Contribution ID: **612**	Type: **not specified**

P2.040 Influence of pellet shielding on disruption mitigation in ITER

Tuesday, 18 September 2018 11:00 (2 hours)

Adequate avoidance and mitigation of disruptions must be ensured if ITER is to meet its objective of high performance burning plasma operation. A comprehensive disruption mitigation system (DMS) is being designed to ensure that thermal, electromagnetic and runaway electron (RE) loads are reduced to tolerable levels. The strategy relies on the injection of impurities/fuel using an array of shattered pellet injectors (SPI) situated in 3 of the upper port plugs and in one equatorial port. Concerning energy loads to plasma-facing components, a mixture of Ne/D2 shards is presently foreseen for mitigation of the plasma stored energy at the thermal quench (TQ) and to increase the density for avoidance of RE formation. A second injection of Ar will be made into the current quench plasma if RE beam development nevertheless occurs.
The TOKES code has for several years been used for the simulation of mitigation by massive injection of impurities. First simulations of SPI [1] with the code approximated the Ne pellet by a gas puff of artificially high density, equal to the average pellet debris density. However, this approximation is too simplistic: the injected pellet debris are evaporated and the vaporized Ne shields the shards from the hot plasma, inhibiting further vapourization and resulting in deeper penetration into the core.
This paper describes the results of TOKES simulations of SPI in ITER, similar to [1], but taking into account the plasma shielding of the pellet debris. TOKES shielding model captures main features, influencing Ne injection distribution. The simulations show that shielding of large pellets (2 kPa·m3), for which the amount of injected Ne is much larger than required for dissipation of the TQ thermal energy, have minor effect on the wall heat load. However, the minimum pellet size providing full dissipation is reduced by a factor of 2.

[1] https://doi.org/10.1016/j.fusengdes.2017.12.016

Presenter: PESTCHANYI, Sergey (INR KIT)

Session Classification: P2