H-mode transition in the presence of counter-NBI in the TUMAN-3M

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An increase in the *LH* transition power threshold towards low density has been observed in many experiments [1,2,3,4]. In the TUMAN-3M the *H*-mode operational domain is restricted to densities of $(1.2\div1.4)\cdot10^{19}$ m^{-3}. No transitions have been observed at densities below the boundary in typical scenarios: ohmic and co-NBI heating schemes [5,6]. In special cases of electrode and pellet assisted *H*-modes, the transition have been found at densities $(0.8\div1.0)\cdot10^{19}$ m^{-3} in the TUMAN-3 [7]. According to [7] in the electrode and pellet assisted *H*-modes an artificial radial electric field could explain transition at lower densities.

Recently the *H*-mode transition at low target density has been observed in the experiments on counter-NBI in the TUMAN-3M. Typical density in those experiments was $0.8\cdot10^{19}$ m^{-3}. Low input power, $P_{input} \approx 1.3P_{OHM} \approx 240$ kW, in these experiments should be noted. No transition is possible in the co-NBI heating scheme at the above density with P_{input} up to $2.5P_{OHM} \approx 500$ kW. One of possible reasons of the transition occurrence at lower density (or transition threshold power reduction) is the generation of the negative radial electric field due to large ion orbit losses in counter-NBI scheme. The enhanced plasma rotation caused by NBI could play a role as well. Analysis of the HIPB diagnostic and Doppler spectroscopy data in the low density counter-NBI assisted *LH* transition will be presented in the paper. Note, the effect of NB injection direction on the *LH* transition threshold power in the DIII-D has been reported recently [8].

References

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