

EXPERIMENTAL INVESTIGATION OF NONLINEAR METAMATERIALS FOR VIBRO-ACOUSTICAL CONTROL

1. DESCRIPTION OF THE PROJECT

The global idea of the project is design, fabrication and numerically/experimentally verifications of vibro-acoustical energies control in nonlinear metamaterials [1,2]. The investigation of such systems will be based on designing fast and slow system dynamics [3] leading to tuning parameters of the desired nonlinearities. The process will stay in two following global steps:

- Design and fabrication of a single nonlinear meta-cell, e.g. a mass-in-mass cell, with *tailored* nonlinearities [4].
- Design and fabrication of a chain of coupled meta-cells in previous step.

The design process will be carried out based on optimization of the non-linearity parameters [5] to achieve the desired system dynamics [3,4]. Then, the fabricated systems will be subjected to different excitations with varying frequencies and amplitudes. Results obtained experimentally for different system dynamics should be compared with those obtained from analytical/numerical analyses.

2. STARTING DATE, DURATION OF POSTDOC AND EXPECTED PROFILES

The postdoc will start as soon as possible (*from January 2023-April 2023*); the duration will be 18 months and the prospected candidate should have following profiles:

- The candidate should hold a Ph.D. in mechanics or acoustics (aerospace, civil or mechanical engineering) with enough knowledges in the domain of nonlinear vibrations.
- The candidate should have enough experiences in the domain of experimental studies.
- A good knowledge on numerical aspects is appreciated.

3. SUPERVISORS OF THE POSTDOC

The postdoc position will be between “LTDS UMR CNRS 5513” and “LaMCoS UMR CNRS 5259” Labs of the University of Lyon. The supervisors will be:

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- 2- B. Deng, J. R. Raney, K. Bertoldi, and V. Tournat, "Nonlinear waves in flexible mechanical meta- materials," *Journal of Applied Physics*, vol. 130, no. 4, p. 040901, 2021.
- 3- A. Labetoulle, A. Ture Savadkoohi, E. Gourdon, "Detection of different dynamics of two coupled oscillators including a time-dependent cubic nonlinearity", *Acta Mechanica*, vol. 233, p.259–290, 2022.
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- 5- S. S. Ahmadisoleymani, S. Missoum, "Optimization under Uncertainty of a Chain of Nonlinear Resonators using a Field Representation," *Applied Mathematical Modelling*, vol. 96, p.779–795, 2021.