532nm Rayleigh-Mie Doppler lidar system for 5-50km wind measurement

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ABSTRACT: Wind is one of the most significant parameter in the weather forecast model and the research of climate change. In order to get the wind profiles, a 532 nm wind lidar system based on a triple-channel Fabry-Perot (FP) etalon was designed. In this paper, the fundamental theory of the Doppler wind lidar with triple-channel FP etalon was described briefly. The system structure of this Doppler wind lidar is introduced in detail. The triple-channel FP etalon parameters were given in detail. Major parameters of emission system, receiver system, emission and receiver optics system and control system were presented. According to the selected system parameters, the detection performance of the Doppler lidar system is simulated. The simulation results show that on sunny weather conditions, within ±50 m/s radial velocity measurement dynamic range, the system can achieve 50 km height at nighttime when the laser elevation is 70°, the spatial and temporal resolution are 100 m and 10 min, to meet the radial wind velocity measurement error less than 8 m/s. The preliminary result show that 532nm wind lidar system has ability to measure the wind field in the atmosphere from 5 km to 50 km.