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First results of plasma potential measurements in the TJ-II stellarator by heavy ion beam probing

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A heavy ion beam probe (HIBP) has been installed in the TJ-II stellarator ($R = 1.5$ m, $a = 0.22$ m, $B = 1.2$ T) to investigate the radial structure of plasma potential. HIBP trajectories have been calculated in different TJ-II magnetic configuration and optimal characteristics has been obtained for active beam control to make measurements at different point of the detector grid.

This report presents a description of the HIBP system (200 keV and about 50 – 100 μ A of Cs^+) and the first measurements of the plasma potential in TJ-II plasmas. Measurements were carried out at $\rho = 0.4 - 0.6$ in He and H plasmas ($P_{\text{ECRH}} = 300$ kW). Plasma potential and secondary beam current show a correlation with electron temperature and plasma density. In particular, the plasma potential becomes more positive (up to 600 V) as plasma density decreases ($4 \times 10^{12} \text{ cm}^{-3}$). In the low density regime, the positive value of plasma potential decreases in He plasmas (about a factor of two) as compared with H plasmas.

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