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Real-time atmospheric monitoring for the Cherenkov Telescope Array using a wide-field optical telescope

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The Cherenkov Telescope Array (CTA) is the next generation of ground-based very high energy gamma-ray instruments and will be built on two sites (one in each hemisphere) in the coming years, with full array operation foreseen to begin 2020. The goal of performing a high precision gamma-ray energy measurement while maximizing the use of observation time demands detailed and fast information about atmospheric conditions. Besides LIDARs designed to monitor clouds and aerosol content of the atmosphere in the pointing direction of the CTA telescopes, we propose to use the “FRAM”(F/(Ph)otometric Robotic Atmospheric Monitor) device, which is a small robotic astronomical telescope with a large field of view and a sensitive CCD camera that together ensure precise atmospheric characterization over the complete field-of-view of the CTA.

FRAM will use stellar photometry to measure atmospheric extinction across the field of view of the CTA without interfering with the observation (unlike laser-based methods). This allows FRAM to operate with high temporal resolution and provide both real-time data for on-the-fly scheduling decisions and an offline database for calibration and selection of scientific data. The fast robotic mount of the telescope supports quick observation of multiple fields when the array is split and even a check of the conditions in the directions of the upcoming observations is possible. The FRAM concept is built upon experience gained with a similar device operated at the Pierre Auger Observatory. A working prototype of FRAM proposed for CTA is being built in Prague for extensive testing before deployment on site; first results and experiences with this prototype are presented.

Collaboration

CTA

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