

## PROPOSAL OF INTERNSHIP IN RESEARCH LABORATORY (MASTER)- 2024

# Temporal study of the hydrodynamic loads applied on a horizontal axis tidal turbine in turbulent flow: Experimental approach

### Research Laboratory :

Laboratoire Universitaire des Sciences Appliquées de Cherbourg (LUSAC)

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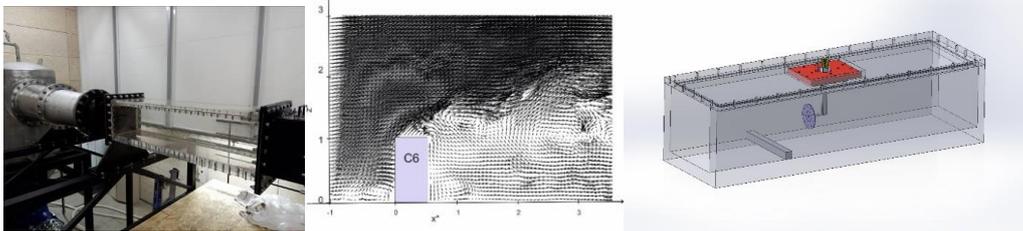
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Marine Renewable Energies and in particular the energies provided by the tidal currents are one of the subjects of our research work. The installation of tidal turbines is envisaged in areas such as the Raz Blanchard (Normandy coasts). The high level of turbulence present in these zones can have a strong impact on the fatigue of the turbine elements. The characterization of these flows as well as the estimation of the forces applied to the turbines must therefore be taken into account in the design of the turbines.

LUSAC has been working on the interaction of the ambient turbulence with turbines (using a computational fluids dynamic approach). Another complementary topic of research developed in our research team deals with the roughness marine bottom with numerical and experimental approaches to improve the understanding of the processes of the turbulence generation. Measurements were deployed in the LUSAC Hydrodynamic Tunnel, with high-velocity flow above a simple obstacle placed on the bottom; complex configurations were also studied. The obstacles anchored on the bottom used are cylinders of rectangular section occupying the entire width of the transparent study area. Finally, we designed a porous disk, a simplified model of a horizontal axis turbine, adapted to the LUSAC Hydrodynamic Tunnel.



*Measurement zone, instantaneous velocity fields measured by particle image velocimetry for an alone obstacle, and combination with a porous disk.*

The trainee will work on the implementation of the porous disk in the Hydrodynamic Tunnel. The trainee will therefore participate in particle image velocimetry measurements and will set up the measurement of the forces applied to the porous disk by the ambient flow generated upstream. The objective of the work is to establish the relationship between the hydrodynamic forces applied to the disk and the ambient turbulence.

### KEYWORDS :

EMR, tidal turbine, bottom obstacles, vortex shedding, porous disk, hydrodynamic tunnel, measurement of hydrodynamic loads, particle image

### PROFIL DU CANDIDAT :

Le candidat devra disposer d'une formation en hydrodynamique / mécanique des fluides et d'une capacité à s'appropriier les développements expérimentaux. En effet, le stagiaire participera aux mesures par PIV et la mise en place de la mesure d'effort sur le disque poreux.

Le candidat doit disposer de bonnes qualités rédactionnelles et présenter une bonne disposition à l'analyse des écoulements caractérisés.

**DATES :** Beginn in march, for 6 month

**MORE INFORMATIONS :**

Salary : ~560 €/moth

It is essential that the TRAINEE provides an ophthalmological examination including fundoscopic examination. On this basis, the doctor from the University of Caen Normandy will issue an opinion regarding the candidate's ability to participate in the experiments (use of class 4 laser sheet illumination) which will condition the final acceptance of the application.