



The **French-German Research Institute of Saint-Louis (ISL)** situated in the border triangle of Germany, France and Switzerland is an internationally renowned research institute belonging to a global industrial and economic network. The spectrum of our core activities comprises a variety of topics: aerodynamics, energetic and advanced materials, lasers and electromagnetic technologies, protection, security and situational awareness. Our activities are related to both basic and applied research.

ISL is offering a **PhD Position**

**Keywords: Numerical acoustics, Acoustic localization, Space-time processing, Applied mathematics**

## Space-time methods for inverse problems in acoustics with applications in sound source tracking

### Context

Conventional localization methods, such as classical delay-and-sum beamforming and MVDR beamformers, encounter significant difficulties in challenging acoustic environments, as they struggle to separate sound sources effectively. Space-Time methods, which have already proven successful in RADAR in low signal-to-noise ratio or cluttered environments, are a promising alternative. In acoustics, these methods have received little attention in application to inverse acoustic problems, although they represent a suitable class of algorithms for localization tasks.

The objective of this Ph.D. project is to research and develop novel space-time acoustic tracking methods that enable accurate and reliable localization of sound sources, while operating in acoustically challenging environments. The space-time acoustic tracking algorithm will be implemented with the goal to effectively handle low signal to noise ratio conditions and the ability to separate multiple sound sources. A comparative analysis of the proposed space-time acoustic tracking method with traditional methods will be carried out. The accuracy, reliability, and real-time capabilities of the developed method will be assessed within the work.

This research project will involve several phases, including a literature review, development of a space-time localization and tracking algorithm, data evaluation and presentation of research results. Ultimately, the work will culminate in a doctoral thesis in applied mathematics. Participation in international congresses and writing of scientific papers in top-tier journals will be supported and strongly encouraged.

### Candidate profile

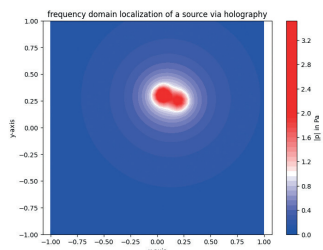
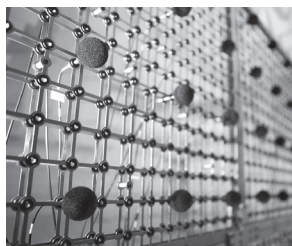
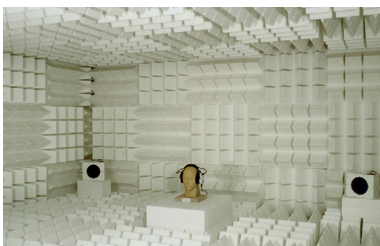
- ◆ Possess a master's degree (or equivalent) in Applied Mathematics, Acoustics, Physics or Electrical Engineering.
- ◆ Experience with numerical solutions of differential equations, particularly in wave propagation modelling and programming experience in Python
- ◆ Proficiency in English, with strong written and spoken communication skills
- ◆ Strong initiative, collaborative abilities and effective interpersonal skills

### What we offer

- ◆ A PhD project within a dynamic and international collaborative environment
- ◆ Access to state-of-the-art experimental facilities
- ◆ Competitive salary

### Localization

The project is carried out in cooperation between the French-German Research Institute of Saint-Louis (ISL) and TU Graz (AUT).



*Anechoic room, Acoustic array, Acoustic-localization/holographic signal processing*

## French-German Research Institute of Saint-Louis (ISL)

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