Executive Summary

Detection of extended TeV emission around the Geminga pulsar with H.E.S.S.

A. Mitchell, S. Caroff, J. Hinton, L. Mohrmann for the H.E.S.S. Collaboration

What is this contribution about?

The detection of extended gamma-ray emission around the Geminga pulsar proved elusive for Cherenkov telescopes due to its particularly large angular scale. Following on from the previously announced detection of the extended emission in H.E.S.S. archival data, in this contribution we present the detection and a more detailed analysis in an independent dataset, from observations conducted in 2019.

Why is it interesting?

The extended gamma-ray emission around the Geminga pulsar is the archetypal example of a pulsar halo; that is, energetic particles (predominantly electrons and positrons) escaped from the pulsar wind nebula and forming a halo undergoing inverse Compton scattering in the surrounding ISM. Given the large angular scale of the emission, the analysis is particularly challenging for Cherenkov telescopes.

What have we done?

We present the detection using two different background estimation approaches, providing an indication of the level of systematic uncertainties inherent in the analysis. Nevertheless, we present preliminary sky maps of the region; a preliminary radial profile of the gamma-ray emission with distance from the pulsar; and a preliminary spectrum of the innermost region of the emission.

What is the result?

The detection of extended emission is confirmed in an independent dataset.
We find indications for an asymmetric distribution around the pulsar, although the true extent of the emission remains larger than the HESS field-of-view, hence it is not possible to measure its radial extent.
Further interpretation of the results and a more detailed discussion of the challenges to the analysis will be presented in a forthcoming publication.