

Project code

HSE-1

Discipline

Occupational Health and Safety and Environmental Protection

Project title

CFD environmental pollutant dispersion simulations

Project description

The Occupational Health and Safety (OHS) Group of the CERN HSE Unit is looking for a motivated and enthusiastic PhD student to work on Computational Fluid Dynamics (CFD) pollutant dispersion simulations in air on and around CERN sites. The objective is to simulate the spread of pollutants (smoke and other aerosols) in air from a building in case of an accidental release, e.g. during a fire. By detailed modelling the pollutant dispersion, the Organization can predict the potential consequences for persons present on and outside the CERN sites in case of an accidental discharge and implement mitigation measures if needed.

The objectives of this doctoral programme are:

- Identifying the most suitable set-up of CFD environmental dispersion models in terms of geometric layout, boundary conditions, wall and turbulence modelling;
- Investigate realistic models of wet and dry aerosol deposition on surfaces integrated with CFD simulations;
- Explore potential CFD-GPM (Gaussian Plume Models) coupling to resolve far-field dispersion. Improve GPM modelling based on CFD simulation trends.
- Investigate plume rise and plume downwash effects;
- Investigate the effect of atmospheric stability conditions on the plume evolution and the pollutant dispersion;
- Investigating the effect of the carrier gas density on the plume propagation (i.e. plumes of gases with densities different from that of air);
- Validate the model with experimental tests to be run in a wind tunnel test facility (an initial CERN site scale model is already available);

These objectives will be achieved mainly by developing case studies linked to existing facilities in collaboration with a project team with expertise in computational fluid dynamics. The candidate will be using the ANSYS Fluent or other CFD software and benefit from the CFD models and studies previously developed in the framework of the FIRIA project (<https://hse.cern/content/firia>). The appointed candidate will be integrated in the FIRIA multidisciplinary project team and will have an opportunity to learn about fire risk assessment, radiation protection, high performance computing, and other disciplines.

The candidate should be knowledgeable of fluid dynamics and have an initial experience with Computational Fluid Dynamics simulations, preferably using ANSYS Fluent or FDS.

If the project sounds interesting to you, please state it explicitly in your application.

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