

High energy gamma rays



Gamsberg, Namibia
altitude: 1 800m



HESS HIGH ENERGY STEREOSCOPIC SYSTEM

Revealing the high-energy Universe

Scientific leader: Mathieu de Naurois (LLR) *

Laboratories involved: APC (Paris), CC-IN2P3 (Lyon), CPPM (Marseille), LAPP (Annecy), LLR (Palaiseau), LP2I (Bordeaux), LPNHE (Paris), LUPM (Montpellier)

Nature: research infrastructure

Status: international project in operation, mainly funded by France and Germany

Website: <https://www.mpi-hd.mpg.de/hfm/HESS/>

Scientific objectives

HESS is an observatory designed to study cosmic gamma rays from a few tens of giga-electronvolts to 100 tera-electronvolts. HESS does not detect gamma rays directly, but rather the tiny trace of light emitted when they interact with the atmosphere. With its five arrayed telescopes, among which one very large telescope, it provides a stereoscopic image of the traces, making it possible to determine both the energy of the gamma ray and its point of origin on the sky. HESS thus studies high-energy cosmic phenomena: cosmic rays, interstellar medium, compact objects, gamma-ray bursts, cosmology, dark matter, etc.

Resources deployed

- HESS is deployed in Namibia at an altitude of 1 800 metres near the Gamsberg, a region well-known for the excellent optical quality of its sky.
- The large central telescope of HESS has a mirror area of 614m², while the four smaller telescopes each have a mirror area of 107m².
- The cameras at the focal point of each of the four identical telescopes weigh 800 kilograms, while the camera at the large telescope weighs over three tonnes.
- This is the only telescope array in the world to operate a stereoscopic view of atmospheric cascades with telescopes of different sizes, thus foreshadowing the future CTA array.

25m diameter of the largest telescope	150Tb data generated per year
40 research institutions	20 years of operation
13 participating countries	€28M construction costs

IN2P3 CONTRIBUTIONS

- Design and construction of the cameras for all five telescopes, which operated on site from 2003 to 2017 for the first four telescopes, and from 2012 to 2019 for the camera of the fifth and largest telescope.
- Participation in the design and deployment of computer tools for data acquisition, simulation, reconstruction and analysis.
- Daily contribution to data analysis and interpretation.

Other french laboratories involved

Irfu (CEA Saclay), LUTH (Meudon)

2002

Signature of the memorandum between the CNRS and Namibia

2004

Inauguration of the four-telescope HESS system

2005

HESS captures its first images of the Milky Way

2012

Deployment of HESS with the addition of the 5th telescope

2015

Discovery of the very high-energy gamma-ray emission from the Vela pulsar

2017

Replacement of the cameras of the four smaller telescopes

2019

Extension of HESS for 5 years

2022

Extension of HESS for 3 more years

* Since 2020