# Transferring energy between acoustic (vibrational) fields by the friction nonlinearity

## Mission:

This post-doctoral is proposed in the framework of a national French research project ANR PANSCAN (Passive Ambient Noise-based Structural monitoring through exploitation of Contact Acoustic Nonlinearity, AAPG ANR 2017 DEfi 3 PRC - AAP Matériaux et Procédés : ANR-17-CE08-0013-03). It represents the continuity of a first project ANR PASNI that ended in 2015. The work, object of the post-doctorate, is part of a specific task of the project, aimed to optimise a passive acoustic (vibrational) source using the ambient vibrational energy on the structure (e.g. aircrafts structural vibrations). It concerns Structural health monitoring of aeronautics structures.
The proposed work will consist in contributing to the development and optimization of an artificial acoustic source, which will generate an acoustic field from the frictional contact between two resonators.

The objective of the work is to design a system able to capture energy either from the ambient acoustic field or from the working environment, and transforming it in a different acoustic field at higher frequencies. To this aim, the nonlinearity of the friction phenomenon between two sliding bodies will be investigated.

During the post-doctoral, both experimental and numerical analyses will be carried on. The device for the acoustic energy transfer will be optimized and validated on a simplified set-up. A numerical model will be developed by Finite Element Modelling in order to reproduce and quantify the energy transfer. The friction law representative of the contact excitation will be retrieved experimentally from tests on a dedicated test bench.

The objective is to optimise simple experimental devices able to reproduce the desired results. A main issue will concern the robustness of the system dynamic and the interface geometry and materials. The device definition, design and analysis will be developed in parallel to the numerical analysis.
The dynamic experimental tests will be accompanied by tribological expertises.

## Contract conditions:

Post-doc position of 6+6 months paid for by the ANR project at the LaMCoS of the INSA of Lyon.

## Candidates profile:

Highly motivated candidates holding a Ph.D. preferably with a background in dynamics, friction, acoustics and/or tribology. The candidate will have a strong background in mechanics. An experience in both numerical modelling and experimental analyses will be greatly appreciated.

## Contact:

Candidates who are motivated should send a CV (with notes) and presentation letter to Eric Chatelet (eric.chatelet@insa-lyon.fr) and Francesco Massi (Francesco.massi@uniroma1.it).