



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:** Electromagnetism, antennas and antenna arrays, radar, signal processing, prototypes and experimental results.

## Optically transparent antenna arrays associated to integrated radar sensors of small dimensions for optical and microwave applications

### Background

Threat detecting systems are key components for defense as well as for civilian applications. They can be either active or fully passive and can operate either in the optical domain (visible or IR) or microwave (over a wide frequency spectrum). They are very attractive for the monitoring of sensitive or critical sites, as well as for the guidance of ground or aerial vehicles. Nevertheless, depending on the operating technology, the systems present advantages and disadvantages (use conditions, performance, etc.).

### Objectives

Design a unique system, responding to the optical and microwave constraints, would be an undeniable asset to take advantage of both technologies. The objectives of the proposed PhD concern the design of technological bricks for a dual system in a compact volume, enabling the implementation of applications based on image acquisition (optical or IR detection), and providing microwave functions. Moreover, in order not to be detected by the threat (either for civilian or defense applications), the system should be ideally fully passive. Such a system can have numerous applications in both the civilian and military sectors, in particular for monitoring critical infrastructure or the navigation of vehicles.

### Proposed work program

Relying on the previous works and the know-how of ISL and IETR, the main objective of this PhD subject is the design of a new radar sensor, working the mm- or cm- wave domain, which can be used together with an optical sensor in compact dimensions. This topic concerns several fields of competences:

- Design of antennas and antenna arrays on optically transparent substrates with compact dimensions (at various frequencies between 2 GHz and 30 GHz)
  - Design of passive and active (at medium range) compact radar systems
  - Development of signal processing algorithms
- Some prototypes of the designed structures will be manufactured and characterized. Then, they will be associated together to characterize the global system.

As far as possible, communications in international conferences and in peer-review journals will be encouraged.

### Conditions to apply

The applicant must satisfy the following requirements to apply for a DGA funding:

- Be a citizen of the European Union or Switzerland
- Holder of an engineering degree or a Master 2 Research (or equivalence), or be enrolled the year of application

A solid background in microwaves, antennas, radar and electromagnetism is appreciated. Good English language skills are desired.

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