Master in Photonics – "PHOTONICS BCN"
ERASMUS+ "EUROPHOTONICS"

MASTER THESIS PROPOSAL

Dates: April - September 2020

Laboratory: CommSensLab-UPC (Communications and Sensing Lab. – UPC), https://www.tsc.upc.edu/en/research/research-groups/commsenslab , https://ors.upc.edu/
Institution: Universitat Politècnica de Catalunya (UPC)
City, Country: Barcelona, Spain

Title of the master thesis: *LIDAR (laser radar) remote sensing: Application to the off-shore wind energy*

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Keywords: *Remote Sensing, wind energy, lidar, laser-radar, signal processing, principal component analysis, classification.*

Summary of the subject (maximum 1 page):

MSc thesis on Laser-radar Remote Sensing and Intelligent Processing at CommSensLab-UPC, an Excellence Centre of UPC.

Lidars (i.e., *laser radars*) are now being accepted as the best suitable sensors to identify candidate locations for *off-shore wind-energy* farms, their assessment and planning. When wind lidars are placed over floating off-shore platforms, like highly-instrumented marine buoys, they permit to measure the wind resource without resorting to expensive equipment like wind-monitoring towers or less accurate methods such as satellite data or numerical simulations. Additionally, remote sensing devices as floating Doppler wind lidars enable to evaluate the wind resource in large areas since they are versatile and can easily be re-deployed (Fig. 1).
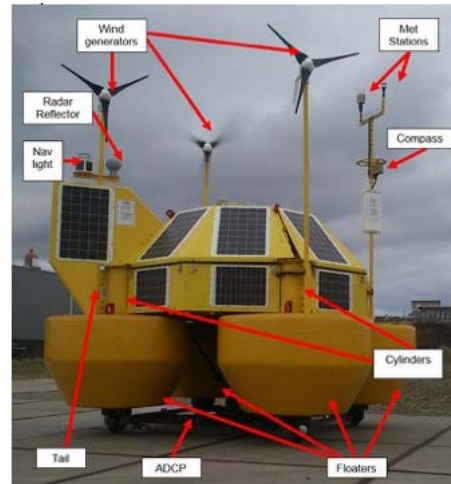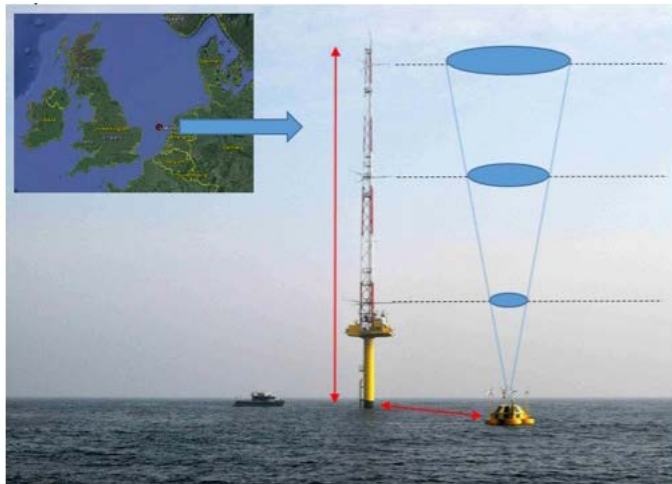
Fig.1 Location of the validation campaign and image of the IJmuiden test site (North Sea). (Left) Meteorological tower and the EOLOS lidar buoy. (Right) EOLOS lidar buoy.

In the framework of European Project NEPTUNE (https://www.youtube.com/watch?v=cJyeUbawIWI), which was participated by UPC (Dep. of Signal Theory and Communications, TSC), Laboratory of Maritime Engineering (LIM – UPC), and key research and industrial partners (incl. Gas Natural Fenosa, CIEMAT, SIMO S.L., and Sttutgart Wind Energy), the wind-lidar buoy of Fig. 1b was developed.

A major measurement campaign carried out at Ijmuiden (the North Sea), where wind-lidar measurements were intercompared against cal/val references such as highly instrumented met-masts and co-operative sensors, namely, Inertial Measurement Units, sonic anemometers and current meters, provided extensive records of both marine and lidar-buoy conditions.

The MSc project proposes to apply basic Artificial-Intelligence (AI)-based tools such as Principal Component Analysis (PCA) as well as to access off-shore measurement campaign data from Ijmuiden's Intensive Observations Periods in order to study the motional behaviour of off-shore wind lidars. This is recognised as a key state-of-the-art research topic and a main industrial concern of floating Doppler wind lidar technology.

Additional information:
* Required skills: *Matlab software.* Physics/Telecommunications degree with clear motivation for the remote sensing arena, data processing and wind energy. Good computer and programming skills are beneficial. English speaking and writing skills preferred.

* Miscellaneous:
The successful candidate will be integrated in a supporting pool of MSc and Ph.D. students.