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Analytical Real-Time Analysis sensitivity evaluation of the Cherenkov Telescope Array

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The Cherenkov Telescope Array (CTA), the new generation very high-energy gamma-ray observatory, will improve on the flux sensitivity of the current Cherenkov telescopes by an order of magnitude over a continuous range from about 10 GeV to above 100 TeV. With tens of telescopes distributed in the North and South hemispheres, the large effective area and field of view coupled with the fast pointing capability make CTA a crucial instrument for the detection and physical understanding of transient, short-timescale variability phenomena (e.g. Gamma-Ray Bursts, Active Galactic Nuclei, gamma-ray binaries, serendipitous sources). The key CTA system for the fast identification of flaring events is the Real-Time Analysis (RTA) pipeline, a science alert system that will automatically detect and generate science alerts with a latency of 30 seconds with respect to the triggering event collection and ensure fast communication to/from the astrophysics community. According to the CTA design requirements, the RTA search for a true transient event should be performed on multiple time scales (from minutes to hours) while being sensitive to a flux at most three times the one given by the nominal CTA sensitivity.

Given the CTA requirement constraints on the RTA efficiency and the fast response ability demanded by the transient science, we perform a preliminary evaluation of the RTA sensitivity as a function of the CTA high-level technical performance (e.g. effective area, point spread function) and the observing time. This preliminary analytical approach allows the exploration of the complex parameter space defined by the scientific and technological requirements, with the aim of defining the feasibility range of the input parameters and the minimum background rejection capability of the RTA pipeline.

Collaboration

CTA

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