Master or engineering school internship: Extraction of the properties of porous materials by combining multi-angle measurements and model inversion

Context

Environmental or occupational noise has harmful effects on the health and quality of life of the population and workers. The most widely used approach to control noise is to install sound-absorbing materials that are chosen based on the value of their absorption coefficient. Sound absorption data end-users are various: researchers, architects, consultants, manufacturers. A drawback is that the current standardized measurement of this coefficient is not highly reproducible and requires a heavy infrastructure (a reverberation chamber). A previous project [1,2] aimed to develop an alternative method for this measurement. The corresponding study showed that the approach was convincing, despite measurement biases linked to the uncertainties present for the very simplified test bench.

A new automated laboratory measurement bench has been developed. It makes it possible to limit many sources of uncertainty such as the positioning of the source and the repeatability of movements. The objective of the proposed internship is to support the development of methods for identifying the properties of porous materials by multi-angle measurements and model inversion. The main aim is to increase the robustness of calculations in the frequency range going from 100 to 500 Hz. The methodology presented in [3] will also be adapted for the synthesis of the absorption coefficient under a diffuse acoustic field excitation, and validation tests on materials. various of which potentially metamaterials will be produced [4].

Internship location and conditions

The internship will take place mainly at GAUS (Sherbrooke, Canada) and will be carried out in partnership with the École de Technologie Supérieure de Montréal (ÉTS) and the Institute for Research in Occupational Health and Safety (Montreal). Regular exchanges and trips are planned with the ETS. Remuneration for the internship is planned (to be discussed according to profile). The planned internship start date for the internship is February 2022 for a period of between 4 and 6 months. This internship is an opportunity to gain experience in an international context with recognized research teams.

Contact

Applications should be sent to the attention of Olivier Robin, assistant professor (olivier.robin@usherbrooke.ca) and Alain Berry, full professor (alain.berry@usherbrooke.ca).
A CV and a transcript must be provided, as well as a reference to contact.

References

[1] Robin O, Berry A, Kafui Amédin C, Atalla N, Doutres O, Sgard F., Méthodologie innovante pour la caractérisation des matériaux acoustiques en laboratoire et étude de son applicabilité sur le terrain, Rapport de recherche IRSST : R-1022 (2018).
[2] Robin O, Berry A, Kafui Amédin C, Atalla N, Doutres O, Sgard F. Laboratory and in situ sound absorption measurement under a synthetized diffuse acoustic field. Building Acoustics. 2019;26(4):223-242.
[3] Robin O, Berry A, Doutres O, et al. Measurement of the absorption coefficient of sound absorbing materials under a synthesized diffuse acoustic field. J Acoust Soc Am 2014; 136: EL13–EL19.
[4] Dauchez N, Nennig B, Olivier Robin O, Additional Sound Absorption Within a Poroelastic Lamella Network Under Oblique Incidence. Acta Acustica united with Acustica, 2018, 104 (2): 211-219.