Advanced divertor equilibrium calculations with finite current density on the plasma boundary

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The Snowflake divertor concept, introduced by Ryutov in 2007 [1], is a potential solution to the challenge of reducing the very high divertor power fluxes foreseen for DEMO with a conventional X-point configuration and narrow SOL. Work reported so far [2] has assumed a vanishing current density at the separatrix. More recently, the volume of the scrape-off layer has been proposed as a new figure of merit for advanced divertor configurations [3]. The CLISTE equilibrium code [4] has recently added the functionality to calculate snowflake-like equilibria under the realistic assumption that the current density profile extends across the separatrix into the SOL. An ideal snowflake is not possible in this case; however it is still possible to optimize the flux flaring factor at the divertor plates. The SOL volume can be optimized independently or both criteria can be jointly optimized with appropriate weightings. Results for advanced equilibrium calculations on ASDEX Upgrade with finite current density on the separatrix will be presented, including configurations with maximum feasible plasma current consistent with poloidal field coil force limits.