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Overview of the Preliminary Design of the ITER Plasma Control System

Thursday, 20 October 2016 14:00 (4h 45m)

The Preliminary Design of the ITER Plasma Control System (PCS) has been carried out since 2014 by members of the ITER Organization and a number of plasma control experts from CCFE, CEA-Cadarache, CREATE, Efremov, General Atomics, IPP-Garching, and Kurchatov as well as through a collaboration with Eindhoven University of Technology. This work builds on the PCS Conceptual Design that was approved in 2013 and focusses on the needs for 1st plasma and early plasma operation in H/He up to 15 MA operation with moderate auxiliary heating power in L-mode. Initial control schemes for plasma initiation, current rise, vertical stability, plasma position and shape, X-point formation, divertor operation, and density control with gas puffing and pellet injection are being developed. Commissioning of the electron cyclotron, ion cyclotron, and neutral beam heating systems are also included. Support functions for stray field topology and real-time plasma boundary reconstruction are included. In addition, initial event handling schemes for essential plant system faults and for disruption protection are being developed. The PCS architecture must also be capable of handling basic control for early plant system and plasma commissioning and the advanced control functions that will be needed for future high performance operation up to Q=10 and for long pulse non-inductive scenarios. A plasma control simulator is also being developed to test and validate control schemes. To handle the complexity of the ITER PCS, a systems engineering approach has been adopted with the development of a plasma control database to keep track of all control requirements including those of the associated diagnostics and actuators needed to carry out the control functions.

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