

Proposal 2015-2016

Topic #5 - Energy harvesting from aeroelastic systems: theoretical and technical considerations

Contacts

ULg / WTL	Thomas Andrianne	(t.andrianne@ulg.ac.be)
ULg / Microsys	Philippe Laurent	(p.laurent@ulg.ac.be)

Context

The role of remote sensors has tremendously increased over the last years. One of the main challenges in this technical field concerns the power consumption of these sensors. Despite much effort in minimizing the needed power of the sensor (ultra-low power), the final objective is to reach a total autonomy, for practical and economical reasons. In the scope of this work, it is considered to harvest renewable energy from the wind. More precisely the energy extraction will be carried out from wind-induced vibrations of a flexible and dedicated structure. Amongst the possible aeroelastic instabilities, single degrees of freedom (1dof) and two dof's instabilities will be considered: galloping and classical flutter respectively.



Objectives

The objective of this final year project is to study the potential of energy harvesting from aeroelastic instabilities. This task is performed theoretically on the basis of mathematical models and experimentally through the design and fabrication of a wind tunnel prototype.

The TFE will consist in:

- Literature research about energy harvesting strategies and aeroelastic phenomena.
- Development of aeroelastic models (empirical models).
- Experimental characterisation of harvesting assemblies for modelling purpose (shaker tests).
- Coupling of the energy extraction to the aeroelastic model.
- Wind-tunnel testing of the prototype.
- Validation of the numerical model(s) through experimental measurements (aeroelastic behaviour and energy outputs).
- Study of the potential scaling of the prototype.