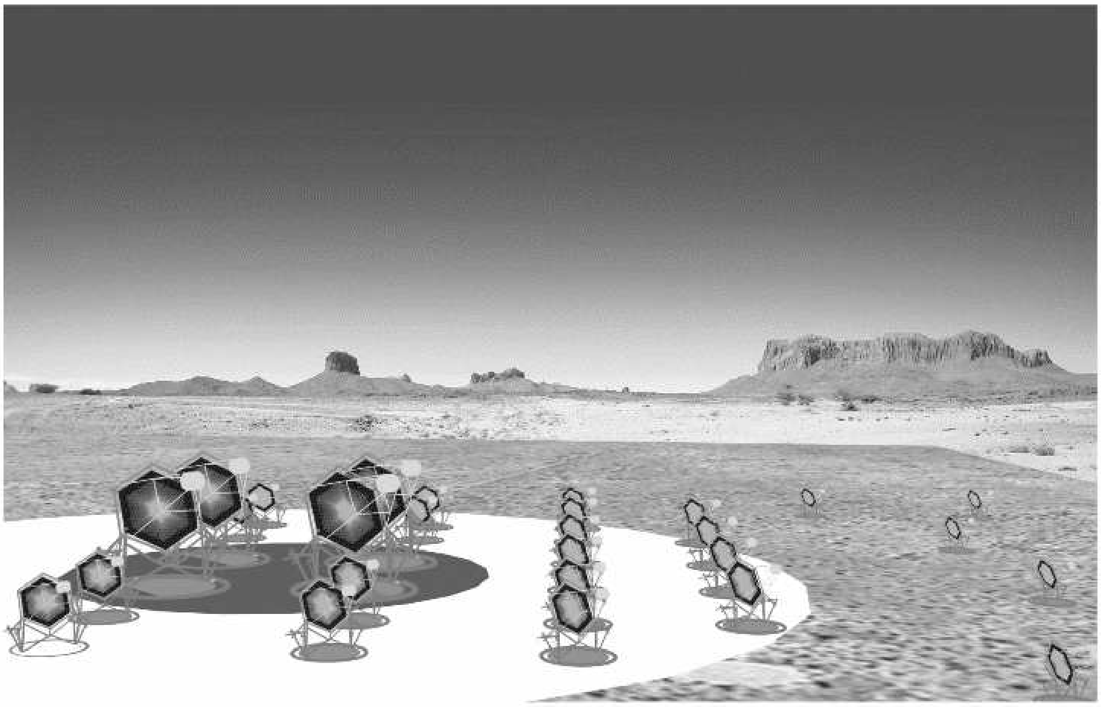
Contributions from the Cherenkov Telescope Array (CTA) Consortium



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CTA: where do we stand and where do we go ?

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Abstract: The Cherenkov Telescope Array (CTA) is a project for the construction of a next generation VHE gamma ray observatory with full sky coverage. Its aim is improving by about one order of magnitude the sensitivity of the existing installations, covering about 5 decades in energy (from few tens of GeV to above a hundred TeV) and having enhanced angular and energy resolutions. During 2010 the project became a truly global endeavour carried out by a consortium of about 750 collaborators from Europe, Asia, Africa and the North and South Americas. Also during 2010 the CTA project completed its Design Study phase and started a Preparatory Phase that is expected to extend for three years and should lead to the starting of the construction of CTA. An overview of the CTA project will be given and the status and plans of its Preparatory Phase will be discussed.

Keywords: CTA, Imaging Atmospheric Cherenkov Telescope, gamma-rays

1. Introduction

Very High Energy gamma-ray astronomy is consolidating as a new and very successful branch of Astrophysics and Astroparticle Physics. Exciting results have been obtained in the last few years by the current generation IACT (Imaging Atmospheric Cherenkov Telescopes) that have increased the number of detected sources from just a handful to about 150.

The present generation of Cherenkov telescopes has allowed the first detailed observations of the sky using gamma rays of energies above 100 GeV and has revealed sources with complex and resolved structures in the central band of the Milky Way and a plethora of extragalactic sources. Based on the extensive scientific knowledge gained with the Cherenkov telescopes H.E.S.S. in Namibia, MAGIC on the Canary Islands, and VERITAS in the United States, there is a high potential for lots of discoveries with a more sensitive gamma-ray observatory with full sky coverage in the energy range above some tens of GeV.

This was the motivation that, back in 2005, gathered together the scientists of the VHE gamma ray community to propose the Cherenkov Telescope Array (CTA) concept. CTA is an European-initiated worldwide project which builds upon the success and convergence of H.E.S.S., MAGIC, VERITAS and CANGAROO and gathers the current expertise in the domain of most of the worldwide community with the aim to exploit the full potential of the IACT technique during the next two or three decades.

When finally completed, CTA is expected to increase the sensitivity of actual observatories such as H.E.S.S., MAGIC or VERITAS by an order of magnitude. It will also expand the energy range coverage from some tens of GeV to about hundred TeV, opening a new window in the VHE domain never reached with such exquisite detail. Additionally, the ideal synergy between the Large Area Telescope (LAT) on board of the Fermi Gamma-ray Space Telescope and CTA will allow nearly seamless coverage from few MeV to hundreds of TeV.

This observatory shall reveal of the order of thousand sources, an order of more sources than in the current VHE catalogues, allowing for example population studies of classes such as Pulsar Wind Nebulae (PWNe) and Active Galactic Nuclei (AGN). Due to its higher sensitivity and better angular resolution it shall be able to detect new classes of objects and phenomena that have not been visible until now and will greatly improve the chances for discovery in fundamental physics issues such as Dark Matter astronomy, Lorenz invariance violation or observational cosmology.

CTA will serve as an open observatory to a wide astrophysics community and will provide a deep insight into the non-thermal high-energy universe enabling scientists to tackle a variety of fundamental open questions con-