Fast ions and turbulence in fusion plasmas.

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The background fields in tokamak reactors provide excellent confinement of plasmas at extreme temperatures, but by perturbing the shape of these fields, and inducing electric field structures, the plasma can still find a way to escape. Ultimately, it is these instabilities that limit the performance of tokamak reactor plasmas: we need to understand them so we can design better reactors, and run existing experiments better.

The MAST-U tokamak in particular will be able to examine the challenges that will arise in a true burning plasma, where high energy fusion products and high plasma pressure mean that the nature of electromagnetic turbulence is quite different to existing laboratory devices. This studentship will tackle that project using a mix of numerical simulation and basic theory.

This project forms part of an exciting UK-wide collaboration, with partner universities Oxford, Strathclyde and York, and CCFE Culham (where the UK's largest fusion experiment, JET, is sited, as well as the new MAST-U tokamak), to understand the role of plasma turbulence across a range of length scales and thereby design more efficient tokamak reactors. The successful candidate will have an opportunity to work for researchers from these universities across the UK.

The student will be responsible for simulating and analysing the coupling of global-scale electromagnetic turbulence with ion-scale instabilities, in the context of reactor plasmas with high pressures and significant fast particle content.

In practice this will involve running and interpret high-performance computing codes on world-class supercomputers, as well as understand and explore the basic plasma theory that underpins tokamak turbulence.

Enquiries and applications from interested students are welcome, with detailed information about the studentship scheme to follow.