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EX/P3-05: Experimental Investigation of Plasma Confinement in Reactor Relevant Conditions in TCV Plasmas with Dominant Electron Heating

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This paper reports on recent TCV experiments performed to investigate the confinement of electron-heated discharges simulating reactor relevant conditions with dominant electron heating. The dependence of the L-mode confinement properties on the electron heating power density profile width has been analyzed for the first time. Discharges with on-axis peaked ECR heating profiles with half-width varying between 15 and 40% of the minor radius have been performed in the range of heating power 0.5-2 MW and at line-averaged density *2 10ˆ19 mˆ-3=0.15 n_Gw. A scenario with off-axis heating peaked at rho˜0.7 but the same total heating power has also been studied for comparison. The following features have been found [1]: (i) the confinement is largely independent of the power deposition profile width, provided a significant fraction occurs inside the q=1 radius; (ii) the energy confinement time scales with the heating power as tau_E˜ (P_tot)ˆ-0.73, independent of the heating profile width, when the power is peaked on-axis; (iii) off-axis heating results in stronger confinement degradation (tau_E˜ (P_tot)ˆ-0.9). An investigation of the plasma confinement in high-density discharges has also been performed. A limit density close to and even exceeding the Greenwald limit n_e_lim˜(0.6-1.1)*n_Gw has been achieved in ohmically heated plasmas, depending on the q_edge value.

[1] N A Kirneva, K A Razumova, A Pochelon et al, Plasma Physics Control. Fusion 54 (2012) 015011

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