Contribution ID: **49** Type: **Oral**

Oral_20: Overview on the development of the plasma diagnostic and control system for the European DEMO reactor concept

Wednesday, 8 September 2021 15:30 (30 minutes)

Within the European development of the concept for a future tokamak demonstration fusion power plant (DEMO) [1] the studies on the plasma diagnostic and control (D&C) system are progressing to prepare the basis for reliable plasma operation at high overall performance [2]. A variety of plasma diagnostics will be employed on DEMO in order to provide an accurate knowledge of the actual plasma state, which is needed to achieve controlled plasma operation within the allowed physical and technical limits. In addition, model based control techniques will be employed to provide early predictions of critical evolutions of the plasma state and to allow for timely reactions by the control system.
The integration of diagnostic front-end components on DEMO has to cope with strong adverse effects arising from neutron and gamma irradiation, heat loads, impinging particles and forces. In this environment, the quality of measurements can only be ensured for longer periods by using robust diagnostic components, mounting them in sufficiently protected (retracted) locations, and any maintenance can only be performed via remote handling. Major open issues are the durability of magnetic measurements in the presence of irradiation induced effects and the feasibility of detachment control under DEMO conditions. In parallel to diagnostic developments, the details of the main control issues are being formulated and investigated by quantitative plasma control simulations. In order to obtain the envisaged desired power output, DEMO operates close to some physics limits where even small disturbances, if not properly controlled, can trigger major variations of the plasma parameters. Equilibrium control requires high control power and can drive the poloidal field coil system to its operational limits. Within this paper, we will provide an overview on the current status of the ongoing D&C developments for the European DEMO concept.
References:
[1] G. Federici et al., Fus. Engin. Des. 109-111 (2016) 1464-1474
[2] W. Biel et al., Fus. Engin. Des. 146 (2019) 465-472

Primary authors: Prof. BIEL, Wolfgang (Institute of Energy- and Climate Research, Forschungszentrum Jülich GmbH, Jülich, Germany); Prof. ARIOLA, Marco (Universita'di Napoli "Parthenope", Consorzio CREATE, Italy)

Presenter: Prof. BIEL, Wolfgang (Institute of Energy- and Climate Research, Forschungszentrum Jülich GmbH, Jülich, Germany)