

## PhD POSITION

LOW FREQUENCY, BROADBAND AND THIN ACOUSTIC METAMATERIALS FOR ACOUSTIC INSULATION



Metacoustic, a R&D company in acoustics specialized in the industrial implementation of advanced solutions such as the use of metamaterials, and LAUM, a leading laboratory in Acoustics both located in Le Mans, France are offering a

**PhD position to join their team to work in the challenging Horizon Europe MSCA doctoral network METAVISION.**

**Expected starting date:** October 1<sup>st</sup> 2023

### **Project:**

This PhD is part of the Horizon Europe MSCA doctoral network METAVISION (METAmaterials for Vibration and Sound reduction – Grant number 101072415). METAVISION is an international consortium of high-profile universities, research institutions and companies located in 7 European countries. METAVISION will train 11 doctoral candidates through intersectoral, multidisciplinary and international joint research and 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 at low frequencies require too much mass or volume to be practically feasible. There is a strong need for low mass, compact 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, revolutionize the manufacturing of metamaterials towards large-scale and versatile solutions, and advance academically proven metamaterial concepts towards industrially relevant applications.

Elastic and locally resonant metamaterials can achieve high sound attenuation, especially at low frequencies, due to properties resulting from periodic lattice organization or local resonances. In particular, recent studies show that high sound insulation can be obtained when inclusions are inserted into a porous medium in which the skeleton vibrates. Metablocker is a metamaterial developed by Metacoustic, based on these principles; its performance at low frequencies has been demonstrated experimentally. The adaptation of this material to address sound insulation applications is an important issue, which is also attracting a lot of interest from industry. Furthermore, the coupled phenomena between the material and the vibrations of the supporting panel can be organized and optimized in order to improve the trade-off between low-frequency acoustic performance and treatment thickness. The applications targeted by this work are specifically related to acoustic insulation in contexts where the acoustic treatments to be applied must be thin in order to limit the size (transport industry, household appliances, etc.). The particular case of ultra-low frequency attenuation for very specific and demanding industrial and scientific applications will be investigated.

The PhD candidate will be in the Metacoustic company and will work with Clément Lagarrigue and Damien Lecoq. She or he will be supervised by François Gautier and Adrien Pelat, both researchers at LAUM.

**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 engineering, physics or mathematics and performed above average in comparison to my peers. I am not in possession of a doctoral degree at the date of recruitment.
- I am proficient in written and spoken English.
- I haven't 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 basic experience with the physical principles of structural dynamics and (vibro-)acoustics and the related numerical modeling techniques, such as the Finite Element Method (FEM), as well as numerical optimization, manufacturing methods, and/or I have a profound interest in these topics. Experience with knowledge of metamaterials is considered as a bonus.
- As a PhD 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.
- Based on interactions and discussions with my supervisors and the colleagues in my team, I set up and update a plan of approach for the upcoming 1 to 3 months to work towards my research goals. I work with a sufficient degree of independence to follow my plan and achieve the goals. I indicate timely when deviations of the plan are required, if goals cannot be met or if I want to discuss intermediate results or issues.
- 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.
- I feel comfortable to work as a team member and I am eager to share my results to inspire and being inspired by my colleagues.
- I value being part of a large research group which is well connected to the machine and transportation industry and I am eager to learn how academic research can be linked to industrial innovation roadmaps.
- 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 or 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:**

- A remuneration package competitive with industry standards in France. You will receive a monthly gross salary of €3958. The net income will be lower since a deduction of income tax, the social contributions, and other permitted deductions need to be considered. In addition to the salary you will receive a mobility allowance of €600 and, if applicable, a family allowance of €660. This salary and allowances are defined by the Horizon Europe MSCA Network.
- An opportunity to pursue a PhD in Acoustics, typically a 3 years trajectory, in a stimulating and ambitious research environment.
- Ample occasions to develop yourself in a scientific and/or an industrial direction with the European research group.

**For further information** about the position please contact Clément Lagarrigue (clement.lagarrigue@metacoustic.com), Damien Lecoq (damien.lecoq@metacoustic.com), François Gautier (francois.gautier@univ-lemans.fr) or Adrien Pelat (adrien.pelat@univ-lemans.fr).

We look forward to receiving your application including a letter of motivation, CV, diplomas with transcripts and contact details of two referees on [job@metacoustic.com](mailto:job@metacoustic.com)