



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 Ph.D. Position

**Research field:** dynamics of materials, experimental mechanics, microstructure analysis, numerical simulations of impacts, terminal ballistics

## Study on the performance and properties of a lightweight ballistic protection with bi-layered 3D welded deposits

### Context

The proposed thesis focuses on studies on materials and structures used as the passive ballistic protection against impacts of kinetic threats. The topic concerns metallic composites combining a steel base support on which another metallic material with different properties is deposited by a specific welding technique. The resulted bi-layered metallic composites offer new possibilities enhancing the resistance to high-velocity impacts, becoming an improvement applicable in protection of land and naval systems.

### Goals of the project

One of the goals of the thesis is to test and describe the discussed metallic composites, which are still considered to be the structures with many unidentified features in terms of both the material characteristics and performance. Therefore, the mechanical, fatigue, and dynamic properties of the base substrate, the front layer deposit, as well as the interface between them and finally, the assembly as a whole, would be characterized. A thorough analysis of the microstructural characteristics of the composite is also scheduled. An adequate approach for describing the performance of the bilayer structures under dynamic loadings should be further proposed. Another objective would be to identify an adapted numerical modeling strategy that enables FEM simulations of the discussed metallic composites. Based on the findings, the study's next phase would involve an optimization and further prototyping of the specified structures in terms of their geometrical, material, microstructures, and ballistic-resistance properties. A highly instrumented terminal ballistics laboratory will host the verification experimental testing program, which will also include actual operational military threats.

### Candidate profile

- Master's degree in Physics, Material Sciences, Mechanics, Computational Mechanics or similar engineering discipline
- Experience in numerical simulations is advantageous
- Excellent English in speaking and writing
- Personal initiative, reliability, teamwork and communication skills

### Benefits

- Ph.D. degree in the domain of Material Sciences or Mechanics of Materials
- Multi-disciplinary experience
- Work in the international environment
- Competitive salary

### Localization

The project is realized in cooperation between the French-German Research Institute of Saint-Louis (ISL) and the Laboratory of Microstructure Studies and Mechanics of Materials (LEM3) at the University of Lorraine in Metz.



[www.isl.eu](http://www.isl.eu)

Dr. Teresa FRAS  
[teresa.fras@isl.eu](mailto:teresa.fras@isl.eu)  
tel: +33 (0) 3 89 69 5088

French-German Research Institute of Saint-Louis (ISL)  
5 rue du Général Cassagnou – 68301 Saint-Louis – France



Dr. Antoine GUITTON  
[antoine.guitton@univ-lorraine.fr](mailto:antoine.guitton@univ-lorraine.fr)  
Tel : +33 372 747 826

Université de Lorraine, CNRS, Arts et Métiers, LEM3  
7 rue Félix Savart – 57070 Metz – France