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HESS-II detects its first pulsar

The HESS-II (High Energy Stereoscopic System) telescope in Namibia has detected gamma rays of only 30 Giga electron volts (GeV) from the Vela pulsar. This is the first pulsar to be detected by HESS and the second – after Crab in 2011– to be spotted by ground-based gamma ray telescopes. These results have been obtained by the HESS collaboration involving the CNRS and CEA.

The HESS experiment in Namibia, which was upgraded in 2012, now boasts a fifth and larger reflecting telescope. It is the first Cherenkov system with telescopes of different sizes detecting cosmic TeV gamma rays in sync. The fifth 28-meter telescope, placed at the center of the other four 12-meter telescopes, lowers the energy range under study down to 30 GeV. HESS-II has now been successfully tested: the scientists have detected a pulsed gamma-ray signal in the energy range of 30 GeV, which they attribute to the Vela pulsar. This paves the way for new observation possibilities of the inner Galaxy.

This achievement has required two years of intensive software development. "For the reconstruction of the data from the 28-metre telescope, we performed a highly sensitive analysis based on extremely complex algorithms. For the first time, this allowed us to detect gamma radiation of only 30 GeV from ground level," explains, Mathieu de Naurois, CNRS researcher at the Laboratoire Leprince-Ringuet (CNRS/Ecole Polytechnique) and deputy director of the HESS collaboration. "Since we are able to survey a projected area of 10 hectares in the atmosphere, we have a considerably higher yield of gamma rays than the largest satellite experiments such as Fermi." From some sources, it is possible to spot up to one gamma per second – a record.

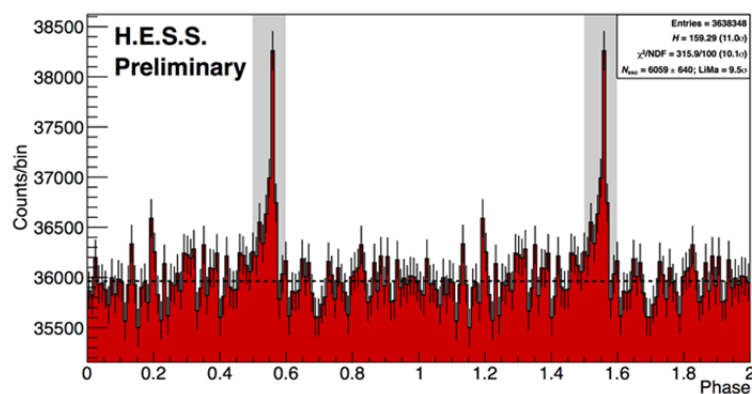
"The data reveals regular gamma ray pulses at a frequency of 89 milliseconds, coming exactly from the direction of the Vela pulsar. According to our preliminary analyses, everything suggests that these are gamma rays in the energy range of 30 GeV," says the pulsar hunter Arache Djannati-Ataï from the Laboratoire Astroparticule et cosmologie (CNRS/Université Paris Diderot/CEA/Observatoire de Paris) who, together with his colleagues within the HESS collaboration, tested the reconstruction analysis for the first time.

The Milky Way is full of pulsars and the location of HESS-II in Namibia makes it possible to explore its very center. This data suggests that the latest-generation telescopes of the HESS-II experiment can unveil many of the universe's mysteries.

The Namibian observatory is the result of an international collaboration involving more than 180 scientists from 42 research institutes based in 14 countries. In France, the CNRS and CEA are the main contributors to the project.



The HESS-II telescope in Namibia.
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Periodic gamma ray pulses of the Vela pulsar in the data obtained by the HESS experiment. One phase is equivalent to 89 milliseconds.

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French laboratories involved in HESS

- Laboratoire « Astroparticule et cosmologie » (CNRS/Université Paris Diderot/CEA/Observatoire de Paris),
- Centre études nucléaires de Bordeaux Gradignan (CNRS/Université de Bordeaux),
- Centre de physique des particules de Marseille (CNRS/AMU),
- Institut de planétologie et d'astrophysique de Grenoble (CNRS/UJF) à l'Observatoire des sciences de l'Univers de Grenoble,
- Institut de recherche sur les lois fondamentales de l'Univers du CEA
- Laboratoire d'Annecy-le-Vieux de physique des particules (CNRS/Université de Savoie),
- Laboratoire Leprince-Ringuet (CNRS/École polytechnique),



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- Laboratoire de physique nucléaire et de hautes énergies (CNRS/UPMC/Université Paris Diderot),
- Laboratoire Univers et particules de Montpellier (CNRS/Université de Montpellier 2),
- Laboratoire Univers et théories (CNRS/Observatoire de Paris/Université Paris Diderot).

Contacts

Chercheur CNRS | Mathieu de Naurois | T +33 (0)1 69 33 55 97 | denauroi@in2p3.fr

Arache Djannati-Ataï | T +33 (0)1 57 27 61 59 | djannati@in2p3.fr

Presse CNRS | Priscilla Dacher | T +33 (0)1 44 96 46 06 | priscilla.dacher@cnrs-dir.fr