

## Acoustic metamaterials for sound transmission cancellation

LAUM, UMR 6613 CNRS, is a leading laboratory in Acoustics located in Le Mans, France. The laboratory is offering a PhD position in the field of metamaterials for sound transmission cancellation.

**Expected starting date:** July 1<sup>st</sup> 2024

**Application Deadline:** April 1<sup>st</sup> 2024

### Project:

This doctoral project is part of a larger, multidisciplinary and international project METAVISION: "METAmaterials for Vibration and Sound reductiON" (no. 101072415) funded under the Marie-Sklodowska-Curie Actions Doctoral Networks within the Horizon Europe Programme of the European Commission.

METAVISION aims to reconcile two conflicting trends. On the one hand, people become increasingly aware of the negative health impact of excessive noise and vibration exposure. On the other hand, every kilogram of mass removed from the logistics chain has a direct economic and ecological benefit. Current noise and vibration solutions still require too much mass or volume to be practically feasible, particularly for lower frequencies. There is thus a strong need for low mass, compact material solutions with excellent noise and vibration characteristics, for which recently emerged so-called metamaterials have shown immense potential. METAVISION aims to develop novel design and analysis methods in view of broadening the performance and applicability of metamaterials, revolutionize the manufacturing of metamaterials towards large-scale and versatile solutions and advance academically proven metamaterial concepts towards industrially relevant applications.

METAVISION gathers universities (KU Leuven, Université du Mans, Universidade de Coimbra), research institutes (Centre National de la Recherche Scientifique, Swiss Federal Laboratories for Materials Science and Technology EMPA) and small- and large-scale industry (Siemens Industry Software NV, Materialise NV, MetAcoustic, Phononic Vibes srl, Airbus, Swiss Federal Railways, Mota-Engil Engenharia e Construção S.A.) from manufacturing, construction, transportation, machine design and noise and vibration solution sectors with the relevant expertise to create the coordinated research environment needed to bring metamaterials from academic concepts to large-scale manufacturable and industrially applicable noise and vibration solutions, paving the way towards a quieter and greener Europe.

### Your tasks

As doctoral candidate within this project you will work on the design, manufacturing, and experimental validation of acoustic metamaterials for sound transmission cancellation. To do this :

- You investigate different design strategies
- You investigate potential optimization strategies
- You design and measure prototypes to validate the models
- You identify the ideal solution for specific problems.

### Profile :

If you recognize yourself in the story below, then you have the profile that fits the project and the research group:

- I have a master degree in acoustic, physics, mechanical engineering or mathematics, obtained no longer than four years ago and performed above average in comparison to my peers.
- I am proficient in written and spoken English.
- I have not had residence or main activities in France for more than 12 months in the last 3 years.
- During my courses or prior professional activities, I have gathered some experience with at least one of the following: principles of acoustics, numerical modeling techniques, or experimental methods in acoustics. I have a profound interest for these topics.
- As a researcher I perform research in a structured and scientifically sound manner. I read technical papers, understand the nuances between different theories and implement and improve methodologies myself.
- In frequent reporting, varying between weekly to monthly, I show the results that I have obtained and I give a well-founded interpretation of those results. I iterate on my work and my approach based on the feedback of my supervisors which steer the direction of my research.
- It is important for me to work as an active team member and I am eager to share my results to in-spire and being inspired by my colleagues.
- During my PhD, I want to grow towards following up the project that I am involved in and representing the research group on project meetings and conferences. I see these events as an occasion to disseminate my work to an audience of international experts and research colleagues, and to learn about the larger context of my research and the research project.

### Offer:

We offer a fully funded 3-year PhD position at LAUM, UMR 6613 CNRS. Perfect absorption of acoustic waves has been the focus of numerous studies this last decade. Several design strategies have been proposed to achieve perfect absorption either focusing on the subwavelength or on the broadband aspects. In this PhD, you will focus on transmission cancellation, that is the total annihilation of the acoustic wave energy. Various strategies, involving non-reciprocal features, will be investigated and combined.

**For further information** about the position please contact Vincent Pagneux ([Vincent.Pagneux@univ-lemans.fr](mailto:Vincent.Pagneux@univ-lemans.fr)), Vicente Romero-García ([virogar1@upvnet.upv.es](mailto:virogar1@upvnet.upv.es)), or Jean-Philippe Groby ([Jean-Philippe.Groby@univ-lemans.fr](mailto:Jean-Philippe.Groby@univ-lemans.fr))

**We look forward** to receiving your online application including a letter of motivation, CV, diplomas with transcripts and contact details of two referees.

Application must be made online via the CNRS recruitment portal (<https://emploi.cnrs.fr/Offres/Doctorant/UMR6613-SANCHA-033/Default.aspx?lang=EN>)