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Novel Aspects of Plasma Control in ITER,* D.A. Humphreys, M.L. Walker, *GA*; G. Ambrosino, *CREATE*; J. Lister, *EPFL-CRPP*; W. Treutterer, *IPP-Garching*; J. Snipes, A. Winter, *ITER IO* — ITER will place uniquely high demands on performance and reliability of plasma control, yet with constrained actuators and limited opportunity to tune algorithms. For example, divertor and core radiation must be regulated to minimize target heat flux. Plasma burn state must be controlled to achieve the Q=10 mission and minimize disruptivity. Performance-limiting instabilities such as tearing modes must be robustly stabilized through regulation of current profile characteristics, control of sawteeth and error fields, or active ECCD suppression. Satisfying these and other control goals requires advances in both physics understanding and model-based control mathematics solutions. For example, control of proximity to tearing limits requires improved understanding of resistive stability physics to identify key profile control parameters and produce models for control design. Ensuring robust control performance relies on advances in model-based algorithm design. We describe selected plasma control challenges for ITER, highlighting novel aspects and needs for improved understanding in both physics and control mathematics.

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