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Modeling runaway electrons dynamics in tokamak plasmas: progresses and challenges

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The sudden termination of a plasma discharge known as a major disruption is a well-identified difficulty from the beginning of tokamak research, which remains still today particularly problematic for the design of a reliable fusion reactor. The key questions are principally related to the growth rate of relativistic electron population, closely linked to the level of the critical electrical field for an electron to run-away, and the upper energy limit that it can reach. Recently, very important achievements have been obtained in this domain. The introduction of the synchrotron radiation reaction force in kinetic calculations is shown to limit the upper energy of the runaway beam to 20-30 MeV consistent with observations [1]. Refined studies have also included the effect of bremsstrahlung radiation [2]. The calculation of the runaway avalanche growth rate has been improved by considering accurately the magnetic field inhomogeneity [3] and the screening effect of partially ionized impurities [4]. With the development of a synthetic diagnostic for the synchrotron radiation [5], numerical tools have reached the required level to perform realistic kinetic simulations of the runaway electron population for assessing effective control capabilities of existing techniques for ITER. A review of the progresses and challenges is performed.

1. J. Decker, et al., Plasma Phys. Control. Fusion 58 (2016) 025016
2. O. Embreus, et al., New J. Phys. 18 (2016) 093023
3. E. Nilsson, et al., Plasma Phys. Control. Fusion 57 (2015) 095006
4. L. Hesslow, et al., Phys. Rev. Letter 118 (2017) 255001
5. M. Hoppe, et al., Nucl. Fusion 58 (2018) 026032

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