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Plasmoid drift and first wall heat deposition during ITER H-mode dual-SPIs in JOREK simulations

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The heat flux mitigation during the Thermal Quench (TQ) by the Shattered Pellet Injection (SPI) is one of the major elements of disruption mitigation strategy for ITER. It's efficiency greatly depends on the SPI and the target plasma parameters, and is ultimately characterised by the heat deposition on to the Plasma Facing Components (PFCs). To investigate such heat deposition, JOREK simulations of neon-mixed dual-SPIs into ITER baseline H-mode and a "degraded H-mode" with and without good injector synchronization are performed with focus on the first wall heat flux and its energy impact. It is found that low neon fraction SPIs into the baseline H-mode plasmas exhibit strong major radial plasmoid drift as the fragments arrive at the pedestal, accompanied by edge stochasticity. Significant density expulsion and outgoing heat flux occurs as a result, reducing the mitigation efficiency. Such drift motion could be mitigated by injecting higher neon fraction pellets', or by considering the pre-disruption confinement degradation, thus improving the radiation fraction. The radiation heat flux is found to peak in the vicinity of the fragment injection location in the early injection phase, while it relaxes later on due to parallel impurity transport. The overall radiation asymmetry could be significantly mitigated by good synchronization. Time integration of the local heat flux is carried out to provide its energy impact for wall heat damage assessment. For the baseline H-mode case with full pellet injection, melting of the stainless steel armour of the diagnostic port could occur near the injection port, which is acceptable, without any melting of the first wall tungsten tiles. For the degraded H-mode cases with quarter-pellet SPIs, which have $1/4$ total volume of a full pellet, the maximum energy impact approaches the tolerable limit of the stainless steel with un-synchronized SPIs, and stays well below such limit for the perfectly synchronized ones.

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