IAEA FEC 2014

Contribution ID: **748** Type: **Poster**

Development of the Q=10 Scenario for ITER on ASDEX Upgrade (AUG)

Friday, October 17, 2014 8:30 AM (4 hours)

In ITER, H-mode operation at 15MA and q=3 is planned to achieve 500MW fusion power at Q=10 in D-T-mixtures. This so-called ITER baseline (BL) scenario is characterized by normalized parameters for plasma density fGW=0.85, energy confinement H=1 and betaN=1.8. A high triangularity shape has been identified to be best suited to combine high density operation with good H-mode confinement.
Demonstration of this scenario in AUG requires central wave-heating to avoid core tungsten impurity accumulation. This boundary condition limits the possible values for plasma-current and magnetic field to two practical combinations for q=3 plasmas on AUG: (i) operation at 1.1MA/1.8T using ECRH in X3 mode and (ii) 1.2MA/2T using ICRH from two antennas with boron-coated protection limiter tiles. Such AUG discharges have been explored and stationary behaviour has been obtained. Normalized parameters for confinement and density come simultaneously close to the target values of 1 and 0.85, respectively, as long as betaN stays at values 20% above the ITER target of 1.8. However, in the fully shaped flattop ELM-frequencies of 10 - 25 Hz are typical as well as ELM-energies of 100 – 200 kJ which cause significant losses of 15 – 25% of the stored energy. The observed large ELMs are intolerable in view of ITER. Therefore, three methods for ELM mitigation were tried: (i) ELM pace making with pellets of different mass and frequency injected from the HFS, (ii) application of magnetic perturbation coils and (iii) nitrogen seeding. Although these methods have been successfully applied to other AUG scenarios, so far, none of these three methods led to a breakthrough in the ITER BL demonstration discharges. Since the operation at q=3 and betaN < 2 turned out to be difficult in particular with respect to the ELM behaviour, the idea came up to explore H-modes at lower plasma current and higher safety factor which still fulfil the requirement of Q=10.
This paper will discuss the present status of ITER BL demonstration plasmas on AUG based on the 2012/13 data and will include the latest results of the 2014 AUG campaign which will focus on the extension of the operational space of ELM mitigation techniques as well as on a slight shift of the scenario's operational point towards a potential less 'difficult corner' at 20% lower plasma-current and thus higher safety-factor.

Paper Number

EX/9-4

Country or International Organisation

Germany

Primary author: Mr SCHWEINZER, Josef (Germany)

Presenter: Mr SCHWEINZER, Josef (Germany)

Session Classification: Poster 7