

УПРАВЛЕНИЕ ПЛАЗМОЙ В ТОКАМАКАХ

Ч. 3.2. Моделирование и реализация систем управления плазмой в ИТЕР и конструкции DEMO¹

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Аннотация. Представлены экспериментальная отработка сценариев для ИТЕР на токамаках DIII-D (США) и WEST (Франция), подходы в моделировании и реализации систем управления плазмой в ИТЕР, подготовка системы управления плазмой в ИТЕР к пуску и эксплуатации. Показаны известные в Европе дорожные карты разработки и создания первой термоядерной электростанции DEMO (последующего шага после ИТЕР), которые указывают два направления разработки DEMO: (i) на традиционных токамаках с относительно большим аспектным отношением и (ii) сферических токамаках модульного типа, позволяющих заметно сократить время создания DEMO и получить конкурентоспособную дешевую электроэнергию. Приведены основные тенденции в разработке полоидальных систем DEMO, а также показана начальная версия системы управления вертикальным положением плазмы в DEMO.

Ключевые слова: токамак, плазма, магнитное управление плазмой, ИТЕР, конструкции DEMO.

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PLASMA CONTROL IN TOKAMAKS. Part 3.2. Simulation and realization of plasma control systems in ITER and constructions of DEMO

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Abstract. Experimental testing of ITER scenarios on DIII-D (US) and WEST (France) tokamaks, approaches to simulation and realization of plasma control systems in ITER, preparation of ITER plasma control systems for starting and exploitation are presented. The road maps, which are known in Europe, for development and creation of the first fusion power plant DEMO (the next step after ITER), are shown. These maps give two directions of DEMO development: (i) conventional tokamaks with relatively large aspect ratio and (ii) spherical tokamaks of modular type allowing to notably reduce the time of DEMO creation and to get competitive cheap electrical energy. The basic trends in DEMO poloidal systems design are given, and the initial version of DEMO plasma vertical position control system is presented.

Keywords: tokamak, plasma, plasma magnetic control, ITER, DEMO constructions.

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