

Overview and status of the system control of WENDELSTEIN 7-X (P2-C-133)

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The new quality of the superconducting fusion device W7-X is its capability for long-pulse operation. Discharge operations can be up to 30 minutes with full heating power. Considering the steady state operation capability the W7-X system control will be important for future long-term fusion experiments. A wide spectrum of requirements has to be considered during design and realization of the system control of W7-X. The experimental nature of the W7-X project requires high flexibility for machine operation and automatic program controlled operation. During the planned life cycle of about two decades the scientific programs will be permanently adapted to new aspects. New components will be included into the control system and established systems have to be adapted with respect to technological progress. The device W7-X is a very complex technical system. On the top of the hierarchically structured system control the central control system is located. Local components, e.g. power supplies, heating systems, and diagnostics, have their own control systems. For commissioning and tests local systems will be run autonomously. In preparation for experiment operation all essential components will be subordinated to the central control system. During experiments the central control system coordinates the activity of these components. A special segment control system is responsible for processing predefined programs. The configuration of a discharge phase can be set very flexible: Short pulses with arbitrary intervals, steady state long discharges and arbitrary sequences of short phases with different characteristics in one discharge will be supported by the segment control system. The interactive session leader program allows to choose and chain predefined segment programs, to start or stop a segment program chain as a discharge. The progress of the discharge is visualized by a sequence monitor. The independent safety system consists of local units responsible for the safety of each component and a central unit ensuring the safety of the whole W7-X system. Each technical and diagnostic component can be described with a unified component model. This model permits a standardized procedure to integrate a component into the control system of W7-X. Currently, some of the technical components of W7-X are already delivered, the others being in the phase of procurement. Already finished components are used for testing their control systems and interfaces.