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P3.047 First Wall and Divertor Protection in JET-ILW: Assessment of Reliability after fifty Hours of Plasma Operation

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The risk of damaging the metallic PFCs on JET-ILW by beryllium melting or cracking of tungsten owing to thermal fatigue requires a reliable active protection system: it shall avoid damage to the plasma-facing components (PFCs). To address this issue, a real-time protection system comprising newly installed imaging diagnostics, real-time algorithms for hot spot detection and alarm handling strategy has been implemented into the JET protection system and successfully demonstrated its reliability. It must be active in every plasma discharge and shall become especially important during the execution of the experiments in the coming D-T campaign, where stationary plasmas with an additional power of 40MW for 5s but tolerable wall heat loads and impurity concentration are required.
The real-time protection system has been operated routinely over 12000 discharges (>50hours of plasma operation) since 2011. Within the last experimental campaigns 2-3% of the plasma discharges were successfully terminated by this system, avoiding material overheating and damage. The different hot spot detection algorithms fulfil their tasks with a high reliability: triggering of false alarms is less than in 0.5% of all plasma discharges. The real-time protection system is an essential tool for JET operation and the experience gained can contribute important ideas and methods to the design of the ITER plasma control system.
Future development of the JET real-time first wall protection is focused on the D-T campaign and on operation near ITER relevant conditions. D-T operation at JET will cause failure of camera electronics within the Torus hall due to significant increase of the hard radiation level (neutrons/gammas). To provide the reliable wall protection needed during coming D-T campaign, two camera systems, equipped with new optical relays to take the images and the cameras outside of the biological shield, have been installed on JET-ILW and calibrated with an in-vessel calibration light source.

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