

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

Authors: Ambra Di Piano (presenter), Andrea Bulgarelli, Valentina Fioretti, Leonardo Baroncelli, Nicolò Parmiggiani, Francesco Longo, Antonio Stamerra, Alicia López-Oramas, Giulia Stratta and Giovanni De Cesare for the CTA Consortium

What is this contribution about?

The Cherenkov Telescope Array (CTA) will be the next generation of Imaging Atmospheric Cherenkov Telescopes (IACTs) and the largest ground-based gamma-ray detection observatory of the next decade. The Science Alert Generation (SAG), is the on-site automated software system that will provide low-level Cherenkov data reconstruction, data quality monitoring, science monitoring and the issuing of candidate science alerts during observations. The system is required to provide a search for transient phenomena on multiple timescales (from 10 seconds to 30 minutes) in the field of view, and to issue candidate science alerts with a latency lower than 20 seconds after data acquisition.

Why is it relevant / interesting?

Since with CTA we will be able to produce significant observations at very short exposure time, we focus on the characterization of the short-term reaction of the SAG up to 100 s where statistics is limited. We make use of ctools and gammapy software packages as well as a photometry tool that is in development for real-time analysis.

What have we done?

We investigate the precision and accuracy of available science tools and analysis techniques for the short-term detection of gamma-ray sources, in terms of sky localization, detection significance and, if significant detection is achieved, a first estimation of the integral photon flux. We evaluate the feasibility of the algorithms' implementation in the real-time analysis of CTA.

What is the result?

We have developed an automated pipeline that handles the analysis of CTA data with different techniques and science tools, to investigate their implementation in an online real-time analysis context and verify the agreement of the results. The full field-of-view analysis technique is more sensitive, on the other hand the standard on/off analysis is computationally faster and provides the detection significance independently from model assumptions.