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An innovative compact heterodyne pulsed Doppler lidar for wind profiling in the PBL.

1 R. Parmentier (1), L. Sauvage (1), I. S. Stachlewska (1), M. Lardier (1), J. P. Cariou (2), M. Valla (2)

(1) LEOSPHERE sas, Palaiseau, France, (2) Département d'Optique Théorique et Appliquée, ONERA/DOTA, Palaiseau, France (rparmentier@leosphere.fr /tel : +33169332605)

The LEOSPHERE's "EASY_WIND_LIDAR"^{TM} is a coherent wind lidar developed by taking into account the ONERA/DOTA teams' advance in a high level know-how in heterodyne lidar technology for both airborne and ground based systems.

This eye safe (EN60825-1), non visible and soundless, robust, easily portable, operating by required power of only 150W (230V/110V) system is dedicated to vertical wind speed and direction profiles measurements. The optic and optoelectronic subassemblies benefit from recent developments in the telecom market providing compact, reliable and affordable OEM components which are integrated in a small 2U19" lidar rack. Lidar packaging design is reviewed and balanced with user's benefit.

System utilizes pulsed heterodyne technique comprising a high spatial and spectral quality Erbium doped fibre optic laser with 10uJ output at 1.54μm wavelength and operating at 10kHz repetition rate.

As the Doppler shift is proportional to the radial component of the wind speed, e.g. 1ms^{-1}results in 1.3MHz shift for 1.55μm, the calculations are done directly without need of calibration.

Several custom developments have been conducted with suppliers to optimize pulsed laser source characteristics and proper light detection and ensure eye-safe operation.

The wind measurement range is between 45-500m. Unlike for the continuous

wave wind lidar, here constant range resolution of 15m/30m (for pulse length of 100ns/200ns, respectively) is provided. The system is able to measure radial wind speeds (in the line of sight) in the range between $\pm$15m/s with estimated absolute accuracy of $\pm$0.1m/s (integration times of 1Hz). This lead to horizontal wind speed range $\pm$30m/s with $\pm$0.1m/s accuracy. Detailed descriptions of environmental conditions at which the sensor can be operated with typical signal-to-noise ratio versus range are provided.

An insight on signal processing, unit design and power consumption reduction efforts kept along development, as well us data format, storage and transmission that allow end-user to focus on their primary goals and forget technology matters will be discussed. Up-to-date development results and their impact on measurement range and accuracy can be easily implemented on our upgradeable sensor platform.

The lidar proved feasible for continuous wind profiling during validation campaigns against calibrated cup anemometers. In January 2007, it has also been proved its potential use for wake vortices tracking over airports. Various samples of these field campaigns will be presented.

This soundless, compact and automated wind lidar is a new very efficient and accurate tool for various geophysical applications, wind energy, and airport security.