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Detection methods for the Cherenkov Telescope Array at very-short exposure times

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The Cherenkov Telescope Array (CTA) will be the next generation ground-based observatory for very-high-energy gamma-ray astronomy, with the deployment of tens of highly sensitive and fast-reacting Cherenkov telescopes. It will cover a wide energy range (20 GeV - 300 TeV) with unprecedented sensitivity. Our study is focused on real-time detection at very-short timescales (from 1 to 100 seconds). We built and characterised an analysis and detection pipeline and tested it via the verification of the Wilks' theorem for false-positives. The performance was evaluated in terms of sky localisation accuracy, detection significance and detection efficiency for different observing and analysis configurations. Our goal is to determine the feasibility of the analysis methods at very-short exposure times. We also investigated the sensitivity degradation which is expected in a real-time analysis context and compared it to the requirement of being better than half of the CTA sensitivity. In this work, we present a general overview of the pipeline and the performance obtained for the use-case of a blind-search and detection following an external alert, such as from a gamma-ray burst or a gravitational wave event.

Keywords

very-short exposure times; blind detection; transients; real-time analysis;

Collaboration

CTA

other Collaboration

Subcategory

Experimental Methods & Instrumentation

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