

## PhD Position on

### “Detection of low-level cars by pedestrians”

In the framework of the H2020 Marie Skłodowska Curie project PBNv2 – Next generation Pass-By Noise approaches for new powertrain vehicles (ETN GA721615) – the engineering school INSA-Lyon (France, <https://www.insa-lyon.fr/en/>) is searching for a candidate to join the team working on the subject "Detection of low-level cars by pedestrians". Hosted by the Laboratory of Vibration and Acoustics (LVA, <http://lva.insa-lyon.fr/en/>) of INSA-Lyon, the PhD position will start on September 2017 for three years. Lyon (<http://www.onlylyon.com/en/>) is one of the biggest French cities.

Candidates who have worked more than 12 months in France during the last 3 years are not eligible.  
Candidates who has already more than 4 years of research experience are not eligible.  
Candidates with a PhD are not eligible.

#### Description of work

Modern cars are being more and more silent, especially at low speeds (below 50 km/h). This is especially true for electric vehicles, for which additional sound will become mandatory, but also for new gasoline engine cars. Pedestrians can hardly detect such cars in an urban environment, which can create dangerous situations. It can be very important to predict the detectability of such cars, from the knowledge of source (mainly engine) behaviours. The aim of this Ph.D. is to investigate how accurate the transfer functions between source and a receiver outside the car should be in order to get an accurate prediction of detectability.

#### Research program

It is well known that the acoustic perception of sounds is highly dominated by the source. The description of transfer paths is of second order. However, huge efforts are produced to develop more and more refined models of the transfer paths. The objective is here to define how detailed should be the transfer paths from a detectability point of view. On the example of vehicles Pass-by Noise, the PhD student will use different acoustical models – from the coarsest to the most detailed – to estimate the noise radiated by an engine block outside its compartment on some control microphones. These models should be able to cover a large part of the audible frequency range and detectability experiments will be carried out to estimate the influence of the modelling of transfer paths on the car audibility. The case of electric vehicles, for which the main sound source is a loudspeaker emitting the additional warning sound, will also be investigated. Participants to the experiments will be normal hearing people; but it will be possible to use a "hearing impairment simulator" in order to get some results for people suffering from typical hearing losses (e.g. presbycusis).

The candidate should have some skills on experiments and numerical simulation (Finite Element methods) and should be at ease with scientific computer programming (Matlab, Python, for example). The candidate should be able to write scientific articles in a good English.

#### Location:

Laboratoire Vibrations Acoustique  
Campus LyonTech la Doua - INSA de Lyon  
Bâtiment St. Exupéry  
25 bis av. Jean Capelle  
69621 Villeurbanne cedex - France

**Supervisors:**

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**Salary** : around 2360€/month free of charge