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Validation of a New Version of the WindCube Scan Lidar

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Accurate measurement of the wind is essential in many applications. From improving the efficiency of wind farms to identifying wind hazards at ports, airports, or industrial plants, precise knowledge of the wind is critical. Wind Lidars are widely used to provide detailed information on wind, and Scanning Wind Lidars provide further measurements in full hemisphere around its location with multiple scanning patterns (azimuthal scans, elevation scans, etc.).

User feedback has always played a vital role in developing this technology. In the most recent round of development, two key areas were identified for improvement, resulting in the development of a new version of the WindCube Scan:

- Reducing range ambiguities that occur when clouds or obstacles are located further than the maximum acquisition distance.
- Adding more flexibility between the different modes of measurement to optimize both measurement range and resolution.

The new WindCube Scan addresses these points with the introduction of new resolutions, mitigated ambiguities, and greater ranges.

This paper will describe the metrological validation performed over the last year both in the field and in a factory setting.

A field validation was conducted in collaboration with two leading meteorological organizations in Europe, pioneers in the PROBE European project for large-scale atmospheric boundary layer remote-sensing deployment and data-sharing. Both organizations received the new version of WindCube Scan for a beta test. They gathered wind data at their sites and compared to other remote sensing devices such as radiosondes and radar wind profilers to verify the performances of different resolutions and overall performance of data retrieval and wind speed precision.

A factory validation, which was conducted at the Vaisala France site, near Paris, consisted of both an indoor and outdoor test. The indoor verification test was aimed at testing radial wind speed precision with intrinsic lidar parameters such as pulse shape, energy, etc. The outdoor validation followed guidelines set by the ISO 28902-2 regarding remote sensing measurement verification with other in-situ devices. The lidar was pointed to an ultrasonic anemometer on a meteorological tower about 2km away. The wind speed measurements from both devices were then compared

for precision and accuracy with proper filtering of unsuitable weather conditions.

The results of the validation testing thus far show positive performance and noticeable improvements of the new version of the WindCube Scan. Additionally, the external validation collaboration with other PROBE members highlights the importance of fortifying and understanding remote sensing device precision and data collection methods if they are to be integrated into large, observational networks.