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Turbulence Characterization via Coherent LIDAR Techniques

The purpose of this research is to use coherent Frequency Modulated Continuous Wave (FMCW) light detection and ranging (LIDAR) for the characterization of turbulence in the atmosphere. This application allows for sensitive measurements of the wave front fluctuations induced by turbulence. The high sensitivity of this method, allows for data collection for sampling distances ranging from 50-100 meters. From this extended data range, the relative turbulence strength between the target and the detector could be determined by implementation of the Kolmogorov's theory of turbulence. The relative turbulence strength values range from $3x10^{-17}$ - $3x10^{-13}$ $m^{-2/3}$ depending on altitude. This is a proof of concept demonstration and has applications in long range coherent imaging including synthetic aperture lidar (SAL).