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David Sosa*

Integrated modelling of impurity transport on WEST

Speaker: David Sosa

When: 2021-10-07 19:00:00

Integrated modelling of impurity transport on WEST

Ramp-up phase improvement of plasma performance by Nitrogen seeding

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Abstract: The development and validation of integrated modelling tools that can be applied to the initial current ramp-up phase in Tokamaks is necessary to design a suitable current ramp for fusion scenarios, that lead to peaked and current density profiles, maximizing core heating and current diffusion in order to avoid radiative collapse and MHD instabilities. Since a good understanding of current diffusion physics is needed, in this work we first develop a simple current diffusion model to highlight how different parameters affect this process. Then we solve the complete resistive current diffusion equation using METIS to estimate the changes in the effective charge, Z_{eff} , induced experimentally by Nitrogen seeding in plasmas of the WEST Tokamak. This study indicates that the increment is only weakly dependent on the Nitrogen puffing rate and suggests that the profile is slightly peaked. Transport analysis is then performed using QuaLiKiz to explore more in detail how Nitrogen affects turbulent transport and micro-stability. It is found that Nitrogen injection enhances TEM modes and stabilises ETG near the plasma edge and increases the particle and electron heat fluxes.

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