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Potential for atmospheric monitoring using FAST telescopes

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The Fluorescence detector Array of Single-pixel Telescopes (FAST) is a design for a next-generation ground-based ultra-high energy cosmic ray observatory, addressing the requirements for a large-area, low-cost detector suitable for measuring the properties of the highest energy cosmic rays with an unprecedented aperture. Three telescope prototypes are installed nearby the fluorescence telescopes of Telescope Array and one prototype is located at the Pierre Auger Observatory. Apart from detecting cosmic ray showers, the FAST prototypes offer the possibility of detecting laser pulses from atmospheric facilities such as CLF. The first part of the contribution describes the theoretical modeling of the photon scattering processes for different atmospheric models, and the raytracing of photons from the laser shot to and inside the FAST telescope. Simulations will be performed for different types of scattering conditions dependent on e.g. the size of the scattering centers or other parameters such as humidity.
The ultimate goal is to create a software tool simulating the measured signals in the FAST telescopes from distant laser shots with proper treatment of light propagation trough the atmosphere and trough the detector. Such simulation toolkit for FAST prototypes at the Pierre Auger Observatory will benefit from existing attempts done for the Telescope Array site. Another part of the contribution will concern the real data of the observed CLF shots by the FAST prototypes both at the Pierre Auger Observatory and Telescope Array. Moreover, we can focus on the comparison of measured CLF shots by FAST prototype with the available data recorded by the full-scale fluorescence telescopes of the Pierre Auger Observatory.

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