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ScanFlow project

ECN and DTU have set-up an extensive measurement campaign at the ECN test site to characterize the wind turbine inflow wind field. The campaign comprises nacelle LiDAR, short range scanning LiDAR, meteorological mast, ground based LiDAR and turbine measurements. It is put up in the framework of IRPWind 1st call for joint projects.

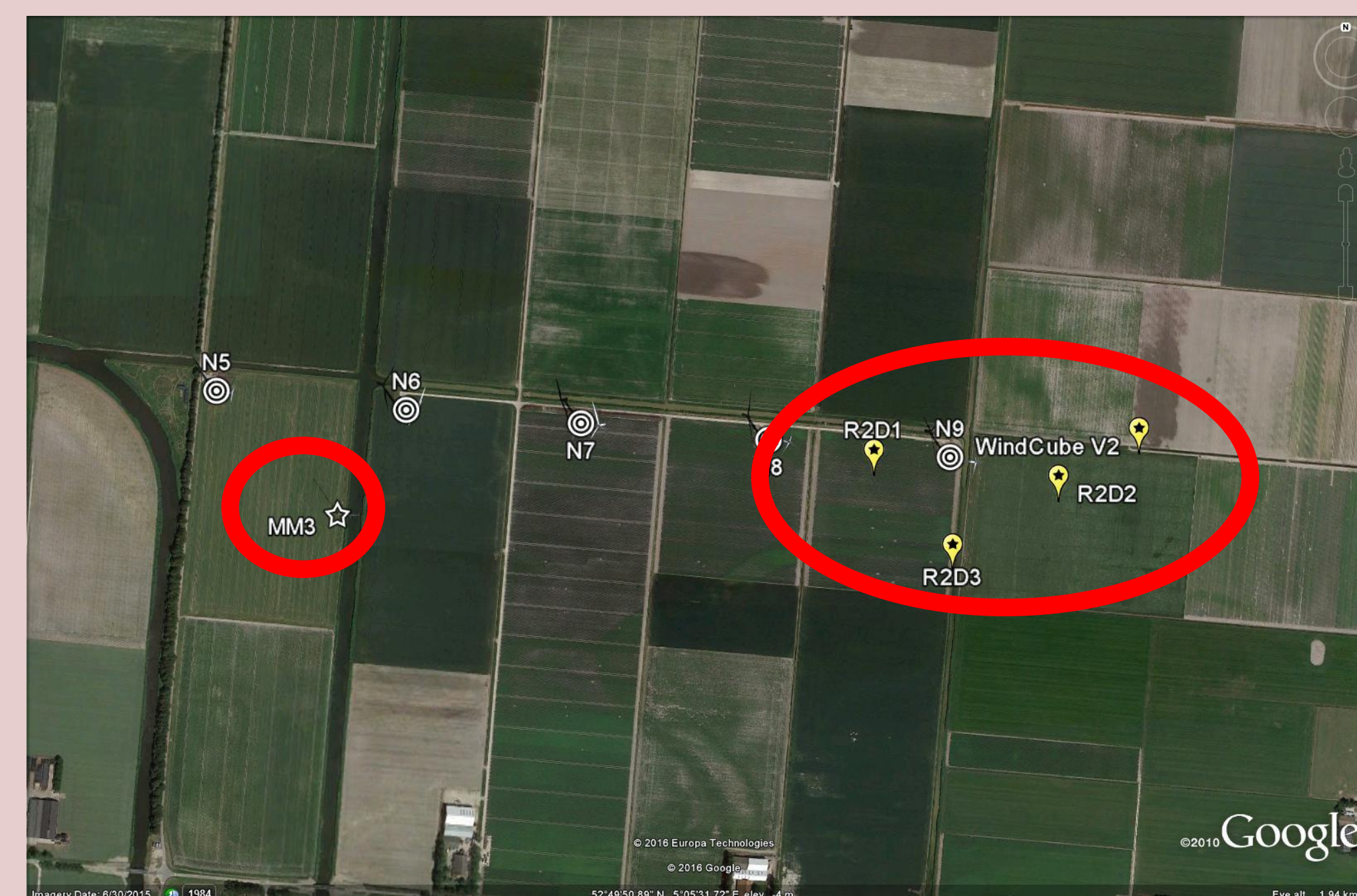
ScanFlow project: "High-resolution full-scale wind field measurements of the ECN's 2.5 MW aerodynamic research wind turbine using DTU's 3D WindScanner and SpinnerLidar for IRPWind's and EERA's benchmark".

Aim: The aim is to establish a unique turbine power performance and induction zone measurement dataset for benchmark purposes.

Key Performance Indicators

- 2 weeks of short-range windscanners (3x)
- 6 weeks of nacelle LiDAR measurements
- 6 weeks of ground based LiDAR, meteorological mast and turbine data
- Public database

Experimental set-up



Layout of the test site with turbine, mast and LiDARs indicated.

ECN Test Site

- 50km North of Amsterdam
- Flat terrain
- 5 research turbines
- West to East line configuration

Turbine (N9):

- 1st from East
- Nordex 2.5MW
- H=D=80m

WindCube V2:

- 2.5D from turbine
- East

IEC mast (MM3):

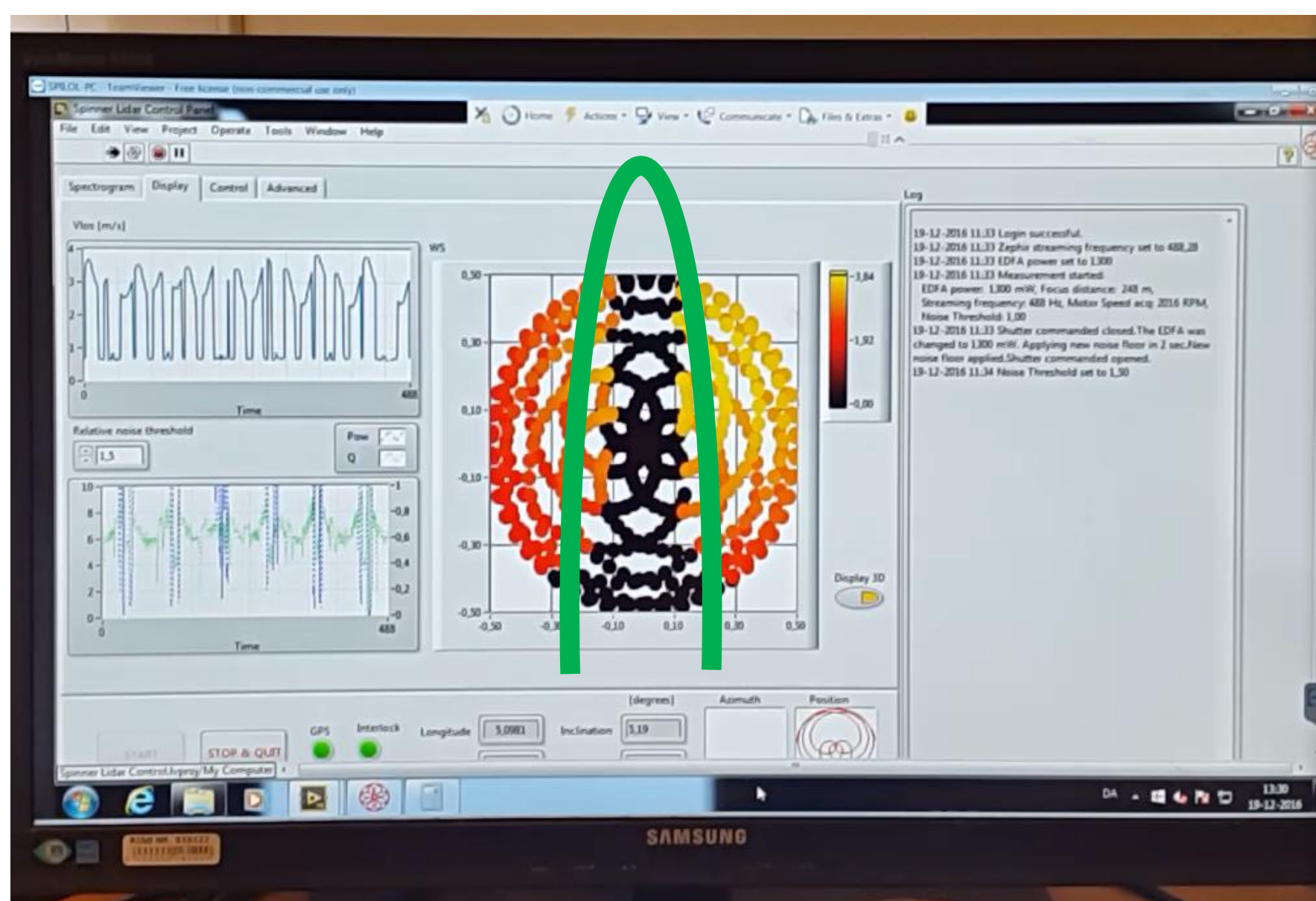
- 1km from turbine
- West
- Ws, wd, T, P, TI, etc.

Nacelle LiDAR:

- Cooler mounted
- Scanpattern
- ~0.8D in front rotor

Short range windscanners:

- R2D1, R2D2, R2D3
- Scanpattern
- ~0.8D in front of rotor



Nacelle LiDAR measurement with blade passage



Nacelle LiDAR installation



Instrumented research turbine



Short range windscanner

Public Database

Data Download Scheme:

1. Registration

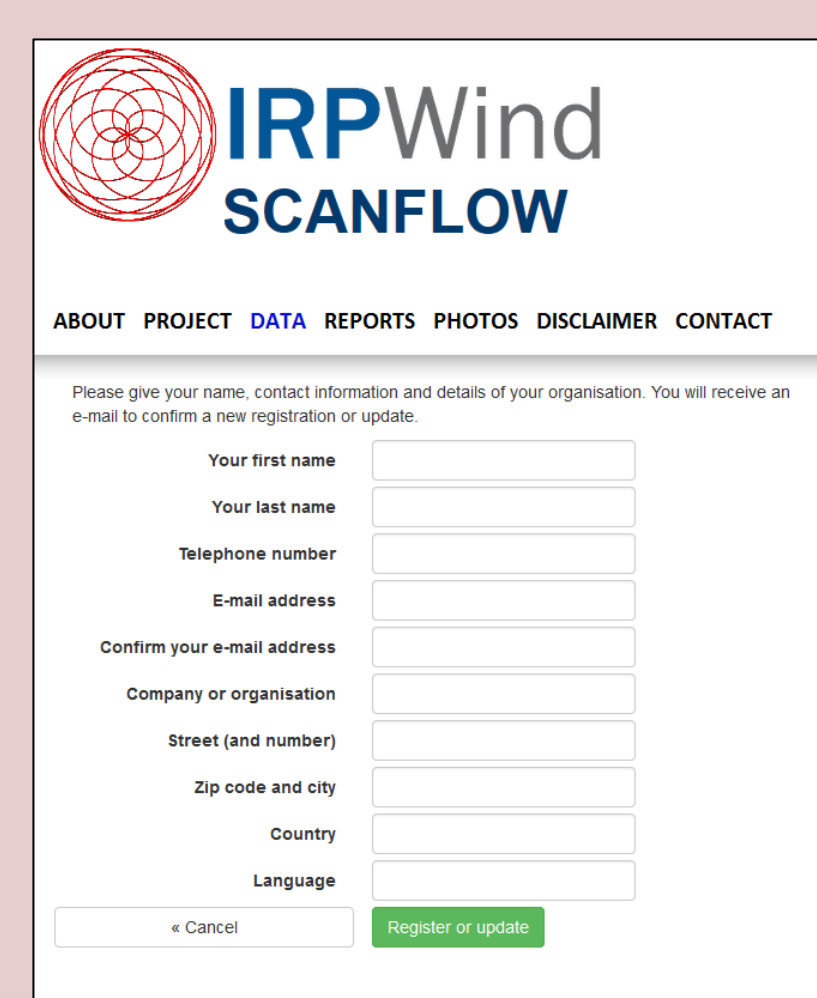
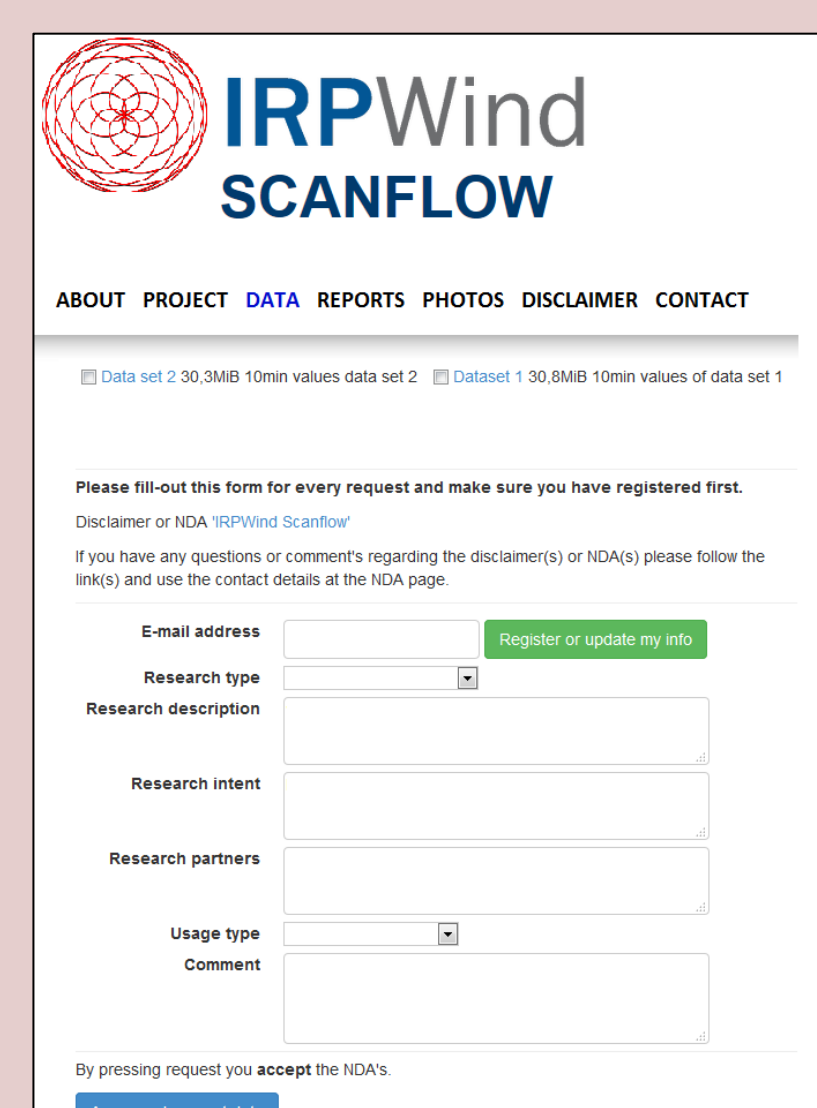
- Go to www.irpwind-scanflow.eu website and click on 'DATA'
- Register as new user
- An email is sent to the new user
- Confirm the registration

2. Data selection

- Go to www.irpwind-scanflow.eu website and click on 'DATA'
- Fill out form and click 'Agree and request data' (the NDA/DISCLAIMER is accepted)
- Data request is being considered

3. Data request evaluation

- The request is being evaluated by the project data maintainer/owner
 - Deny. User receives email with denial motivation
 - Accept. User receives email with a download link, which is temporarily valid
- Download the data

| Available data | | | | | |
|--|---|--------------------------|--------------------------|--------------------------|---|
| MM3 | Wind speed 52m, 80m, 108m | Turbine | PLC Yaw | | |
| | Wind direction 52m, 80m, 108m | | PLC Power | | |
| WindCube V2 | RHT 80m | Short range scanner R2D1 | PLC Rotational speed | | |
| | Pressure 80m | | Short range scanner R2D2 | PLC Status (binary) | |
| | TI | | | Short range scanner R2D3 | Time |
| | Horizontal wind speed | | | | X coordinate of a right-handed Cartesian coordinate system. |
| Vertical wind speed | Y coordinate of a right-handed Cartesian coordinate system. | | | | |
| Wind direction | Z coordinate of a right-handed Cartesian coordinate system. | | | | |
| Data availability | Radial wind speed | | | | |
| 40m, 50m, 60m, 70m, 80m, 90m, 100m, 110m, 120m, 130m | U-component wind vector | | | | |
| Nacelle LiDAR | Time | V-component wind vector | | | |
| Index: sample number in scan pattern | W-component wind vector | | | | |
| LOS velocity | Scan pattern index | | | | |
| Quality | Quality index velocity estimation | | | | |
| Power in spectrum | Max power | | | | |
| Azimuth | Total power Doppler spectrum | | | | |
| x-component unit vector | # measurements per point | | | | |
| y-component unit vector | Status | | | | |
| Focus distance | | | | | |
| Inclination | | | | | |
| ScalingFactor | | | | | |

Acknowledgements

The work described here has received support from IRPWind, a project that has received funding from the European Union's Seventh Programme for Research, Technological development and Demonstration.

Final Statement

In the ScanFlow project various measurements are being performed to characterize the inflow wind field. These data will publically become available at the end of the project (February 2017) via the website www.irpwind-scanflow.eu. Related websites and important links are www.irpwind.eu, www.windbench.eu and www.windscanner.net.

