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The stereo Topo-trigger: a new concept of stereoscopic trigger system for imaging atmospheric Cherenkov telescopes

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Imaging atmospheric Cherenkov telescopes such as the MAGIC telescopes are built to achieve the lowest possible energy threshold. The trigger system of these telescopes is one of the most important parts to achieve it. The main problem when decreasing the energy triggered by an IACT is the rapid increase of accidental triggers caused by the ambient light and the after pulses of the photomultipliers. The coincidence trigger between the telescopes strongly suppresses the accidental rate recorded by the telescope. At lower trigger threshold, however, it is difficult to discriminate at the trigger level between the triggers produced by accidental triggers or real cosmic events.
In this contribution we present a topological trigger, dubbed Topo-trigger, a novel technique that discriminates between the events triggered by cosmic rays and accidental triggers allows a decrease of up to 85 % of the accidental events triggering MAGIC system in stereo. We have simulated and tested this algorithm in the MAGIC telescope while keeping more than 99 % of the gamma rays triggered. According to simulations, this trigger system increases the collection area at the analysis level of about 30 % at the lowest energies and between 10-20 % at the energy threshold. The decrease in the analysis energy threshold of the telescope is ˜8 %. The selection algorithm proposed here was tested on real MAGIC data taken with the current trigger configuration and we find that no triggers are lost due to the algorithm proposed. A full implementation of the Topo-trigger was installed in MAGIC at the end of 2014 and the first results of its performance will also be shown.

Collaboration

MAGIC

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297

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