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Photon Reconstruction for H.E.S.S. Using a Semi-Analytical Model

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The High Energy Stereoscopic System (H.E.S.S.) is an array of five Imaging Atmospheric Cherenkov Telescopes (IACTs) designed to detect and image cosmogenic gamma-rays with very high energies. Originally consisting of just four identical IACTs (CT1-4) with an effective mirror diameter of 12 m each, it was expanded with a fifth IACT (CT5) with a mirror diameter of 28 m in 2012. Being the largest IACT worldwide, CT5 allows to lower the energy threshold of H.E.S.S., enabling to close the energy gap between space-based detectors and IACTs. Events can be analysed either monoscopically (i.e. using only information of CT5) or stereoscopically (requiring at least two triggered telescopes per event). To achieve a good performance, a sophisticated event reconstruction and analysis framework is indispensable. This is particularly important for H.E.S.S. since it is now the first IACT array that consists of different telescope types. An advanced reconstruction method is based on a semi-analytical model of electromagnetic particle showers in the atmosphere ("model analysis"). The properties of the primary particle are reconstructed by comparing the image recorded by each triggered telescope with the Cherenkov emission from the shower model using a log-likelihood maximisation. Due to its performance, this method has become one of the standard analysis techniques applied to CT1-4 data. Now it has been modified for use with the five-telescope array. We present the adapted model analysis and its performance in both monoscopic and stereoscopic analysis mode.

Collaboration

H.E.S.S.

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509

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