Remote wind sensing with a CW diode laser lidar beyond the coherence regime.

We experimentally demonstrate for the first time (to our knowledge) a coherent CW lidar system capable of wind speed measurement at a probing distance beyond the coherence regime of the light source. A side-by-side wind measurement was conducted on the field using two lidar systems with identical optical designs but different laser linewidths. While one system was operating within the coherence regime, the other was measuring at least 2.4 times the coherence range. The probing distance of both lidars is 85 m and the radial wind speed correlation was measured to be $r^2 = 0.965$ between the two lidars at a sampling rate of 2 Hz. Based on our experimental results, we describe a practical guideline for designing a wind lidar operating beyond the coherence regime.

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