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**

Research field: Laser and electromagnetic technologies

Simulation and calculation of the explosively pumped rapid deformation of metal bodies passing through a magnetic field

A fundamental understanding of the deformation process induced by the Lorentz force is of significant interest for applications like electromagnetic forming or explosively pumped flux compression generators.

The investigation of the deformation of a metal body was done up to now mainly under the contemplation of the mass distribution. The calculation within a simulation was done but only under basic conditions, without the influence of an outer magnetic field. Therefore the main topic of this work is to investigate the rapid deformation of a metal body which is inside a magnetic field at the moment the deformation starts.

For the understanding of such a system it is necessary to investigate different magnetic disturbances, i.e. caused by different coil geometries. The construction of different coils for these investigations requires a not insignificant experimental effort. To have an estimation about the properties of different coil geometries simulations should be done.

One of the main topics of this work is, based on the theory of the magnetism of coils, to do computer simulations with a FE software to calculate the magnetic field of different coils. These calculations should be expanded by placing a metal body inside the coils and so inside the magnetic field. The time depended magnetization and the induced eddy current must be investigated. In a second step the metal body must be integrated into the simulation as a moved object. For that the calculation of the magnetization must be done again.

The main part of the work is to calculate, with a self-written modified simulation, the deformation of the moving metal body passing through the magnetic field. In particular a model must be created to describe the process during the deformation of the metal body which includes the mechanical, electromagnetic and hydrodynamic processes when the forming of the metal body happens. In this case the magnetic flux compression depending on different body and coil geometries is of special interest.

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