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# A Comprehensive Strategy of Disruption Prediction to Avoid the Collapse of the Configuration in the Next Generation of Tokamak Devices

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Disruptions are catastrophic forms of collapse that have affected all tokamak devices and are therefore one of the main potential showstoppers on the route to a commercial reactor. A new approach to proximity detection has been developed. It allows determining both the probability of and the time interval remaining before an incoming disruption. The methodology has been implemented with adaptive, from scratch, real time compatible routines. Moreover particular attention has been paid to identify machine independent indicators, to improve the transfer of the predictors to different devices. The new analysis methods have been deployed on thousands of JET discharges, covering the isotopic compositions from hydrogen to full tritium and including the last major D-T campaign. The nature of the main types of disruptions has been investigated to corroborate the potential of the devised solutions. The results indicate that physics based prediction and control tools can be developed, to deploy strategies of disruption avoidance and prevention, that meet the requirements of the next generation of tokamaks.

Keywords: Tokamaks, Disruptions, Radiation limit, Tomography, Adaptive predictors, Proximity control, Transfer Learning.

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