



## Evaluation of the offshore wind resource using LIDAR

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A QinetiQ's ZephIR Wind LIDAR (LIght Detection And Ranging) was installed during 6 months on the transformer/platform of Horns Rev, the world's largest wind farm, located in the North Sea at the West coast of Denmark. The aim of the campaign was the experimental investigation of offshore winds and the analysis of some turbulence characteristics which can be observed with this laser system (e.g. turbulence intensities and momentum fluxes). The range of the LIDAR unit (approx. 200m) allows the study of wind at high levels in the atmosphere. At such heights, accurate wind data (conventionally measured with sonic and cup anemometers) are difficult to find due to the costs of mast erection and structural problems related with the towers. This wind assessment campaign is then not only important for the study of the ocean's atmospheric boundary layer but also because offshore conditions have a great future for the wind energy industry (the wind is considerably higher and less turbulent than on land). The last needs reliable measurements at these rough conditions due to the increasing wind turbine size, which is reaching hub heights around 100m. Wind measurements from cup anemometers installed at different levels on three different masts (located around 4km from the platform) are compared with the LIDAR data. The correlation observed between them is typically as high as it has been found on land (with slopes of 0.99). Turbulence measurements from the LIDAR also follows the behavior of the cups. LIDAR mean wind speed profiles are extended from cup profiles at a height of 63m AMSL (the first LIDAR measuring height) to 161m (further away from the surface layer). Both profiles match fairly good and therefore logarithmic profiles can be fitted into the data to show deviations with different stability conditions (using bulk Richardson numbers) and the influence of the fetch and the wind farm itself.