Improved confinement regimes induced by limiter biasing in the TJ-II stellarator

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The influence of limiter biasing on plasma confinement, radial electric fields and fluctuations has been investigated in Electron Cyclotron Resonance Heated plasmas in the TJ-II stellarator. First results show evidence of improved confinement regimes induced by limiter biasing (V = 200 V, $I_{limiter} \approx 30$ A) with changes in the following plasma parameters:
1) The ratio between plasma density and particle recycling, as quantified by $H_\alpha$radiation monitors, increases up to a factor of two during limiter biasing. In addition, a bursty behavior has been observed in H_α monitors during the limiter biasing phase. Stored energy appears to show a density dependence ($W_{kinetic} \approx n$) stronger than that reported in plasmas with floating limiters ($W \approx n^{0.6}$). **2)** Local edge ExB turbulent transport is reduced by up to factor of (5 – 10) in a time scale of the order 10 to 100 μs. **3)** Edge ($\rho \approx 0.8$) as well as core ($\rho \approx 0.2$) plasma potential is modified at two different time scales. In the fast time scale (10 – 100 μs) the plasma potential changes by about 100 V both at the edge and core regions after limiter biasing; in the slow time scale (1 – 10 ms) plasma potential modifications are linked to the plasma density evolution with changes in the plasma potential of up to 500 V. **4)** The perpendicular phase velocity of fluctuations changes up to 2000 m/s after limiter biasing. Evidence of plasma bulk rotation is also provided by MHD frequency shifted modes as measured by Mirnov coils. **5)** The intensities of spectral line emissions from inherent plasma impurities (e.g. B, C, O and Fe) all increase in proportion to the line-averaged electron density and show no evidence of a significant influx during limiter biasing. **6)** So far, the impact of limiter biasing seems to be stronger in plasmas with smaller volume. This might suggest a possible role of plasma configuration (e.g. ripple) in the access to improved confinement regimes. Further experiments are in progress to investigate the role of iota, edge rational surfaces and ripple in the triggering of improved confinement regimes during limiter biasing.