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Development of a real-time system for ITER first wall heat load control HIMANK ANAND, PETER DE VRIES, YURI GRIBOV , RICHARD PITTS, JOSEPH SNIPES, LUCA ZABEO, ITER organization — The steady state heat flux on the ITER first wall (FW) panels are limited by the heat removal capacity of the water cooling system. In case of off-normal events (e.g. plasma displacement during H-L transitions), the heat loads are predicted to exceed the design limits (2-4.7 MW/m^2). Intense heat loads are predicted on the FW, even well before the burning plasma phase. Thus, a real-time (RT) FW heat load control system is mandatory from early plasma operation of the ITER tokamak. A heat load estimator based on the RT equilibrium reconstruction has been developed for the plasma control system (PCS). A scheme, estimating the energy state for prescribed gaps defined as the distance between the last closed flux surface (LCFS)/separatrix and the FW is presented. The RT energy state is determined by the product of a weighted function of gap distance and the power crossing the plasma boundary. In addition, a heat load estimator assuming a simplified FW geometry and parallel heat transport model in the scrape-off layer (SOL), benchmarked against a full 3-D magnetic field line tracer is also presented.

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