# Modelling of electron runaway in cooling fusion plasmas

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**Abstract.** In order to ensure the safe operation of future tokamak reactors, the generation of runaway electrons must be prevented or their effects mitigated. Due to the separation between the parameter regimes of present-day and future tokamaks, robust prevention and mitigation schemes for future devices must be developed with the help of validated simulation codes. This talk covers recent developments in modelling of runaways in cooling plasmas, bringing together diverse insights into the runaway problem gained over more than two decades. We describe a new integrated numerical tool for self-consistently simulating the evolution of temperature, poloidal flux, and impurity densities, along with the generation and transport of runaway electrons in a cooling tokamak plasma [1]. We show examples of modelling runaway generation and evolution in present-day devices (ASDEX Upgrade, TCV and JET), including how synthetic diagnostics can be used for benchmarking theoretical models and probing runaway dynamics. We address the expected runaway beam formation and evolution during ITER disruption scenarios, and identify limits on the injected impurity density and magnetic perturbation level for which the runaway seed current is acceptable without excessive thermal energy being lost to the wall via particle impact.

[1] Hoppe, Embreus, Fülöp, Computer Physics Communications, 268, 108098 (2021).