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Raman LIDARs for Pierre Auger Observatory: field experiences and results.

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The optical properties of the troposphere are quite important for ultra-high energy cosmic ray observatories that use the atmosphere as a giant calorimeter. To estimate the energy of a cosmic ray extensive air shower (EAS), the amount of UV scintillation light generated by an EAS (air fluorescence) can be measured, and, the optical transparency of the atmosphere affects the amount of UV light that reaches the ground-based air fluorescence detector. The most variable component of atmospheric optical transmission is the vertical aerosol optical depth (VAOD).
The Raman LIDAR is the technique to be preferred for the measurements of the VAOD in the UV wavelength range [1].
We present the design and the technical details, and the performances and the limitations of the Raman LIDAR systems used at the Pierre Auger Observatory [2] and in the Auger R&D in South-Eastern Colorado [3]. The latter field experiment combined a UV backscattered Raman LIDAR and a side-scattering detector, i.e., a LIDAR detector in bi-static configuration; this was a model of the new setup of part of the atmospheric instrumentation [4], now in use at the Pierre Auger Observatory, and it was designed to improve the methods to measure the VAOD profiles.

[1] G. Pappalardo, et al., Aerosol lidar intercomparison in the framework of the EARLINET project. 3. Raman LIDAR algorithm for aerosol extinction, backscatter, and LIDAR ratio, Appl. Optics 43 (2004) 5370{538.
[2] Pierre Auger Collaboration, Iarlori M., Visconti G. (2012), Atmospheric monitoring with LIDARs at the Pierre Auger Observatory. THE EUROPEAN PHYSICAL JOURNAL PLUS, vol. 127, ISSN: 2190-5444, doi: 10.1140/epjp/i2012-12092-0
[3] Pierre Auger Collaboration et al., (2012), UV Raman lidar and side scattering detector for the monitoring of aerosol optical transmission at the Pierre Auger Observatory, PROCEEDINGS FOR THE ILRC 2012, Greece, June 2012.
[4] Pierre Auger Collaboration (2013), Techniques for measuring aerosol attenuation using the Central Laser Facility at the Pierre Auger Observatory, JOURNAL OF INSTRUMENTATION, 8, P04009, 10.1088/1748-0221/8/04/P04009, 1748-0221, 2013.

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