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Update on SPI experiments at JET-ILW in 2019-2020

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In 2019, the JETILW was equipped with a Shattered Pellet Injector (SPI) system with a wide capability to allow studies on the efficacy of shattered pellets in reducing the electro-magnetic and the thermal loads during disruptions and the avoidance/suppression of the formation of runaway electrons. This contribution presents various aspects of the SPI experiments, with the three-pellet injector with diameter [4.57, 8.1, 12.5] mm, conducted on JET-ILW in 2019-2020.
The experiment was performed with Ip = (1.1 - 3.1) MA plasma and mainly with Ne + D2 pellet composition, but also with Ar pellets. Experiments were mainly conducted with normal ("healthy") plasma, not prone to disruption. The current quench (CQ) duration, τ80-20, as well as the radiated energy during the mitigation reflect the effectiveness of mitigation.
A pellet with a high content of Ne or Ar can reduce the CQ duration to below the upper required JET threshold, τ80-20 < 27.5 ms. Plasmas with high internal (thermal + poloidal magnetic) pre-disruptive plasma energy require a high content of Ne or Ar pellet to obtain a short CQ duration, moreover, Ar pellets are more efficient than Ne pellets.
The Ne fraction in the pellet does not affect the mitigation efficiency except for pellets with a small fraction of Ne, Ne/(Ne+D) < 0.5. Moreover, pellets with a very small amount of Ne, and accordingly large amount of D, instead of causing a mitigated CQ, create the conditions for a "cold"VDE, that is the worst-case scenario for plasma termination.
Disruption mitigation is intended to be applied on off-normal or post-disruptive plasmas. SPI plasma mitigation has been shown to be equally effective (in terms of τ80-20) on normal ("healthy") plasma and post-disruptive plasma. The successful prevention of development of full-scale Vertical Displacement Events (VDE), which could become an Asymmetrical VDE, was also demonstrated.

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