Contribution ID: **41** Type: **Poster**

ITR/P1-11: Demonstrating the ITER Baseline Operation at q95=3

Tuesday, 9 October 2012 08:30 (4 hours)

ITER requires robust operation of various plasma scenarios within the hardware constraints of the device. Operation in H-mode at 15MA and q95=3 is planned to achieve Q=10 in deuterium-tritium mixtures. The Integrated Operation Scenario Topical Group of the ITPA has coordinated experiments in C-Mod, ASDEX Upgrade, DIII-D and JET to obtain optimum data assessing H-mode scenarios at q95˜3. Previous results for the plasma formation at low loop voltage and the ramp-up phase were reported.
Recent joint studies on the flat top and ramp down phase show that entering H-mode is generally observed at Ptot/PL-H˜1. Regular ELMing H-modes achieving H98˜1 require
Ptot/PL-H=1.3-2 at JET, for Ip up to 4.5MA, in DIII-D regular ELMing H-modes are only achieved at higher plasma beta (beta_N=2.0), while in C-Mod Ptot/PL-H˜1 is only achieved in stationary H-modes at high input power and higher radiation fraction using seeding. JET data show no significant difference in plasma performance or temperature and density profile shapes when using ion cyclotron heating compared to neutral beam heating, despite the rotation profile changing dramatically when the co-neutral beam is reduced to zero. For H-modes at high plasma current, some experiments only reach ne/nGW˜0.65-0.7 using gas fuelling. At DIII-D the stability of long pulse operation at q95=3, shows susceptibility to n=1 tearing modes. The current ramp down requires H-mode combined with a reduction in plasma elongation to control the plasma inductance excursion without additional flux consumption, for ohmic or L-mode discharges a stronger reduction in elongation would be required.
The experimental data presented provide important input for benchmarking integrated code simulations using sophisticated models for transport and heating or current drive systems; moreover they give additional confidence and insight into the possible operation domain of the baseline plasma scenario in ITER.

Country or International Organization of Primary Author

European Union

Collaboration (if applicable, e.g., International Tokamak Physics Activities)

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Session Classification: Poster: P1

Track Classification: ITR - ITER Activities