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OVERVIEW OF TJ-II FLEXIBLE HELIAC EXPERIMENTS

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TJ-II is a four period low magnetic shear stellarator, designed with a high degree of experimental flexibility, which is operating in Madrid since 1998 (R = 1.5 m, a < 0.22 m, $B_0 \leq 1.2$ T, $P_{ECRH} \leq 600$ kW, $P_{NBI} \leq 3$MW under installation). Plasma is created and heated using two ECRH transmission lines with different power densities (1 vs. 25 W/cm^3) and steering launching capabilities (fix vs. poloidal and toroidal variation).
Magnetic configuration (iota ≈ 1.28 – 2.24), plasma volume (0.6 – 1.1 m^3) and magnetic well scans (0-6%) have been investigated to study the role of magnetic topology (mainly rational surfaces) on transport and the phenomena associated to instability thresholds. Plasma stored energies up to 1.5 kJ have been measured for electron densities and temperatures up to 1.2 x 10^{19} m-^{3} and 2.2 keV respectively with $P_{ECRH} \leq 600$ kW. TJ-II typical plasmas are characterized by peaked electron temperature and flat density profiles. Several new confinement regimes have been identified which show an enhanced particle and energy confinement and which in the case of the recently obtained toroidal current regime improves plasma stored energy up to a factor two. Measurements of electron temperature profiles using ECE and high resolution Thomson scattering diagnostics have shown evidence of internal heat transport barrier formation in the TJ-II stellarator. First measurements with the heavy ion beam probe system (HIBP) has shown a correlation between plasma potential and plasma density.

Topic 1 Oral Presentation

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