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Dual pure-rotational Raman channel design and implementation in a multiwavelength lidar system for the monitoring of aerosol optical properties.

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Pure-rotational Raman (PRR) scattering has proven to be an efficient technique for the determination of atmospheric aerosol optical properties for lidar applications. We present the implementation of a UV-PRR and the design of a VIS-PRR in the EARLINET/UPC multi-wavelength lidar system (Barcelona, Spain). State-of-the-art computations of N_2 and O_2 differential backscatter cross-sections weighted by the optical losses inside the optical separation unit of the system allow for the theoretical estimation of the expected signal-to-noise ratios (SNR) in both UV and VIS channels. By means of customized optical interference filters UV-PRR signals from atmospheric N_2 and O_2 were detected and compared to the classical vibro-rotational Raman signals. UV-PRR detected signals have shown to possess high SNR and relative uncertainty levels lower than a tolerable 15% for daytime and nighttime measurements. The theoretical analysis of the VIS-PRR channel augurs improvements similar to those observed with the UV-PRR channel.