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A first analysis of JET plasma profile based indicators for disruption prediction and avoidance.

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Disruptive events still pose a serious problem for the protection of in-vessel components of large size tokamak devices, representing therefore a key aspect to be considered for the design of next step fusion devices such as ITER and DEMO. If an efficient mitigation is strongly required to avoid damage and preserve the structural integrity of the machine, efficient avoidance schemes are needed to possibly bring the plasma back to a safe operating condition. In this framework, disruption prediction plays a key role and in the last few years a substantial effort has been devoted to developing more sophisticated prediction systems and improving their performance both in terms of success rate and warning time. Many of the presently developed disruption predictors mainly rely on MHD markers related to still rotating modes and, especially, to locked modes, which are basically the final precursor of most of the disruptions. Nevertheless, in many cases the detection warning time is still unsatisfactory with respect to avoidance requirements, and a significant step forward needs to be taken.
This work deals with the development of "plasma profile based indicators"for disruption prediction and avoidance in JET, where parameterized peaking factors have been implemented for electron temperature, density and plasma radiation profiles. The basic interplay of the time evolution of different profiles will be described in relation to the phenomenology characterizing specific disruption types together with the relevant time scales. Furthermore, a statistical analysis aiming to describe differences and boundaries between the safe and the disruptive space as well as among specific types of disruptions will be presented, discussing the implications in terms of disruption prediction and avoidance.

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Eligible for student paper award?

No

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